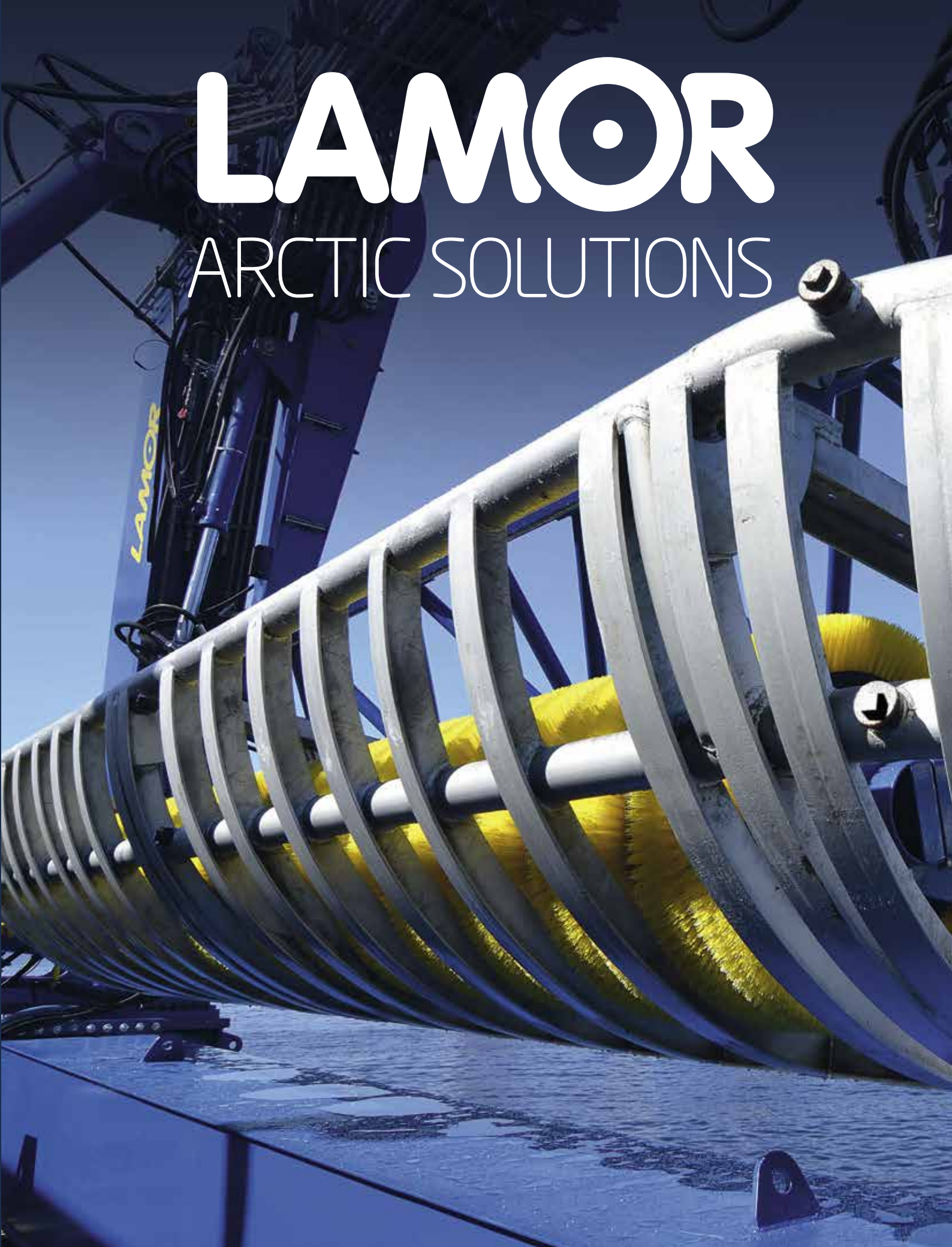

LAMOR

ARCTIC SOLUTIONS

ARCTIC SOLUTIONS

Arctic Defense; Responsibility & Research

Addressing Finland's need for Arctic oil spill prevention, response & recovery has been a priority for Lamor since the company's inception over 30 years ago. Through cooperative research, internal development, and global involvement in Arctic advancements, Lamor has provided innovative and effective market leading Arctic technologies across the globe.

The constant revision of these technologies, the development of new ideas, and improving response applications has and will remain a paramount focus for Lamor. These technologies will continue to preserve and defend the challenging, environmentally sensitive Arctic areas where there are evolving transportation, exploration and production activities.

In 1982, Lamor introduced the ground-breaking and effective brush wheel skimmer. In 1989, together with the Finnish Environment Institute (SYKE), Lamor developed the Ice Bow Collector, another product tested here in Kemi. Today, we proudly introduce our latest Arctic innovation and achievement, the Lamor Sternmax. The Sternmax is the world's largest vessel mounted skimmer and is dedicated to harsh Arctic oil spill response operations.

I trust that you will enjoy reading our publication and please do not hesitate to contact us if you have any questions or would like to receive more detailed information.

Sincerely,

FRED LARSEN
President & CEO

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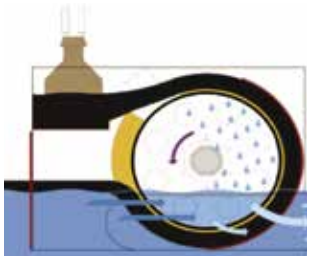
PRODUCTS

ARCTIC ARTICLES

Lamor Arctic Developments



1982

Stiff Brush Skimmer Invented

1991

Ice Bow Collector

1995

Bucket Skimmer

Boom Applications in the Arctic

Oil containment booms can be deployed and utilized in varying Arctic situations including shoreline, shoreline boom trenching on ice, boom ice slotting on and under ice, and beach sealing boom on ice.

- Inflatable or solid booms
- Varying lengths & heights
- Innovative & effective oil containment designs
- In & below ice applications
- Strengthened boom walls & light connections for effective Arctic use

1999 — Minimax12 Skimmer

2001 — Winterized Off-loading Pumps

2002 — Oil & Ice Separator

2003 — Arctic Skimmer

2004 — Rock Cleaner

2006 — Winterized Vessel Systems

2010 — Winterized Multi-Skimmers

2012 — Minimax 25 Skimmer

2013 — Sternmax Vessel Skimmer System

Arctic Equipment Enhancements

Lamor specializes in winterized mechanical recovery equipment. Robust and durable, Lamor's line of Arctic equipment operates effectively in cold temperatures and icy conditions. The equipment is fully tested technology combined with innovative and effective oil and ice separation techniques.

Winterized Enhancements Include:

- Heated hoses
- Heated isolation grates
- Heated brush cleaners
- Heated skimmer oil collection hopper
- Heated storage tanks
- Hot water injection for oil transfer pump
- Winterized power units (heated)
- Heated & humidified containers

The Source of Knowledge is Experience

Lamor Corporation offers optimal oil recovery solutions in all climatic conditions and environments. The source of knowledge is experience, and Lamor has for over 30 years developed advanced innovative expertise in Arctic, inland, nearshore, and offshore operations.

Lamor's headquarters is located in Finland, with hubs in China and the US and subsidiaries in Brazil, Ecuador, Oman, Peru, Turkey, Russia and UK. Moreover, Lamor has agent and distributor networks in over 90 countries.

Lamor provides expertise coupled with solutions that protect the environment and ecosystems through in-depth knowledge and investment in technologically advanced oil clean-up response equipment that has a proven track record in all scenarios and climatic conditions.

The company's patented and certified solutions guarantee reliable and efficient oil recovery operations in any environment; land spill clean-up, port and marina service, shoreline clean-up, near shore oil recovery, offshore oil spill response, salvage operations, wreck oil removal, Arctic oil spill response on the ice, in broken ice and under the ice.

Lamor is ISO 9001 certified and its equipment is individually capacity certified and inspected by third party classifying authorities e.g. Bureau Veritas, Den Norske Veritas, Russian Maritime Register, to name a few.

The company has extensive experience in cooperation with governmental agencies worldwide i.e. Swedish Coastguard, North American authorities and representative agencies, Russian authorities and ministries, European Union environmental administrations, European Maritime Safety Agency (EMSA), Chinese governmental and maritime departments and Middle Eastern environmental and representative agencies in several countries.

Lamor oil recovery equipment deployed during EMSA's preparedness drill in the Gulf of Bothnia

NEW Sternmax Winterized Crushing Power

The Lamor Sternmax is the world's largest skimmer that is vessel mounted dedicated to Arctic operations. The Sternmax has a remarkable recovery capacity of 560 m³/h (2465 gpm).The brush wheel skimmer system has two Lamor oil transfer GTA 115 pumps and an ice and oil separating grate that collect oil with excellent ice handling capabilities in harsh Arctic climatic conditions.

As the vessel with ice breaking capabilities crushes the ice, the Sternmax is deployed from the stern of the vessel. "The isolation grate pushes the large pieces of drifting crushed ice under the water, separating the oil and water from ice. The grate can be lifted and tilted to remove ice and debris. The oil is collected by the brush skimmer that separates the oil from the water and transfers the oil into a hopper equipped with two GTA 115 pumps," says Lamor's **Rune Högström**. COO.

The Sternmax is supported by an A-frame that deploys the skimmer off the stern of the vessel from its storage cradle. It is a robust and durable vessel mounted, hydraulically driven system that utilizes Lamor's proven technology to enable successful Arctic oil spill response operations. The Sternmax is designed and certified in accordance with DNV 2.22 Lifting Appliances and it is Ex-Zone 1.

A significant feature is that the tilt/tipping cylinders can be used to adjust the screen so the dense side of the screen is used for pushing blocks of ice down. Other features include a hollow frame equipped with steam inlets allowing the frame to be pre-heated prior to deployment. A hot water injection line keeps the system warm including the hopper and brush scraper and moreover provides lubrication to support the flow of oil back to the vessel. The whole system can be operated by one person from the vessel creating a safe and efficient oil spill recovery environment.

Technical Specifications

Length (isolation grate)	9000 mm
Width (isolation grate)	2400 mm
Height (isolation grate)	1060 mm
Weight (system)	32 tonnes
Capacity	560 m³/h*
Hydraulic flow	240 l/min
Hydraulic pressure	210 bar
Power	110 kW
Operational reach	7 m

*Capacity related to pump selection

- Excellent handling capabilities
- Max. ice thickness 1.1 m (43.3 in)
- Ice, water and oil separation
- Hot water injection
- Steam heated isolation grate
- A-frame mounted maneuverable system
- Stiff brush wheel system
- Storage cradle for easy maintenance , cleaning and de-icing
- Dual positive Archimedes pumps
- Removable isolation grate for non-Arctic operations
- Remote control Ex Zone 1
- Single operator

Lamor Oil Recovery Bucket (LRB)

The LRB is ideal and effective for oil spill recovery operations on land, offshore and in Arctic conditions. The LRB is deployed from a vessel crane, dredging machine or excavator and is typically operated via remote control.

The skimmer automatically separates oils, emulsions and oily debris from sea water or soils.

The LRB system is unaffected by floating debris and the free water content in recovered oil is less than 2 %.

LRB 250

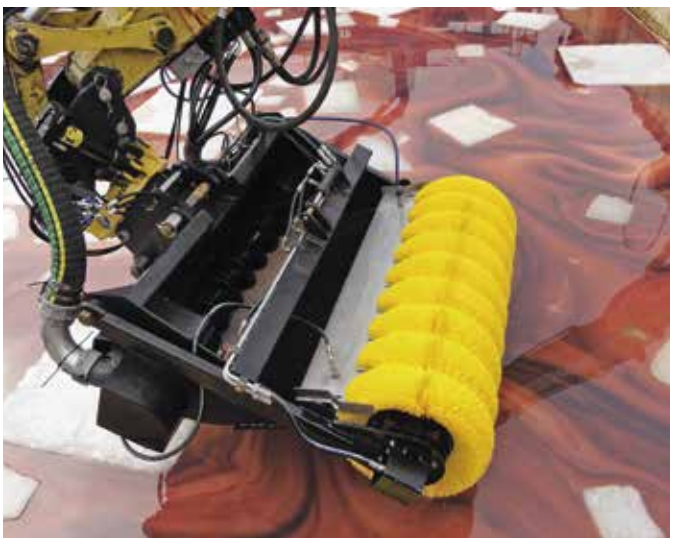
LRB 40

LRB 150

Technical Specifications

LRB	40	150	250
Length, mm	880	1740	2480
Width, mm	680	1800	2900
Height, mm	800	1180	1450
Weight, kg	75	650	1600
Certified capacity, m³/h	19*	115*	140*
Free water content	<2%	<2%	<2%
Hydraulic flow (skimmer only), l/min	20	30	30
Hydraulic pressure, bar	180	210	210
Power requirement, kW	6	11	15

*Capacity related to pump selection



LRB tested at Ohmsett

Lamor Built-In Oil Recovery System (LORS)

LORS is a vessel mounted advancing skimming system that is designed for usage on workboats, tugs and medium-to-large vessels providing the highest possible performance and safety for oil spill recovery operations..

Deployment of the LORS makes the entire vessel an "oil slick processing system". The LORS uses the vessel's forward motion to deflect surface water and oil from the collection area, formed by the jib arm and sweep boom, into the recovery process. The flow of water carries oil through the recovery channel, where the oil is efficiently separated and removed from the flow with the brush skimmer.

The skimmer can operate in adverse weather and sea conditions without losing performance. The rotating brushes collects oils of all types including weathered bunker oil and emulsions with less than 2 % free water content, making maximum use of valuable storage volume.

The LORS system can be deployed and operated by a small crew very quickly. When the system is not in use, it is stored below deck and is otherwise independent of the other functions of the vessel.

Technical Specifications (single side system)

LORS	4C	5C
Length, mm	2500-4500	3500-6000
Width , mm	ca. 1000	1500
Height, mm	ca. 2000	2000-3000
Weight, kg	ca. 1800	ca. 2000
Power requirement (skimmer only), kW	3	3
Certified capacity, m^3/h	203*	260*
Free water content	<2%	<2%
Recovery speed	1 - 4 knots	1 - 4 knots
Hydraulic flow (skimmer only), l/min	10	10
Hydraulic pressure, bar	180	180

*Capacity related to pump selection

Lamor Side Collector (LSC)

The LSC The LSC is a side-vessel mounted advancing skimming system for tug and workboats as well as for large vessels. In addition to the skimmer unit on one or both sides of the workboat, the total LSC system typically consists of automatic or manual outrigger jib arms and sweeping booms.

Owing to the high recovery speed, the system is able to recover the largest possible area of an expanding oil slick at sea. The deployment of the system can start skimming oil within minutes of arrival on site and be operated by a small crew requiring very little specialized training.

The brush conveyor system recovers all types of viscosity oils, tar balls, etc. even with large amounts of floating debris present. The LSC can operate in adverse weather and sea conditions without losing performance. Another major advantage is that the recovered oil contains less than 5% free water content, thus maximizing the of valuable storage volume.

The LSC system can be fitted in various types and sizes of vessels allowing them to serve as oil recovery units. It can be installed in new-buildings as well as in existing vessels.

Technical Specifications
A few examples of Lamor's product range.

LSC	3C	5C
Length, mm	3600	3600
Width, mm	900	1250
Height , mm	2950	2950
Weight, kg	560	690
Certified capacity, m³/h	152*	252*
Free water content	<2%	<2%
Recovery speed	4 knots	4 knots
Hydraulic flow (skimmer only), l/min	25	25
Hydraulic pressure, bar	210	210
Power requirement, kW	10	10

*Capacity related to pump selection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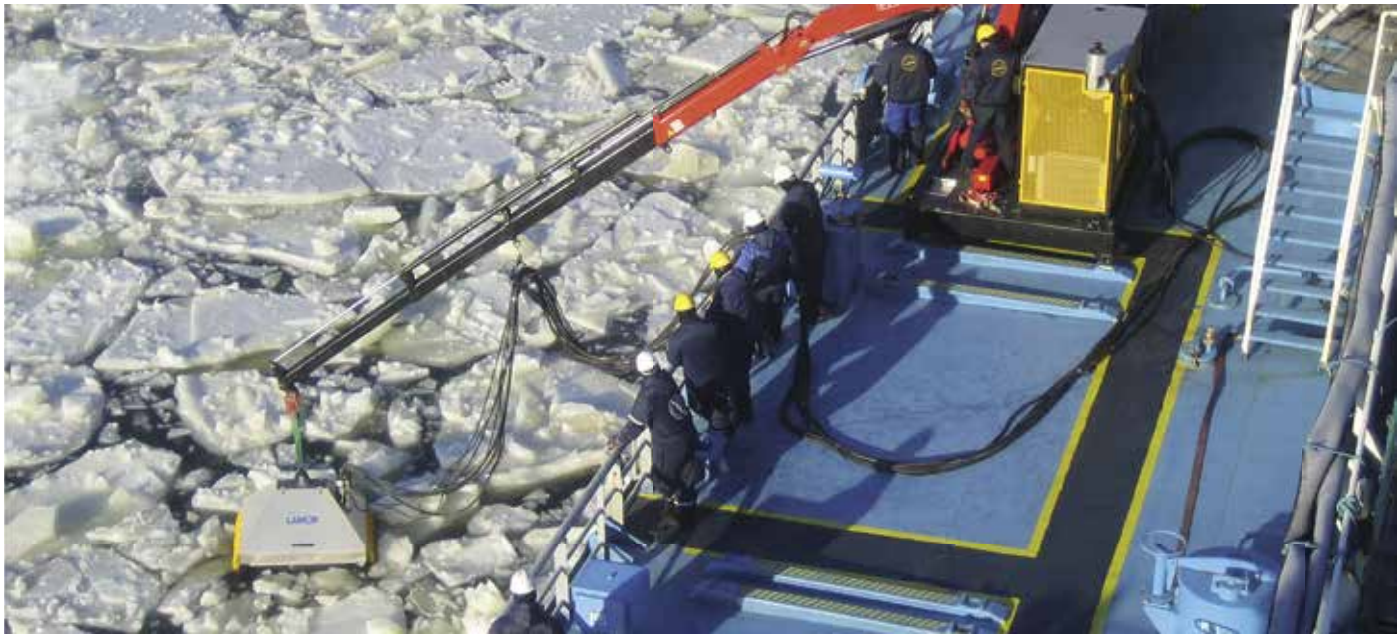
Lamor Arctic Skimmer (LAS)

The LAS is a special purpose oil recovery system designed for operations in extreme harsh conditions and it represents a technical advance in the development of equipment that provides an efficient and practical solution to recovery in all Arctic conditions.

The LAS is normally deployed from a crane or davit but can also be used as a free floating skimmer utilizing the optional floats when required. The skimmer incorporates static ice deflection pipes and rotating brush wheels for separation and collection of oil.

The LAS is equipped with a hot water injection system to improve recovery in Arctic conditions. The two brush wheels collect and separate the oil from the water and ice particles are crushed by the ice crushing screws installed in the hopper.



Technical Specifications

Length, mm	1850
Width, mm	1414
Height, mm	2182
Weight, kg	780
Weight with pump, kg	950
Certified capacity, m³/h	125*
Free water content	<2%
Hydraulic pressure, bar	200
Power requirement , kW	30

* Related to pump selection

Lamor Free Floating Skimmer (LFF) 100

The LFF100 is high capacity brush chain skimmer designed to recover oil in offshore operations for efficient collection of all types of floating oil from light to viscous oils and emulsions. The LFF 100 has excellent wave following characteristics and is suitable for use in all environments, including Arctic conditions.

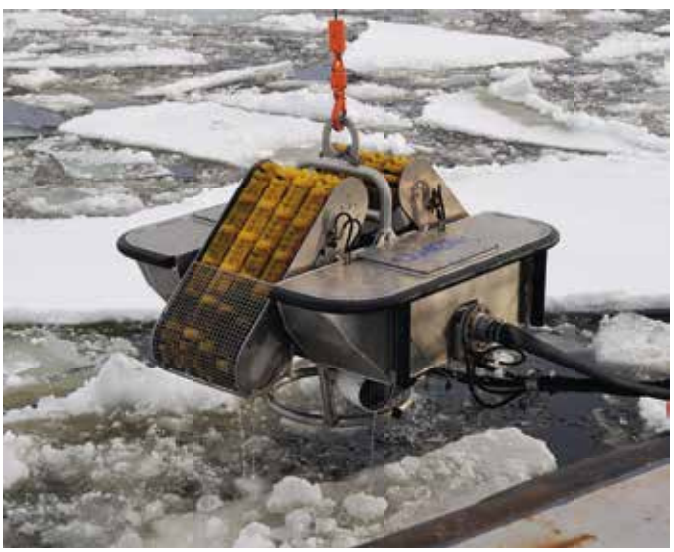
The skimmer has two 4-row oleophilic V-brush chains that separate the oil from water effectively and lifts the oil to a specially designed brush scraper from where the oil is directed to the oil transfer pump. The LFF has a robust aluminum frame and floats with a single lifting point, which makes the skimmer easy to lift, operate, clean and store. The LFF has a heated scraper and hopper for effective skimming in Arctic conditions and is equipped with thrusters for mobility.

The skimmer has a remarkable recovery rate of 405 m³/h and its effectiveness in Arctic operations has also been tested at Ohmsett testing facilities.

Technical Specifications

Length, mm	2290
Width, mm	2250
Height, mm	1946
Weight, kg	700
Certified capacity, m³/h	405*
Free water content	<2%
Hydraulic flow (skimmer only), l/min	70
Hydraulic pressure, bar	210
Power requirement, kW	25

* Related to pump selection

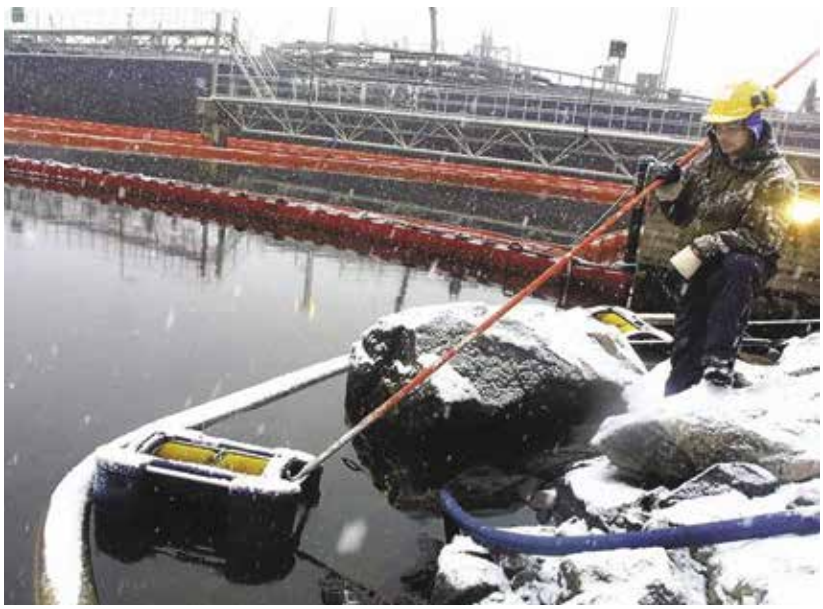


Lamor Minimax (LMM) 12

The LMM 12 is a light, portable suction-type oil skimmer, designed to recover oil from shorelines, harbors, rivers and lakes. The MM 12 combines high oil recovery capacity with a low free water pick-up rate. The MM 12 has proven its efficiency in continuous recovery operations in hundreds of oil spills, in all conditions and varying types of spilled oil. Moreover, its capacity is certified by Bureau Veritas.

The MM 12, weighing only 28 kg is a hand portable skimmer with a recovery rate of up to 45.4 m³/h. The brush wheels will recover any floating oils which remain fluid.

The MM 12 is entirely hydraulic and should be connected to an effective suction pump or vacuum system.



Technical Specifications

Length, mm	835
Width, mm	665
Height, mm	357
Weight, kg	28
Draft, mm	120
Certified capacity, m³/h	45.4*
Free water collected, %	2
Hydraulic flow (skimmer only), l/min	1-3
Hydraulic pressure, bar	60-100
Power requirement, kW	0.5

*Capacity related to pump selection

Lamor Minimax (LMM) 25

The Minimax 25 skimmer is a light-weight new generation modular oil skimming unit that is easily transported and assembled. The portable skimmer can be used in all terrains and environments, including Arctic conditions and remote locations.

The LMM 25 consists of only three easily assembled parts, a skimmer body, a collection hopper and a brush module. Therefore it can be assembled in less than a minute facilitating cleaning and service. Disc and drum modules are available as optional equipment.

The skimmer utilizes the Lamor next generation brush wheel technology, which combines high oil recovery capacity with less than 2 % free water content. The skimmer's frame and hopper made of molded polyethylene are light-weight, durable and easy to clean. The skimmer is entirely hydraulically operated and its power requirement is low. The unit is intended to be connected to a suction pump or vacuum system.

The recovery capacity of the Minimax 25 is certified by Bureau Veritas at 26.8 m³/h. Moreover, the skimmer's recovery rate and efficiency has been fully tested at Ohmsett testing facilities.

Technical Specifications

Length	852 mm
Width	853 mm
Height	464 mm
Weight	22.5 kg
Draft	128 mm
Certified capacity	26.8 m³/h*
Free water collected	<2 %
Hydraulic flow, l/min	1-3
Hydraulic pressure	60-100 bar
Power requirement	<0.5kW

Lamor Rock Cleaner (LRC)

The LRC is designed for oil recovery operations on rocky shorelines, in harbors, at oil terminals etc. It has an adjustable steering handle and can be carried with a harness in a comfortable ergonomic position. The LRC is an important tool in the Lamor beach cleaning concept and its recovery capacity in varying oil viscosities has been certified by Bureau Veritas.

Compared to conventional methods, the LRC offers new possibilities thanks to the Lamor stiff-brush technology combined with its small size, making it possible to recover oil from the water as well as from land, ice, concrete, asphalt, oil booms, etc.

It is recommended to use the LRC with a Lamor Stone Catcher to protect the suction pump in use. The LRC can be connected to many different power sources, vacuum pumps or to a vacuum truck. The LRC can also be used for varying chemical clean-up operations since it is made in stainless steel and aluminum.

Technical Specifications

Length, mm	1500
Width, mm	400
Weight , kg	6.5
Certified capacity, m³/h	6.7*
Free water collected, %	5
Capacity, certified max	9.7 m³/h
Hydraulic flow (skimmer only), l/min	1–3
Hydraulic pressure, bar	60–100
Power requirement, kW	0.5

*Capacity related to pump selection

Lamor Oil Ice Separator (LOIS)

The LOIS is a breakthrough in the development of oil spill recovery in Arctic conditions, where recovering oil in icey conditions is extremely difficult due to the immense technical requirements on the equipment's strength, durability and its functions. Lamor cooperated with the Finnish Environment Institute (SYKE) in the research and development of the LOIS for three years, and the end result was the first advancing skimmer system dedicated for Arctic conditions in the world.

The special unit is installed on the side of the vessel with its own pivoting hinges and hydraulic lifting system, so that it can easily be lifted for transportation to the scene of the oil spill and then lowered for operation.

As the vessel moves at a speed of 1 – 3 knots, the crushed ice is pushed under the grids of the LOIS. The grids oscillate up and down with a stroke of 200 mm and a frequency of 0.7 Hz. Since oil is lighter than water, it rises through the grid inside the LOIS up to water surface, from where it flows into the Built-in Lamor Oil Recovery System (LORS) skimmer brushes through an opened side hatch.

Technical Specifications

Length, mm	14290
Width, mm	3438
Height, mm	3034
Weight, kg	32000
Hydraulic flow, l/min	170
Hydraulic pressure, bar	250
Power requirement, kW	75

Lamor Heavy Duty Oil Booms (HDB) 900-2000

The HDB covers the increasing demand for a boom which is specifically suited for use in open seas, harbors and permanent installations such as oil terminals and power plants. Moreover, the HDB can be utilized in all climatic conditions and environments, including Arctic conditions. The HDB is available in sizes varying from 900 to 2000 mm in height and 50 or 100 m section lengths.

The HDB is manufactured using the highest quality components and is constructed so that two layers of synthetic fabric are vulcanized together with synthetic oil resistant rubber outer layers. The HDB is constructed using fully vulcanized and rubber welded parts without the use of any pop rivets. The synthetic coated outer layer gives the HDB excellent resistance to the effects of oil and UV degradation.

Inflation of the HDB is quick due to the patented Lamor F1 air valve and use of a Lamor Air Blower. The complete use of the air valve at inflation can be carried out by one person. It is recommended the HDB be stored on a dedicated hydraulically powered reel, enabling deployment of up to 200 meters in approx. 15 minutes.

Technical Specifications

Ballast weight, kg/m	1.5 - 4.5
Temperature resistance	-40...+60 °C
Base fabric	EP 315 and 400
Fabric Tensile strength	15750-20000 N/5 cm
Air chamber length, m	3
Valve	F1

The Heavy Duty Oil Booms

Product	Deflated Height (mm)	Weight (kg/m)	Freeboard (mm)	Draft (mm)	Buoyancy/ weight ratio
HDB 900	900	8.1	350	450	11:1
HDB 1200	1200	10.0	440	560	10:1
HDB 1500	1500	12.6	445	845	12:1
HDB 1800	1800	15.2	560	960	13:1
HDB 2000	2000	17.1	560	1160	12.5:1

Lamor Foam Filled Oil Booms (FOB) 350-1500

The FOB is a very dependable rapid deployment response oil containment boom that is robust yet lightweight and easy to handle. The FOB is well suited for emergency deployment or permanent use in harbors or oil terminals. It is available in sizes varying from 350-1500 mm in total height. The FOB is supplied in 25 m sections but can be modified to different section lengths.

For Arctic conditions, the FOB is an excellent solution due to its design being narrow and it can be inserted between the man-made or natural cracked ice blocks to contain an oil spill. Lamor's FOB has been utilized in numerous Nordic climate oil containment operations over the years with excellent results.

The FOB is manufactured using highly visible red PVC coated woven 1100 dtex polyester, which is resistant to the effects of oils and UV radiation. Each section incorporates reflectors, supplemented by light pouches and built in chaff for radar detection. The floatation is derived from resilient closed cell foam and a ballast chain is incorporated into the skirt.

The FOB can be supplied in storage racks, allowing sections to be pre-joined ready for rapid deployment or on powered reels holding up to 300 m of boom for effortless deployment and recovery.

Technical Specifications

Ballast weight, kg/m	1.9 -3
Temperature resistance	-35...+70 °C
Base fabric	1100 dtex polyester
Fabric Tensile strength	4000 N/5 cm

Foam Filled Oil Booms

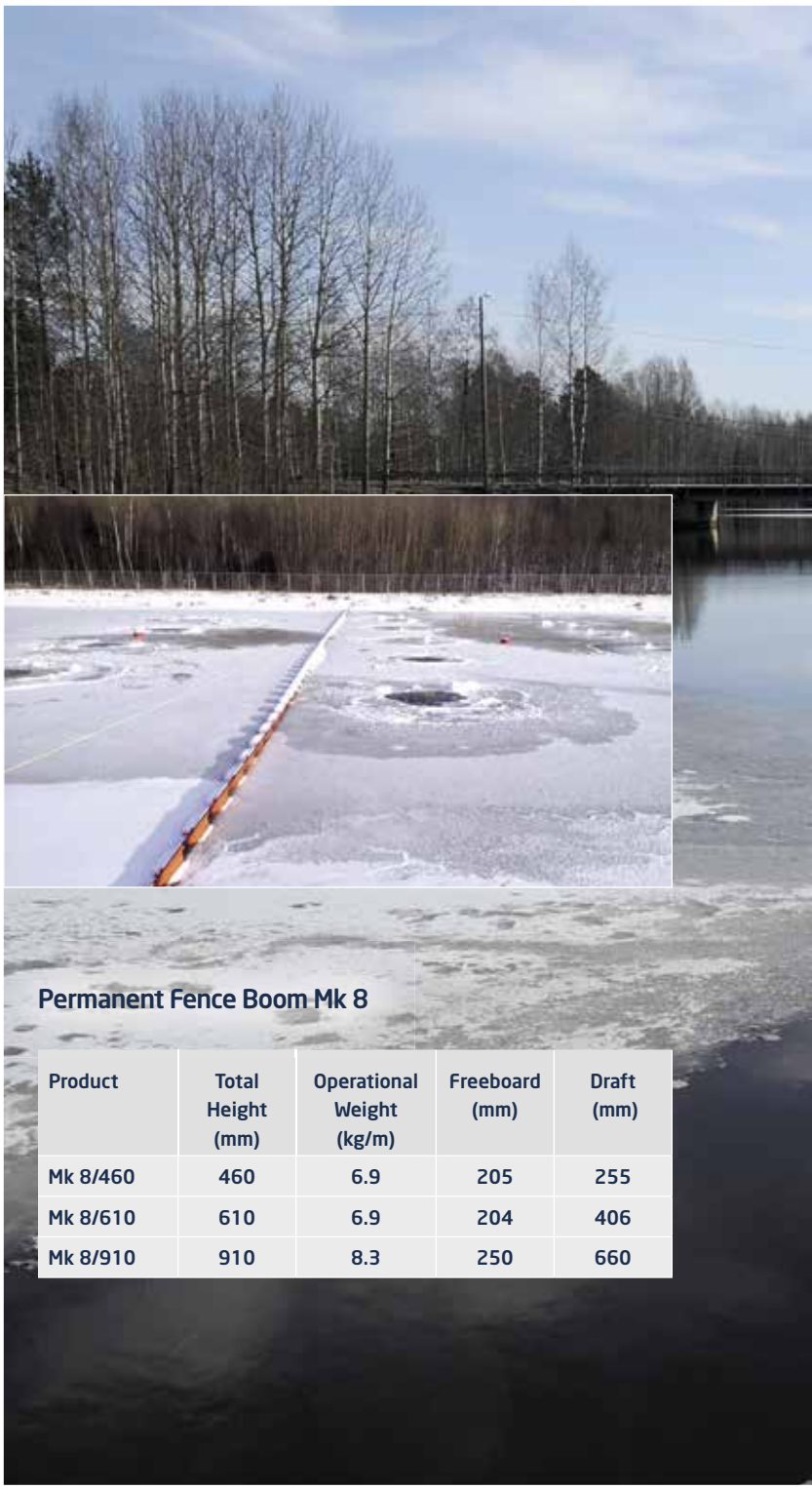
Product	Total Height (mm)	Operational Weight (kg/m)	Freeboard (mm)	Draft (mm)
FOB 350	350	3.5	150	200
FOB 500	500	3.8	200	300
FOB 750	750	4.2	250	500
FOB 900	900	5.3	350	550
FOB 1200	1200	6.2	425	775
FOB 1500	1500	7.5	500	1000

Lamor Permanent Fence Boom Mk 8

The Lamor Permanent Fence Boom Mk 8 is a heavy duty boom engineered specifically for permanent installations in e.g. harbors and water inlets. The Mk 8 oil containment and protection boom is durable and can withstand the impacts of heavy debris concentrations as well as ice. Moreover, it has a long service life.

The Mk 8 is manufactured from strong PVC coated belting fabric together with polyethylene floats. The booms have marine growth inhibitors and are UV resistant.

The Mk 8 has been utilized in Finland year-round in Arctic conditions at the water inlet of a power plant for several years and has proven to be a very durable and dependable boom designed specifically for permanent installations.



Technical Specifications

Coating/base fabric	PVC coated belting fabric
Fabric Tensile strength	133.400 N
Fabric weight	5925 g/m^2

Permanent Fence Boom Mk 8

Product	Total Height (mm)	Operational Weight (kg/m)	Freeboard (mm)	Draft (mm)
Mk 8/460	460	6.9	205	255
Mk 8/610	610	6.9	204	406
Mk 8/910	910	8.3	250	660

Lamor Power-Packs

Lamor supplies a wide variety of portable and mobile power sources for effective and flexible operation of oil spill response equipment, such as skimmer systems, oil containment boom reels etc.

Depending on the scenario, the climatic conditions and overall recovery operation, numerous types of multi-purpose hydraulic, electric as well ex-proof electric power-packs can be supplied with varying technical parameters pending the needs i.e. assembled powerful oil transfer pumps, Chalwyn valves, spark arrestors, container corners, stainless steel couplings, remote controls etc.

Lamor is recognized for its high-quality, robust and durable power-packs, guaranteeing a long service life even in harsh climatic conditions. To ensure operational efficiency in harsh Arctic conditions, the company utilizes only Arctic compatible engine oils and hydraulic oil. Special engine block heaters and hydraulic oil heaters are fitted

Technical Specifications Lamor Power-Pack (eLPP 55-80 Kw)

Length, mm	2100
Width, mm	1230
Height, mm	1450
Weight (dry), kg	1750
Hydraulic circuits	3-5 pcs
Hydraulic flow	200 l/min
Hydraulic pressure, bar	210 / 350
Tank capacity - hydraulic	100 l
tank capacity - fuel	180 l

on the power-packs. Moreover, larger battery power sources and battery maintenance chargers are included as standard.

Power capacities vary from e.g. 3 kW to 200 kW. A selection of power-packs are presented here, the complete product range comprises several more models, options and custom-made solutions.

Due to stricter emission legislation worldwide, Lamor has developed a brand new product range of power-packs thus reducing the environmental footprints. The new ranges of power-packs are remote controlled and by using different modes enable simultaneous utilization of a selection of various oil spill response equipment, such as skimmers, oil boom reels etc. Hence, one single power source is needed versus several different types of power-packs as a power source for various functions and OSR equipment. Moreover, the state-of-the-art power-packs have reduced noise emissions.

Technical Specifications for a selection of power-packs recommended for Arctic operations

POWER PACK	LPP 23	LPP 35	LPP 58	LPP 77	LPP 119	LPP 150	LPP 200
Length, mm	1345	1330	1600	2000	2300	2650	2650
Width, mm	810	800	1050	1300	1400	1440	1440
Height, mm	1100	1000	1340	1600	1800	1900	1900
Weight, kg	530	570	900	1480	2000	2300	2300
Hydraulic flow, l/min	73	110	160	230	320	300	420
Hydraulic pressure, bar	180	180	210	210	210	210	210
Power, kW	23	35	58	77	120	150	200

NEW GT A Oil Transfer Pumps GT A 20–30, GT A 50–70, GT A 115-140

Lamor has developed portfolio of oil transfer pumps, the GTA multi-purpose submersible Archimedes screw pumps with a capacity ranging from 20 to 140m³/h.

The newly developed a series of GTA pumps manufactured in stainless steel have been especially designed for long-term permanent use on vessels. The stainless steel GTA pumps have also been surface treated to enhance its superior properties for the acid proof stainless steel casing with a mix of highly protective dirt repellent and hydrophobic coatings.

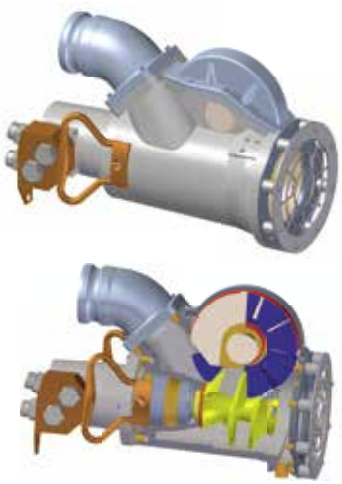
All Lamor GTA pumps have a unique design that promotes a smooth pumping action and easy flow control that will not emulsify oily water and reduces cavitation ensuring a constant flow. In addition to being used as oil transfer pumps, the pumps can be utilized for numerous applications such as offloading emergency pumping of heavy crude, bitumen, tank cleaning, pipeline maintenance, sludge removal etc.

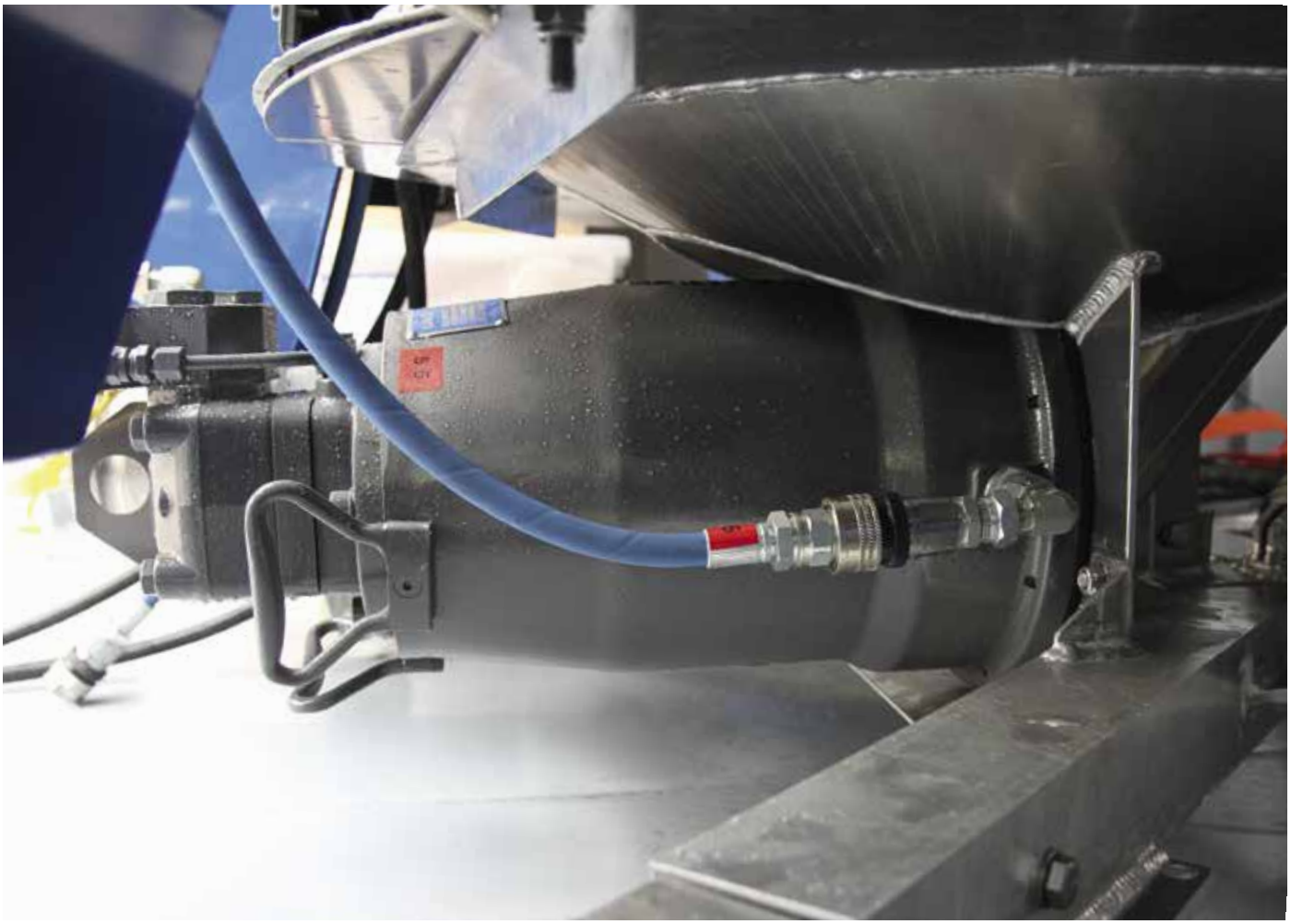
The efficiency of the GTA pumps is increased due to a water/steam annular injection on the inlet and a debris cutting knife to handle solids such as seaweed, plastics and ropes. The pumps are constructed from robust seawater resistant aluminum for the casings and stainless, acid proof steel internals with special seals.

The pump range has been extensively tested in the field and is certified by Bureau Veritas for its recovery capacities in oils of varying viscosities.

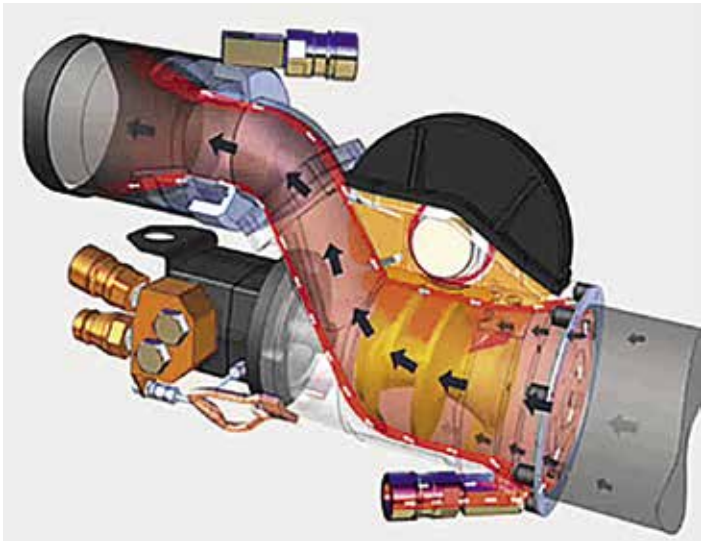
Technical Specifications

Pump model	L (mm)	W (mm)	H (mm)	Weight (kg)	Weight stainless steel (kg)	Certified Capacity (m³/hr)	Discharge pressure (bar)	Hydraulic flow max. (l/min)	Hydraulic pressure max. (bar)
GT A 20	300	195	435	25	39	21	14	80	210
GT A 30	300	195	435	26	41	31	14	75	210
GT A 50	400	250	500	49	73	61	14	160	210
GT A 70	400	250	500	47	72	84	10	92	210
GT A 115	500	300	598	71	109	119	14	160	210
GT A 140	500	300	598	71	109	142	12	160	210





Hot water injection to pump



Hot water injection for pump

Successful Simulated **Arctic OSR Testing**

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Bureau of Safety and Environmental Enforcement is the principal US federal agency that funds research in oil spill technologies through the Oil Spill Response Research (OSRR) program. For BSEE, Ohmsett is the cornerstone of its OSRR program. The OSRR program has partnered with state and federal government agencies, academia, private industry and other countries who share similar interests in Arctic oil spill response research.

In March, BSEE and the United States Coast Guard (USCG) invited several OSR equipment manufacturers under the theme "BSEE Ice Month Testing at Ohmsett" to evaluate different types of skimmers used by the USCG. The testing conditions simulated the Alaska North Slope crude (ANS) in two different ice conditions with 30% and 70% ice concentration.

"We tested our Lamor Multimax 50 (LAM 50) and our proven oil recovery bucket skimmer (LRB), which has been used in numerous oil spills since the early 1990s," says Lamor's COO **Rune Högström**, who was at Ohmsett to supervise the testing of Lamor's equipment.

All tests were performed with Hydrocal, a standard Ohmsett test oil. "Hydrocal, a lubricant oil, was selected rather than a crude oil because, as a refined product, it provides a more stable test fluid and produce less of a breathing hazard over the four-week test period. At a nominal test temperature of 32F (0C), Hydrocal has a density of 0.90 g/mL and a viscosity of 1000 cP," says Lamor's **Vince Mitchell**, VP Special Projects.

"We had utilized our latest brush technology for the LRB and the test results exceeded our expectations markedly. Large amounts of oil were recovered with minimal water intake, "Högström highlights.

"The most significant outcome of the test was that it made no difference if there was 30% or 70% or any ice at all for that matter with respect to the recovery capacities, due to its easy maneuverability and ice-handling features," he notes.

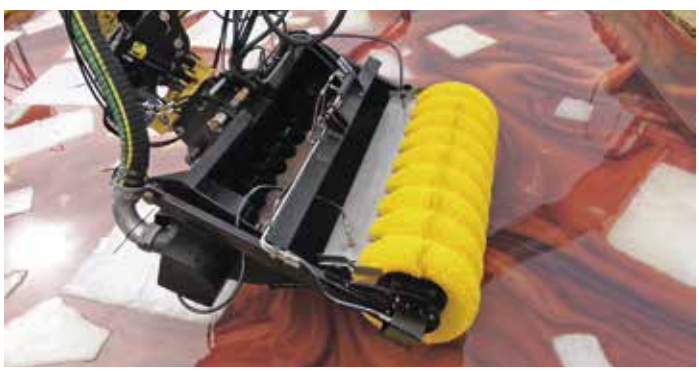
Engaging a world-class facility

Government agencies including the USCG and the Navy as well as private industry and oil spill response organizations train their emergency response personnel with real oil and their own full-scale equipment. Some of the testing activities have included remote sensing tests, wave energy conversion device tests, skimmer and boom tests, dispersant tests, alternative fuel recovery tests, and industry oil spill response training classes.

The research and training facility centers on an approx. 10 million liter (2.6 million gallon) salt water tank. Government and the private sector train with oil under realistic oil spill conditions and increase their proficiency using actual oil spill recovery equipment by collecting and recovering oil. Ohmsett creates oil spills in a safe environment. Without this facility, experiments would have to be conducted in the open ocean, which have significant environmental implications.

"The Ohmsett facilities have a full-scale oil spill response equipment testing, research and training can be conducted in a marine environment with oil under controlled environmental conditions i.e. waves and oil types," says Högström.

"The opportunity to test our skimmers at Ohmsett was once again remarkable and a fantastic experience since its facilities offers a realistic simulated controlled marine environment for oil spill equipment e.g. the use of real oil in a wave/tow tank. Based on the outstanding offering of services coupled with the great cooperation and flexibility of its staff, Ohmsett is already an integral part of our testing and vetting process," concludes Högström. ●



Lamor's proven oil recovery bucket skimmer

BSEE

In response Gulf of Mexico oil spill, the Obama Administration launched the most aggressive and comprehensive reforms to offshore oil and gas regulation and oversight in US history. BSEE was formally established on October 1, 2011 as part of a major reorganization of the US Department of the Interior's offshore regulatory structure.

BSEE uses the full range of authorities, policies and tools to compel safety, emergency preparedness, environmental responsibility and appropriate development and conservation of offshore oil and natural gas resources.

Key functions include:

- an offshore regulatory program that develops standards and regulations and emphasizes a culture of safety in all offshore activities
- oil spill response preparation including review of industry Oil Spill Response Plans to ensure compliance with regulatory requirements
- environmental enforcement with a focus on compliance by operators with all applicable environmental regulations, as well as ensuring that operators adhere to the stipulations of their approved leases, plans and permits
- and funding scientific research to enhance the information and technology needed to build and sustain the organizational, technical and intellectual capacity within and across BSEE's key functions that keeps pace with industry technological improvements, innovates regulation and enforcement and reduces risk through systematic assessment and regulatory and enforcement actions in order to better carry out the BSEE mission.

Advanced Oil Spill Response in Ice Course

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

For the second year in a row, Alaska Clean Seas (ACS) has conducted an Advanced Oil Spill Response in Ice Course at the Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire. Two separate week-long courses were held, training approximately 55 spill response personnel representing oil companies and agencies working on Alaska's North Slope.

(r) Lamor's Dan Beyer overseeing the testing of the Multimax 50 skimmer

This course was held at CRREL's 60 x 25 x 8 outdoor saline test basin. Approximately 18-20" of sea ice is grown using the tank's chilling system, completely covering the tank's surface.

"North Slope crude oil is injected under the ice prior to the start of training. Our training covers a wide range of topics, including: ice safety, detection and delineation of an oil spill under ice, containment and recovery tactics in ice, deployment of skimmers and recovery systems, and oil spill in-situ burning," says Alaska Clean Seas, **Chris Hall**, Training Specialist and Oil Spill Responder.

Controlled environment

"We select topics that provide the responder with diverse, realistic training but the focus is to use CRREL to do what we cannot do on the North Slope. CRREL allows us the opportunity to train with real oil in real ice. It is a safe and contained environment. That said, all of the unknowns and unique winter operational challenges that can happen in a real spill can happen at CRREL," Hall highlights. "Our students have knowledge and proficiency in site safety, equipment operations, and other spill response topics from their weekly training on the North Slope. CRREL enables us to 'put it all together' in a realistic yet simulated training environment. We build confidence in our students that they can effectively respond during an Arctic oil spill event," notes Hall.

Vendor support has been critical to the success of this training. "Our vendors provide equipment that is geared to a winter Arctic spill response scenario. Very few of our students have ever attended an oil spill

Lamor's Jim Gianacopolos preparing the Multimax 50 with GT A 50 pump for testing

trade show or conference, so they are not familiar with individual company representatives. These are true frontline end-users, deploying the equipment without the controls that might be present in a vendor demonstration," Hall outlines.

"Lamor brings great spill response equipment and a wide range of Arctic response expertise. Lamor representatives have been active participants in ACS training events for years, both at CRREL and Ohmsett in New Jersey. Each year sees a new piece of skimming equipment brought to the training and each class gets the opportunity to put the equipment through its paces. We are highly appreciative for the assistance provided by the Lamor team," says Hall.

Unique oil spill cooperative

ACS is a non-profit, incorporated oil spill response cooperative whose current membership includes oil and pipeline companies that engage in or intend to undertake oil and gas exploration, development, production and/or pipeline transport activities on the North Slope of Alaska.

"We are a unique oil spill cooperative in that ACS provides its member companies with extensive oil spill management and response training, oil spill research and development, and day-to-day field environmental and spill response support," says Hall.

"Our operations are focused on Alaska's North Slope and selected areas of the Alaskan Outer Continental Shelf and adjacent shorelines coupled with the Trans-Alaska Pipeline from Pump Station One to Milepost 167," Hall concludes. ●

Alaska Clean Seas

ACS provides arctic oriented spill response training to its member companies, contractors, village response teams and government agencies. This includes training in all aspects of spill response, including in-situ burning, broken and solid ice response, wildlife protection, incident management and safety and health issues. In 2012 ACS provided over 648 classes.

ACS Members:

- **Alyeska Pipeline Service Company**
- **Anadarko Petroleum Corporation**
- **BP Exploration (Alaska), Inc.**
- **Brooks Range Petroleum Corporation**
- **ConocoPhillips Alaska, Inc.**
- **Eni Petroleum**
- **ExxonMobil Production Company**
- **Great Bear Petroleum Operating LLC**
- **Pioneer Natural Resources USA, Inc.**
- **Repsol Services Company**
- **Savant Alaska, LLC**
- **Shell Exploration and Production**

Alaska North Slope

Located on the northern slope of the Brooks Range is the Alaska North Slope, situated between the Arctic Ocean and Chukchi Sea. The region contains the bulk of Alaska's National Petroleum Reserve. The petroleum reserves are transported via the Trans-Alaska Pipeline System to Valdez on the Pacific Ocean.

The CRREL complex in Hanover, N.H., houses world-class facilities and offers a variety of products.

- 24 low-temperature research cold rooms (temperature range down to -35°C)
- Special purpose ice test facilities
- Low temperature materials laboratories
- Research permafrost tunnel in Fox, Alaska
- 133-acre permafrost research site near Fairbanks, Alaska
- Project offices in Anchorage and Fairbanks, Alaska

The Corps of Engineers' Remote Sensing/Geographic Information Systems Center of Expertise is located at CRREL, along with the Cold Regions Science and Technology Information Analysis Center. CRREL maintains unique expertise related to the Earth's cold regions and is part of the U.S. Army Engineer Research and Development Center (ERDC).
CRREL solves interdisciplinary, strategically important problems of the U.S. Army Corps of Engineers (USACE), Army, Department of Defense, and the Nation by advancing and applying science and engineering to complex environments, materials, and processes in all seasons and climates.

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Marking a Complete Rotation of the Arctic Council

In Kiruna, Sweden, Canada officially assumed the position of Chair of the Arctic Council (AC) with a 2013–2015 mandate. Appropriately, the Government of Canada appointed the Honorable Leona Aglukkaq (ᓕᐅᓇ ᐊᒡᓘᒃᑲᖅ), an Inuk, as Chairperson of the AC. Minister Aglukkaq takes on this role in addition to her role as Minister of Health and Minister of the Canadian Northern Economic Development Agency.

Minister Aglukkaq was born and raised in Thom Bay, Taloyoak and Gjoa Haven in Nunavut, and is very knowledgeable of remote communities. Moreover, she was the first Inuk to be sworn into the Federal Cabinet as Minister of Health in late 2008. Nunavut remains close to her heart and she has fought hard for the interests of all Nunavummiut. “It is an honor to be selected to represent my country in the AC. I am energized and committed and hope to move forward with tangible actions on all issues,” says Minister **Leona Aglukkaq**.

“I welcome the new observer status countries of China, India, Italy, Japan, Republic of Korea and Singapore. The Arctic Council Ministers also agreed to respond positively to the European Union’s application for observer status, but deferred a final decision until the concerns of Arctic Council Ministers are resolved. Specifically Canada’s concerns around the European Unions position on the seal hunt, a legitimate, sustainable industry in Canada. That said, the AC adopted an observer manual that will define what rights the observer States have and clarify which decisions are not included in the observers’ mandate,” she continues.

Within the framework of the AC, developments in the Arctic are a source of both challenges and opportunities. With the changing environment in the Arctic and the increased business interest, one thing remains clear; the People who live and work in the Arctic must be consulted and put

(l-r) Patrick Borbey, Amb. Chris Shapardanov, Min. Leona Aglukkaq, Fred Larsen, Rune Högström

first. Minister Aglukkaq noted that countries interested in resource development in the Arctic, including oil and gas exploration, will not have "carte blanche" by becoming observers to the AC. The council will continue to serve as a protector of the delicate environment, indigenous communities and vast resources of the region.

Economic and social development

"Development for the people of the North with a focus on responsible Arctic resource development, safe Arctic shipping and sustainable circumpolar communities, is a very important element of our agenda. The official Kiruna Declaration of May 15th focuses on economic and social development, climate change, protecting the Arctic and strengthening the AC," says Minister Aglukkaq.

The Canadian chairmanship has set forth to include the establishment of a Circumpolar Business Forum (CBF) to provide opportunities and possibilities for industry and businesses to introduce their expertise and knowledge with the council. "The CBF is the perfect forum for oil spill recovery and response players to share their expertise, training and solutions," says **Patrick Borbey**, Chair of the Senior Arctic Officials and President of the Canadian Northern Economic Development Agency.

Experience is the source of knowledge

The AC should be a forum where a proactive approach is taken to prevent incidents such as oil spills, that may harm the natural environment. "Shortly after the Kiruna Ministerial Meeting, I travelled to Finland and spent an afternoon at Lamor Corporation in Porvoo. It was a very informative meeting, where I was able to see first-hand the equipment that is used in oil spill prevention and clean-up. The Arctic Council will continue to focus on oil spill prevention and response, which is vital to protect the Arctic's natural environment," says Minister Aglukkaq.

The 2010 Gulf of Mexico (GoM) massive oil spill needed immediate external support, expertise, solutions and equipment to assist in the containment and clean-up efforts. "We immediately set our action plans into motion and within 36 hours and through our global network, we airlifted an arsenal of equipment and key personnel to the scene," notes CEO **Fred Larsen**, Lamor Corporation.

"We also supported the Vessel of Opportunity (VoO) program, a modified sustainable Lamor concept, by training local fishermen and converting their fishing vessels to oil spill response vessels. This concept developed by us is something which proved to be very beneficial by engaging local communities and populations to collectively change and become responders to oil spills," he says.

Equipment, training and preparedness

Early training, preparedness and well-organized response operations coupled with effective equipment are the essential tools needed for proactively reducing the environmental impacts and effects from oil and other hazardous material accidents.

Lamor's COO **Rune Högström** highlights: "Our knowledge in oil spill response operations providing equipment and training is long. Naturally, due to our geographical location, Arctic conditions are a way of life for us and we have adapted our equipment to meet those challenges head on. That said, training is essential coupled with refresher training, and having the right equipment lessens the impacts of an oil spill."

"During the GoM incident, simultane-

ously three other oil-spills occurred in Dalian, China, Hong Kong and in Michigan (US), and we responded to these incidents too. We have facilities strategically located throughout the world with a stockpile of equipment to ensure that our response and readiness is not limited to one incident or region," says Larsen.

"It was great to meet with Lamor representatives, who have operational knowledge and expertise in the Arctic. By working together, we can achieve our goal of preventing oil spills from occurring in the first place," concludes Minister Aglukkaq. ●

Fred Larsen explaining how the Lamor Umbilical Hose Reel operates

Arctic Council Chairmanship

Arctic Council Chairmanship:
The Chairmanship of the AC rotates every two years between the eight member states. On May 15, 2013, Canada was handed over the Chair in Kiruna, Sweden during the AC Ministerial Meeting. In 2015 USA will Chair the AC followed by Finland in 2017.

Canada: Inauguration of Arctic Council – 1998 (Ministerial Meeting held in Iqaluit, Canada 1998)
United States: 1998–2000 (Ministerial Meeting held in Barrow, Alaska, 2000)
Finland: 2000–2002 (Ministerial Meeting held in Inari, Finland, 2002)
Iceland: 2002–2004 (Ministerial Meeting held in Reykjavik, Iceland, 2004)
Russian Federation: 2004–2006
(Ministerial Meeting held in Salekhard, Russian Federation, 2006)
Norway: 2006–March 2009 (Ministerial Meeting held in Tromsø, Norway, 2009)
Denmark: 2009–2011 (Ministerial Meeting held in Nuuk, Greenland, 2011)
Sweden: 2011–2013 (Ministerial Meeting held in Kiruna, Sweden, 2013)
Canada: 2013–2015
United States of America: 2015-2017

CANADA'S NORTHERN STRATEGY OUR NORTH, OUR HERITAGE, OUR FUTURE

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Multilateral Cooperation on Arctic Issues

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Canada's participation in the Arctic Council supports several objectives in the Government of Canada's Northern Strategy, including exercising Arctic sovereignty, promoting environmental heritage, social and economic development and improving Northern governance.

Canada-Finland relations on Arctic issues are strong. "Cooperation takes place predominantly through the Arctic Council, which both countries regard as the leading forum for multilateral cooperation on Arctic issues. With one third of Finnish territory north of the Arctic Circle and 99% north of 60 degrees, Finland is a natural partner for Canada at the Arctic Council," says HE **Chris Shapardanov**, Canada's former Ambassador to Finland.

Finland has high tech Arctic expertise and experience which provide the basis for frequent Canada-Finland exchanges on best practices. Canadian mining companies have a strong presence in Northern Finland of which approx. a third of all Finnish mines are Canadian-owned. "Officials from both our nations as well as companies collaborate closely in the area of winter navigation, icebreaking and shipbuilding," Ambassador Shapardanov highlights.

Aker Arctic is a member in the team led by local STX Canada Marine (formerly Kvaerner Masa Marine) who currently is designing the new polar icebreaker for the Canadian Coast Guard (CCG). "The polar icebreaker will be named after our former Prime Minister John G. Diefenbaker. The new icebreaker, CCGS *John G. Diefenbaker*, is expected to join the fleet in 2017 and will be delivered to coincide with the decommissioning of the CCGS *Louis S. St-Laurent*. That said, I do want to note that PM Diefenbaker was Canada's 13th prime minister and it was during his tenure in 1962 that the CCG was founded," explains Ambassador Shapardanov.

The northern dimension

"Relations between Canada and Finland on circumpolar matters have expanded rapidly. Canadian indigenous groups have established regular exchanges with the Sámi of northern Finland and Scandinavia. Finland initiated and promotes the EU "Northern Dimension" policy. Our involvement as an observer has added momentum to these shared interests, not only on traditional circumpolar matters but also vis-à-vis North-

Canada's Northern Strategy

Canada's Northern Strategy was launched in 2009. It is the Government of Canada's vision for a new North and its commitment to ensure that vision comes to life for the benefit of all Canadians. To meet the challenges and opportunities of a changing North, the Government is taking concrete action in four priority areas:

- **Exercising our Arctic sovereignty**
- **Protecting our environmental heritage**
- **Promoting social and economic development**
- **Improving and devolving Northern governance**

World-leading Arctic science and technology underpin the Northern Strategy and help ensure sound decision-making. The Government is committed to helping the North realize its true potential as a healthy, prosperous and secure region within a strong and sovereign Canada.

H.E. Chris Shapardanov, former Ambassador of Canada to Finland

west Russia and the Baltic Rim," says Ambassador Shapardanov.

Canada's interest in oil spill prevention and remediation is of paramount interest in maintaining and preserving the environment and its population. "After a very well managed Chairmanship by Sweden, we were handed over the rotation as Chair of the Arctic Council in Kiruna, Sweden for the next two years. We seek continuity and maritime issues are important on the agenda. Moreover, I would like to emphasize the opportunity for continuity of priorities across the Chair periods of Canada, the U.S., and Finland. Realizing this potential would be important for the continued success of the Arctic Council," he says.

Canadian oil and gas exploration
and production in Alberta

"I welcome Lamor and other Finnish companies to work closely with Canada. There are several opportunities which make close cooperation beneficial to all."

The North is a fundamental part of Canada's heritage and national identity. "Our government recognizes the tremendous opportunities – as well as the many challenges – that exist in the North today. That is why we are allocating more resources and attention to Northern issues than at any time in our country's history," Ambassador Shapardanov explains.

Unique culture and way of life

Inuit (which means "people" in Inuktitut) have occupied Canada's Arctic lands and waterways for millennia. Ambassador Shapardanov explains: "Long before the arrival of Europeans, Inuit hunters, fishers and their families moved with the seasons and developed a unique culture and way of life deeply rooted in the vast land. Our nation's strong presence in the Arctic today is due in large part to the contributions of Inuit, who continue to inhabit the North."

International interest in the North has intensified because of the potential for resource development, the opening of new transportation routes, and the growing impacts of climate change. In September 2007, satellite imaging verified that the Northwest Passage had less than 10 percent ice coverage, making it, by definition, "fully navigable" for several weeks.

"This was well ahead of most recent forecasts. Although the Canadian archipelago is not expected to become a safe or reliable transportation route in the near future, reduced ice coverage and longer periods of navigability may result in an increased number of ships undertaking destination travel for tourism, natural resource exploration or development. The Arctic Council is an important venue for deepening global understanding of the Arctic and has played a key role in developing a common agenda among Arctic states," says Ambassador Shapardanov.

Engaging local communities

The foreign ministers of the Arctic Council signed the "Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic" which will prepare and improve procedures in combatting oil pollution in the Arctic region.

"Cooperation and communications are vital since oil spills have no borders. That said, as Lamor Corporation's CEO **Fred Larsen** recently highlighted, a challenge is also standardization where equipment can work in synergy coupled with joint OSR preparedness and training is also a very important part. Lamor has the experience from the Gulf of Mexico incident in the Vessel of Opportunity (VoO) concept which is very important by engaging local support in contributing to the success of an oil spill clean-up operation. This Lamor concept would be a very valuable solution in Northern Canada," notes Ambassador Shapardanov.

Oil spill preparedness is very important. In Canada there are several strategically prepositioned OSR depots. "Lamor has a long experience and expertise in Arctic OSR operations with equipment and training. The early hours are crucial in any oil spill therefore I feel that Lamor has an important role when it comes to training and equipment to further enhance Canada's and other countries oil spill prevention operations. That said, any company conducting exploration in the Arctic needs to follow the guidelines of our National Energy Board, Environmental Impact Review Board and other legislation and legislative boards, which includes oil spill response and recovery contingency plans," he explains.

Lamor's presence in Canada

"It has been a wonderful and rewarding experience being Ambassador to Finland since 2009. I welcome Lamor and other Finnish companies to work closely with Canada. There are several opportunities which make close cooperation beneficial to all. When I am back in Ottawa later this year I hope that Lamor's presence will expand in Canada and become a key partner to us," Ambassador Shapardanov concludes. ●

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Preparedness in the Straits of Mackinac

Lamor was one of the select oil spill responders that participated in an 'Oil in Ice' demonstration exercise held in the Straits of Mackinac, St. Ignace, Michigan. The initiative was to explore tactics, techniques and technologies for oil spill response in ice conditions.

The Straits of Mackinac

(pronounced mac-i-naw), is the waterway that joins two of the Great Lakes, Lake Huron and Lake Michigan. Considered a major shipping lane, the USCG based out of Graham Point, St Ignace, assist USCG icebreaking initiatives to keep an ice free route open during the winter freeze. Prior to the railroad being established, immigrants used the Great Lakes (Huron, Ontario, Michigan, Eire and Superior) to travel to the Great Plains and Midwest. Moreover, the Straits were a vital and important route for the fur trade for native Americans. Fort Michilimackinac (Mackinaw City, MI), a former French fort was founded in 1715 and on the northern side of the Straits is St. Ignace, MI was founded in 1671 and was the site of a French Catholic mission.

The equipment arrived ready for deployment and was quickly, effectively and safely installed on a Vessel of Opportunity (VoO)

Marine Pollution Control (MPC) was awarded a contract by the USCG Research and Development Center to provide specific equipment suites to facilitate the 'Oil in Ice' demonstration. "This was the third such demonstration we have participated in in this role, representing a multi-year initiative," says MPC's **Bill Hazel**, Director of Marine Services who served as MPC's Project Manager at the demonstration.

Established in 1967, MPC was one of the first spill response contractors on the North American continent. Conceived as a highly mobile, rapid-response organization, we have evolved from the early years of oil pollution clean-up into a fully equipped and experienced company providing effective solutions to our clients' oil and hazardous materials spill responses as well as any industrial service requirements. "One of our main marine specialties is the emergency offloading of vessel's petroleum and chemical products during casualties and spill responses, as is best exemplified by our offloading of the tanker Exxon Valdez in 1989," Hazel explains.

Equipment put to the test

"At the demonstration we operated with a number of applicable ice response technologies. We did so in an appropriate and challenging environment, truly putting the gear to work in a real-life scenario. A great deal of valuable experience was passed along among the participants, who have since gone out and transferred what they learned to others," notes Hazel.

"We used peat moss as a surrogate oil to simulate a spill. We utilized our oil recovery brush bucket skimmer, the LRB 150, with a recovery capacity of up to 115 m^3 per hour during the exercise," says Lamor's **John Kolonyi**, Product Manager.

Marine Pollution Control (MPC) was awarded a contract by the USCG Research and Development Center to provide specific equipment suites to facilitate the 'Oil in Ice' demonstration.


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The Lamor Oil Recovery Bucket (LRB) can be effectively operated by a crane onboard a vessel or excavator.

"The system was self contained and in addition to the skimmer, there was a skid mounted knuckle crane, a diesel/hydraulic powerpack, a hot water generator for hot water injection if required and hoses," he lists.

"This skimmer is ideal for the use in "pocket" oil recovery, when the ice acts as the containment boom for the oil or the platform itself (either the vessel or barge) can act or assist with containment. The LRB 150 is an "active" skimmer and the bucket can be activated and with a crane used to maneuver any ice that may impede skimming operations. This skimmer can also be fitted on to an excavator arm or ships crane," Koloyni explains.

The equipment was swung from the dock to the vessel of opportunity deck barge. Container locks and "D" rings were welded to the barge deck to secure the equipment. The total loading and installation time was approximately three hours for the entire system.

Equipment's depth of technological maturity

The equipment arrived ready for deployment. "It was quickly, effectively and safely installed on a Vessel of Opportunity (VoO). This is a critical component of response in these environments and scenarios. Every step that can be taken care of in advance improves the likelihood of success during the operation. The equipment's design was very well thought out, and its ability to reach out and push down into the ice field is a very important aspect of its value as an arctic response tool," says Hazel.

"Our equipment performed flawlessly during this exercise and demonstrated just how quickly the Lamor further developed VoO concept can be completely outfitted as a formidable oil spill response platform. The brush bucket skimmer demonstrated is ideal for use in ice conditions where only the "pocket collection" of oil may be possible," says Kolonyi enthusiastically. ●

The Lamor Oil Recovery Bucket (LRB)

The Lamor Oil Recovery Bucket (LRB) can be effectively operated by a crane on board a vessel or excavator. It is a practical piece of equipment for pit cleaning and oil spills on land, shorelines, and swamp areas. The skimmer is ideal for oil recovery in ice waters.

The LRB is based on the proven Lamor stiff-brush wheel technology and it offers the highest possible performance and safety levels in oil spill recovery operations. It combines the efficient cleaning of the Lamor Brush Wheel enhanced by the proven pumping performance of an optional positive displacement Lamor Archimedes screw type pump.

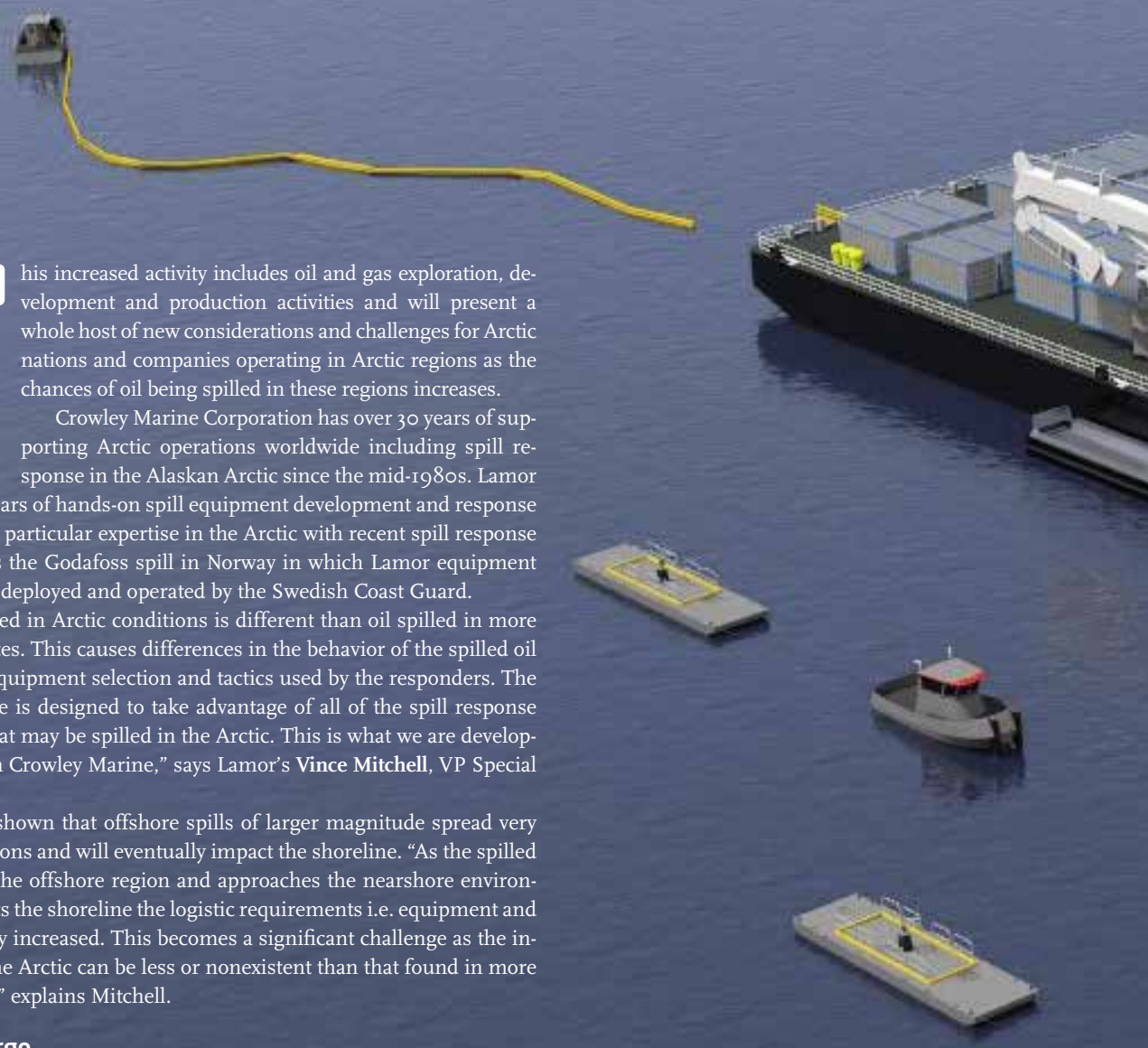
The skimmer brush can be operated in both directions depending of the oil type. The LRB system is unaffected by the floating debris normally found in an oil slick. Most often it is operated via remote control. The skimmer automatically separates oils, emulsions and oily debris from sea water or soils. Recovered oil normally contains less than 5% free water.

In addition to a US Coast Guard operated skimmer and Lamor's LRB 40 skimmer, the following technologies were employed during the demonstration:

- MPC Fire monitors were used to herd and move the simulated oil to a collection area
- The use of fire resistant boom for the "in situ" burning of oil
- A ROV for use in the detection and tracking of oil under ice
- A AUV (Autonomous Underwater Vehicle) for use in the detection and tracking of oil under ice
- Enhanced radar detection and processing for ice field navigation
- Helium filled balloon platform for fully integrated aerial surveillance of the demonstration operations
- Two ice-breaking tugs, Erika Kobasic and Nikelena, a platform barge and the USCGC Hollyhock were the VoO utilized during the demonstration
- USCG Sector Sault Sainte Marie established a command center in St. Ignace that operated in step with the field operations

Arctic OSR Barge

– Crowley and Lamor team together



This increased activity includes oil and gas exploration, development and production activities and will present a whole host of new considerations and challenges for Arctic nations and companies operating in Arctic regions as the chances of oil being spilled in these regions increases.

Crowley Marine Corporation has over 30 years of supporting Arctic operations worldwide including spill response in the Alaskan Arctic since the mid-1980s. Lamor brings over 30 years of hands-on spill equipment development and response experiences with particular expertise in the Arctic with recent spill response activities such as the Godafoss spill in Norway in which Lamor equipment was successfully deployed and operated by the Swedish Coast Guard.

"The oil spilled in Arctic conditions is different than oil spilled in more temperate climates. This causes differences in the behavior of the spilled oil that affects the equipment selection and tactics used by the responders. The Arctic OSR barge is designed to take advantage of all of the spill response options for oil that may be spilled in the Arctic. This is what we are developing together with Crowley Marine," says Lamor's **Vince Mitchell**, VP Special Projects.

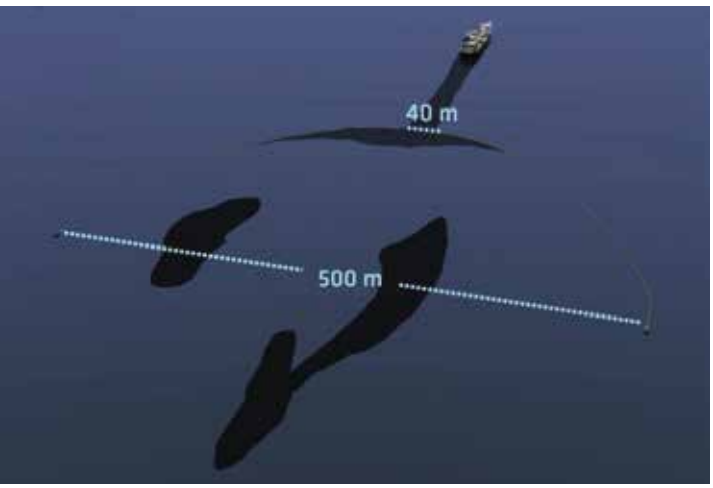
History has shown that offshore spills of larger magnitude spread very rapidly in all regions and will eventually impact the shoreline. "As the spilled oil moves from the offshore region and approaches the nearshore environment and impacts the shoreline the logistic requirements i.e. equipment and people are greatly increased. This becomes a significant challenge as the infrastructure in the Arctic can be less or nonexistent than that found in more temperate areas," explains Mitchell.

Arctic OSR barge

"We have teamed with Lamor in the development of the ice classed Arctic OSR barge. It is capable of supporting timely response activities in the offshore, coastal nearshore, sensitive areas and shoreline environments. The large internal storage capacity of 100,000 bbls (15,899 m³), on board accom-

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

The unprecedented seasonal retreat of sea ice in the Arctic that is occurring will definitely increase the amount of world-wide marine activity in the Arctic waters in the foreseeable future.



Arctic Response Barge Offshore and Nearshore Skimming in Open Water

Arctic Response Barge Offshore and Nearshore Skimming in Open Water

modations and support for 100 responders, incident command communications and control center, mechanic workshop, spare parts, forklifts, cranes and helideck and more. The Arctic OSR barge is capable of supporting on-scene response activities for weeks," says Crowley Marine Corporation's **Bruce Harland**, VP Business Development.

Mechanical containment and recovery is the most "traditional" of the oil combating techniques

Equipment and tactics

Mechanical containment and recovery is the most "traditional" of the oil combating techniques and involves what commonly comes to mind when one thinks about response to oil spills i.e. the use of oil containment booms and oil recovery skimmers. "The equipment selected for use with the Arctic OSR barge is robust, simple and fitted cold temperature adaptations based on Lamor's extensive operating experience in the Arctic. The equipment has also been selected so as to be interchangeable between the oil recovery tactics," says Harland.

Oil must be collected in the thickest layer possible for the most efficient skimming to occur. "This generally involves longer lengths of "deflection" booms into a collection pocket where the skimmer is located. In the Arctic regions the use of these deflection booms is only possible during "open water" conditions with light ice coverage of 1–2/10ths or less. This is due to the ice being deflected and concentrated along with the oil and interfering with or damaging the skimming device," explains Mitchell.

"As the amount of ice increases, shorter lengths to no "deflection" boom must be used. As the ice further increases, the ice itself acts as a natural containment boom and "pocket" recovery tactics in areas of oil trapped by the ice become feasible," says Mitchell.

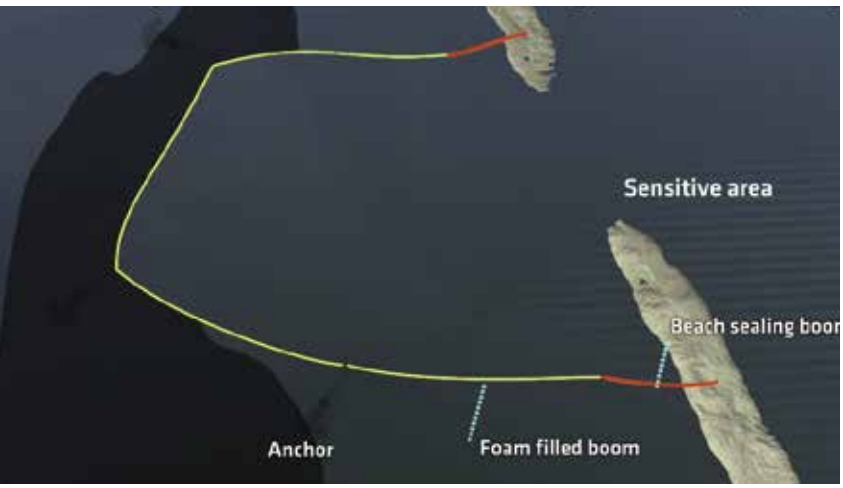
Offshore response

The Arctic OSR barge is fitted with two oleophilic (oil attracting brush skimmers) Lamor Side Cassettes (LSC) with a total nameplate recovery capacity of approx. 3000 bbls/hr. There is also up to 800m of heavy duty oil boom available. "The LSC 5 skimmers are fitted the latest in Arctic enhancements including steam heating of the dual rotation brush scrapers and collection well in addition to hot water injection to the discharge pumps to pump the recovered oil much more efficiently. The efficiencies of the skimmers have been tested to over 95%, but any of the "free water" recovered with the oil can be decanted after settling, to maximize the storage of recovered oil," notes Mitchell.

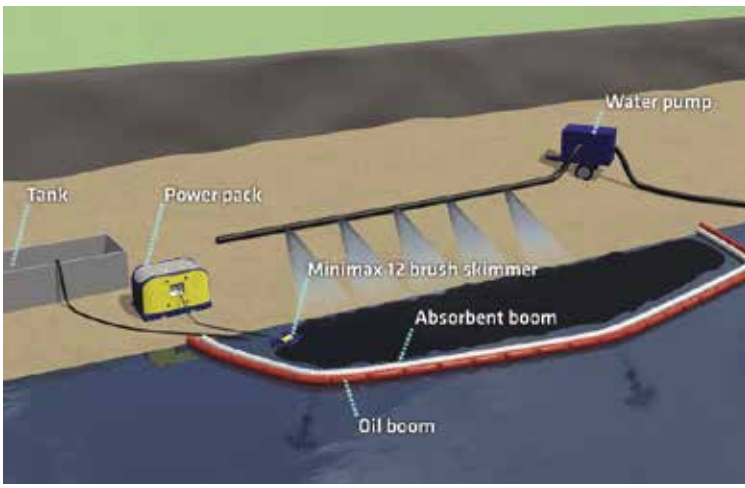
Nearshore response and shoreline recovery

As the oil moves into the coastal nearshore and shoreline regions, four dedicated 32 foot high capacity skimming vessels that can be launched and recovered utilizing a Vestdavit system that allows for the safest manned launching and recovery. "Each skimming vessel is equipped with enhancements specifically for use in the Arctic including ice belting, hardened and recessed propellers, and significant heating capabilities," says Keith Whittimore of Kvichak Marine.

"The skimming vessels are equipped with a pair of Arctic enhanced, two chain brush oleophilic inbuilt skimming systems with a nameplate recovery capacity of over 1,000 bbls/hr coupled with up to 400m of heavy duty deflection boom. Eight Kvichak Marine 249 bbl intermediate storage barges, fitted with heating coils, are also found on the Arctic OSR barge to ensure the continuous recovery, transfer and storage of recovered oil from nearshore operations. This allows for the complete interchangeability of these assets for the nearshore and shoreline tactics selected based on the objectives and strategies set forth by the incident Unified Command. Additionally, four offloading manifolds are fitted on the Arctic OSR barge to receive recovered oil from the intermediate storage barges. Four Lamor GT A offloading pumps, each with an offloading capacity of 50 m3 per hour, with hot water injection capability will be used for offloading the intermediate storage barges," lists Mitchell.



Arctic Response Barge Landing Craft and Boom Protection of a Sensitive Area



Arctic Response Barge Shoreline Cleanup Boom and Recovery Equipment

Sensitive area protection

Protection of sensitive areas can also be accomplished by the use of boom to deflect or exclude oil from areas such as a barrier inlets, bays or rivers. There are 12 complete exclusion booming systems 400 – 500 m in length, the boom can be sized for use in exposed or protected locations as a selection of Lamor SFB 24, SFB 18 or FOB 1100 is available. The deployment and boom configuration is supported by eight Kvichak Marine 30 foot shallow draft landing crafts. These boom systems and vessels can be used singularly or combined for sensitive area protection as required.

Shoreline clean-up

Once oil impacts the shoreline, the response activities generally move from the "emergency" phase and into the "project phase". "There are twelve shoreline clean-up kits on the Arctic OSR barge capable of supporting beach deluge (flooding) and "passive collection" recovery operations. Eight "active" systems, each system fitted with two recovery skimmers, Lamor LNXG 100 oleophilic and Vacuum skimmers combined with shore storage tanks and four "passive" recovery systems, comprised of sorbent boom," says Mitchell.

Non mechanical response

The non-mechanical methods of combating spilled oil in the offshore, and to lesser degree nearshore regions are the application of oil spill dispersants and the burning of the oil (in situ burning). Both of these non-mechanical spill response methods can be used to augment mechanical response techniques or can be used alone when mechanical response techniques become less effective or cannot be used. These methods of combating spill oil usually present significant logistical challenges in remote Arctic regions.

A dedicated, multipurpose Arctic OSR barge is essential for meeting the tasks and requirements for an effective and credible response in Arctic regions

Dispersants

"The overall effectiveness of the dispersant is very dependent on both the temperature and the salinity of the water and the properties of the oil," says Harland. "The weathering of spill oil will be slower in the Arctic than in more temperate climates. The application of oil dispersants to spill oil generally requires permission from the appropriate authority or agency."

The Arctic OSR barge is fitted with a helicopter deck and two dispersant application buckets that hold up to 900 liters of dispersant each that allows precise application from a helicopter. The arctic response barge can be equipped with a significant inventory of dispersant, dependent on the customer requirements and available for immediate use," Harland notes.

Burning

The burning of oil from the sea surface is a very viable response option in the arctic. "The oil thickness needs to be a minimum of 2–4 mm to sustain combustion in Arctic conditions and the thicker the oil the more efficient the burning operations. For "open water" conditions (~1/10–2/10's), spilled oil can be contained with special fire resistant booms," says Harland.

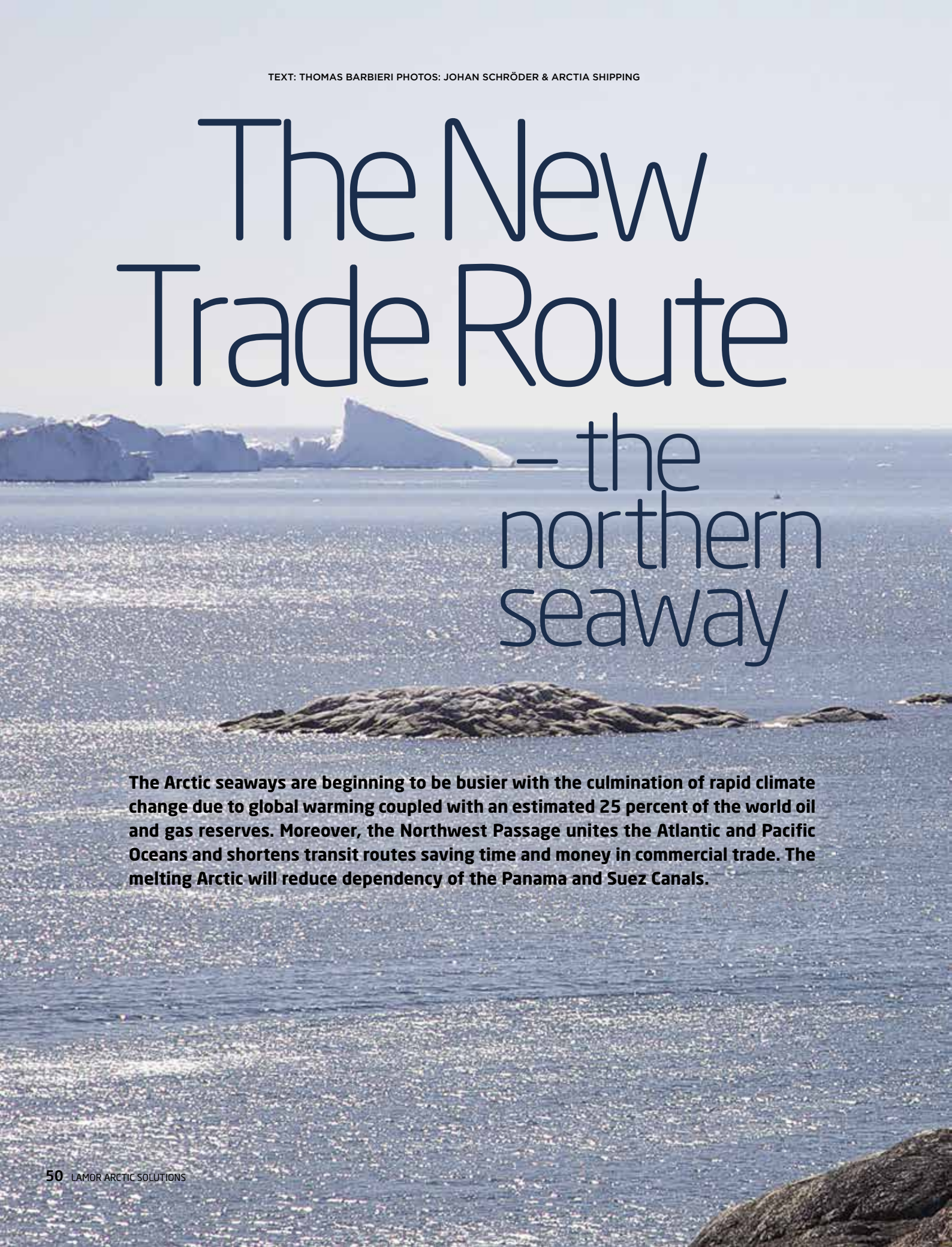
The Arctic OSR barge is equipped with four 150m fire-boom systems. As the ice conditions increase, the ice itself will act as the containment boom. "The actual ignition of the oil can be accomplished by the use of hand held igniters that can be deployed from the air, vessels or even from the ice," Harland highlights.

Looking ahead of the concept

In evaluating the effective tools for OSR operations in the Arctic, it becomes clear that the concept of a dedicated, multipurpose Arctic OSR barge is essential for meeting the tasks and requirements for an effective and credible response in Arctic regions. This concept has been developed and tempered by Crowley and Lamor, two companies with many years of experience and expertise in Arctic operations. ●

TEXT: THOMAS BARBIERI PHOTOS: JOHAN SCHRÖDER & ARCTIA SHIPPING

The New Trade Route – the northern seaway



The Arctic seaways are beginning to be busier with the culmination of rapid climate change due to global warming coupled with an estimated 25 percent of the world oil and gas reserves. Moreover, the Northwest Passage unites the Atlantic and Pacific Oceans and shortens transit routes saving time and money in commercial trade. The melting Arctic will reduce dependency of the Panama and Suez Canals.

In recent years, according to polar climate scientists and researchers, the shrinking Arctic sea ice will become passable without the assistance of icebreakers for a greater period each summer. In 2009, the German-based Beluga Group in Bremen was the first western company to attempt and succeed in the crossing without icebreaker support from Ulsan, South Korea to Rotterdam, the Netherlands, thus cutting approx. 4,000 nautical miles off the journey.

By linking the Atlantic and Pacific Oceans greatly reduces transit times for ships that have relied on the southern route through the Panama Canal. Temperatures in the Arctic are rising faster than anywhere else in the world, making the Arctic region easier to navigate. For shipping companies hoping to shorten trade routes through the Arctic Ocean it provides them quicker access to economic dynamos such as China and India.

A new geopolitical battleground

In early 2011, at an Arctic conference held in Tromsö, Norway, U.S. Rear Admiral Dave Titley stated: "We believe that sometime in the next few decades there is a good chance that the Arctic Ocean will be essentially ice-free for extended periods."

These longer intervals of ice-free waters will likely mean more vessels trying to navigate the narrow straits and channels of the Northwest Passage, a series of waterways along the US coast that wind through Canada's Arctic archipelago of 36,000 islands, including commercial shippers looking for shortened trade routes.

Canada, for example, has claimed it has full rights over the parts of the passage that pass its territory. While the US and EU counter by stating the passage is in international waters. Countries that border the Arctic region are Canada, Denmark (Greenland), Iceland, Norway, Russia and the US.

That said, the Arctic Ocean continues to cause more diplomatic riffs pursuant to the usage of waterways. All countries in the region regard parts of the Arctic seas as "national waters" i.e. territorial waters out to 12 nautical miles. There also are disputes

Finland is a world class leader with expertise in designing, building and operating icebreakers and other vessel types suitable for Arctic conditions

regarding what passages constitute "international seaways" and rights to passage along them e.g. the Northern Passage.

Energy sources under ice

As the need for energy continues to rise and while onshore oil reserves dwindle, the search for oil offshore continues to surge. This increases the risks for accidents. The harsh climatic conditions in the Arctic Ocean make the exploration and extrapolation very dangerous. The waters of the Arctic are particularly extreme for drilling because of the punishing cold, long periods of darkness, dense fogs, and hurricane-strength winds.

Lamor's knowledge, expertise and commitment in providing the most advanced oil spill clean-up solutions with equipment, training, and a dedicated response team known as the Lamor Response Team (LRT), is unparalleled with a global reach in any climatic condition and region. "We have expertise and equipment for tackling hazardous accidents such as oil spills caused by collisions, groundings etc. in all terrains and climates," says **Fred Larsen**, CEO of Lamor Corporation.

The Arctic Ocean's ecosystem is considered to be one of the most vulnerable to oil spills in comparison to other regions. "The cold weather, the thick ice cover together with slow turnover of ecosystems mean that toxic oil spills last longer and expose multiple generations of organisms to contamination," says Larsen.

"An Arctic oil spill could set off irreversible chain-reactions of contamination. The lack of sunlight also impacts the breakdown of spilled oil and other chemicals. Therefore, it is essential for both corporations and governments to be responsible and take the necessary steps by investing in training and equipment to reduce a catastrophic environmental disaster in a proactive way. This is where Lamor can help," Larsen says categorically.

Increased activities, increased needs

"The Arctic seaways will increasingly become busier in coming years due to climate change and the surge in exploration of natural resources. This sea change will create major opportunities for Finnish ice-breaking expertise," says **Tero Vauraste**, CEO of Arctia Shipping.

As the climate becomes warmer, the three Arctic seaways, the Northeast Passage north of Russia, the Northwest Passage north of Canada and the so-called Polar Route, will cut shipping distances by as much as 20 to 40% compared with the routes through the Panama and Suez Canals.

"The Northeast Passage is spearheading this development with its nuclear-powered icebreaker service," Vauraste highlights. "In 2012, approximately 1.4 million tons of cargo aboard 43 vessels passed along this route. Russia aims to have some 20 million tons of cargo go through by 2020 and the reported capacity is up to 50 million tons," he says.

Knowledge and potential

According to Vauraste, Finland is a world class leader with expertise in designing,

building and operating icebreakers and other vessel types suitable for Arctic conditions. There will be no lack of opportunities due to the fact that the current global fleet of around 100 ageing icebreakers hardly meets even today's needs.

"At least 20—40 new icebreakers will be required within the next 10—20 years to replace old ones and to meet new needs, and this includes proficient crews for operating them as well," says Vauraste.

Environmental issues pose a particular challenge for future development because increasing activity also increases risks. "Icebreakers should be multipurpose vessels with oil spill recovery equipment onboard coupled with search and rescue capabilities," he states emphatically.

Additional factors that affect Finland's position in terms of maritime logistics are the EU's imminent sulfur emissions directive and Energy Efficiency Design Index (EEDI) which will both cut back emissions and increase shipping costs. "Arctia has used Wärtsilä's technology for converting its multipurpose icebreakers Fennica and Nordica to comply with the new environmental regulations. The conversion reduces the ships' SOx emissions by more than 99 percent, NOx emissions by approximately 90 percent and particulate emissions by around 50 percent," Vauraste points out.

Icebreakers should be multipurpose vessels with oil spill recovery equipment onboard coupled with search and rescue capabilities

Equipped and ready

In March 2012, the European Maritime Safety Agency (EMSA) in accordance with its operational plan for the EMSA network of Standby Oil Spill Recovery Vessels (SOSRV) in the Baltic Sea conducted its quarterly drill in the Gulf of Bothnia. In conjunction with the OSR drills, the giant Finnish icebreaker Kontio was deployed.

"Kontio is equipped with a Lamor Free Floating (LFF 100) skimmer, stiff sweep with brush and weir modules, heavy duty oil booms as well as oil transfer pumps. With the use of traditional open water containment booms, of which 500 m can be found on the deck of the vessel, oil is contained by deploying the boom in a U or a J configuration in front of the approaching oil and collected with brush module skimmers on stiff sweeps," says Vauraste.

Kontio is one of three EMSA stand-by SOSRV's in the northern Baltic Sea, with a total net storage capacity of 2033m³. Its crew is fully trained in accordance with IMO (International Maritime Organization) OPRC (Oil Pollution Preparedness, Response and Cooperation) level 1 and 2. "These quarterly drills are an important aspect of maintaining skills, readiness and equipment in the event of an OSR operation," concludes Vauraste. ●

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Arctic Council and Chairmanship

In 1996, the Ottawa Declaration formally established the Arctic Council (AC) as a high-level intergovernmental forum to provide a means for promoting cooperation, coordination and interaction among the Arctic states, with the involvement of the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues; in particular, issues of sustainable development and environmental protection in the Arctic.

The Arctic Council has become the pre-eminent intergovernmental body to discuss Arctic issues

AC members observing Lamor's simulated Minimax 12 skimmer in operation.

The AC provides a valuable platform for discussions and international agreements on all issues of relevance to the Arctic and the people who live there.

Delivering results on the major challenges facing the Arctic region takes more time than a two-year chairmanship allows. The purpose of this paper is to promote continuity in the work of the AC by identifying common objectives and priorities for the next three chairmanships from 2006–2013.

Sweden's chairmanship program

For the region's inhabitants, developments in the Arctic are a source of both challenges and opportunities. Climate change affects the cultures of the indigenous peoples and their traditional trades, such as reindeer husbandry, hunting and fishing. At the same time, the business community's increasing interest in Arctic areas may create opportunities for economically more advantageous living conditions.

During its chairmanship, Sweden will promote negotiation by the Arctic states of a tool for prevention, preparedness and response when extracting oil in the Arctic in order to safeguard the region. To justify development in this sensitive area, it is important that it takes place in accordance with the conditions that are characteristic of the region.

Sweden will therefore lead the work on drafting guidelines for responsible entrepreneurship in the Arctic, which are based on existing internationally agreed guidelines on corporate social responsibility (CSR).

Responsible entrepreneurship means that companies freely assume responsibility – beyond what is required by applicable legis-

Fred Larsen descriping challenges in Arctic OSR operations with AC delegation.

lation – on how their activities affect the environment, labor law conditions, human rights and the prevalence of corruption in their markets of operation. The aim is to create a platform for dialogue and cooperation on sustainable enterprise.

A Finnish perspective

"The Arctic Council has become the pre-eminent intergovernmental body to discuss Arctic issues", says Finland's **Hannu Halinen**, Ambassador Arctic Affairs, Ministry for Foreign Affairs.

"Finland has consistently worked for the strengthening of the Council. International Arctic cooperation started with the Environmental Arctic Strategy agreed upon in Rovaniemi in 1991. This led to the establishment of the Council in 1996. Since then the mandate of the Council has expanded from environmental topics to economic, legal and wider security issues.

We would like to see the Council to convert to a fully fledged international organization. The Arctic as a region has a global reach: the effects of the climate change, new opening seas routes and exploitation of offshore oil and gas potential, fisheries, etc. have to be addressed by Arctic and non-Arctic stakeholders alike," says Halinen.

"First steps to that direction have been taken by establishment of a permanent secretariat and a joint budget for the Council. Finland will continue to work actively to further increase the impact of the Council during our Chairmanship in 2017–19. Leading to that we coordinate closely our efforts already with the two preceding Chairs Canada and the US." Halinen notes. ●

Sustainable Development in a Changing Arctic

- The European Institue - Washington D.C.

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

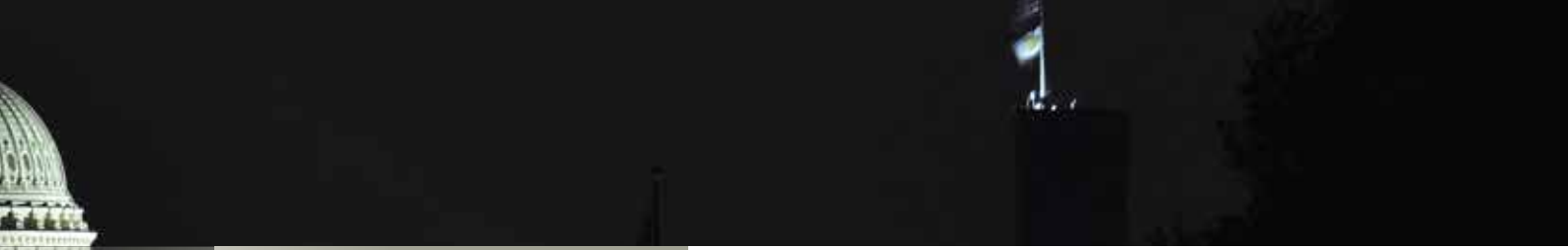
On November 29, 2012, The European Institute hosted a seminar following the Arctic Council's formal Senior Arctic Official meeting in Sweden. The seminar, held at the Cosmos Club in Washington D.C., brought together representatives of the Arctic Council's member states and focused on the evolution of the Arctic's governance and the prospects for ensuring sustainable economic development in this fragile and resource rich region.

The moderator for the discussions was **James Graff**, Executive Editor of The Week. Panelists included: **Berit Enge**, Minister Counselor, Political Affairs, Royal Norwegian Embassy; Dr. **John Farrell**, Executive Director, U.S. Arctic Research Commission; **Julia Gourley**, U.S. Senior Arctic Official, U.S. Department of State; Ambassador **Hannu Halinen**, Ambassador Arctic Affairs, Ministry of Foreign Affairs, Finland; **Fred Larsen**, CEO, Lamor Corporation; **Ida Heimann Larsen**, Minister Counselor, Economic, Royal Danish Embassy; **Eva Hunnius Ohlin**, Environmental Technology Officer, Embassy of Sweden; **Sheila Riordon**, Minister, Political Affairs, Embassy of Canada and former Canadian Senior Arctic Official; **Brian Robinson**, U.S. Coast Guard Liaison, Office of Oceans & Polar Affairs, U.S. Department of State; His Excellency Gudmundur **Arni Stefansson**, Ambassador of Iceland to the United States; and Ambassador **Anton Vasiliev**, Senior Arctic Official of the Russian Federation.

Founded in 1989, The European Institute is the leading public policy organization in Washington D.C. devoted exclusively to transatlantic relations. With the involvement of senior US and European government representatives, NGO's and global corporation leaders from both continents, The European Institute encourages the strengthening of the transatlantic relationship to respond to new challenges. Its mission is to act as an early warning system and a mechanism for conflict resolution.

Recent participants at The European Institute include: Christine Lagarde, Managing Director of the International Monetary Fund, Sergey Lavrov, Foreign Minister of the Russian Federation, Jean-Claude Junker, Prime Minister of Luxembourg and Ambassador Alexander Vershbow, NATO Deputy Secretary-General, to name a few.

Fred Larsen with distinguished panelists.



Fred Larsen's speech

Good morning ladies and gentleman, distinguished guests, friends,

I would like to thank The European Institute and the Embassy of Finland for arranging this forum here at the famed Cosmos Club where in 1888 the National Geographic Society was founded and the Club's commitment to the advancement of science, literature, arts and the humanities. I wish to acknowledge, recognize and highlight The European Institute's commitment in shaping European-American cooperation in the 21st Century and providing a forum for dialog.

My name is Fred Larsen and I am CEO of Lamor Corporation, a family enterprise started by my father exactly 30 years ago this year in Finland. We are a global company with strategically located offices around the world in China, Russia, UK and our new hub for operations in the US in Milford, Connecticut.

That said, being in a northern European country we have substantial experience and expertise in Arctic conditions. Being an oil spill response company we are committed to continuously invest in R&D and best available technology to provide the most effective solutions for all scenarios and climatic conditions. We conduct vetting and recovery efficiency of our equipment at Ohmsett in New Jersey.

This naturally brings on challenges on a global perspective such as standardization of equipment and the various standards countries use individually. When an incident occurs, cross-border action by responding cooperatively is a necessity, yet again a challenge due to non-standardized equipment. These are just some of the concerns and issues we face daily.

Globally the increase in demand for oil continues to surge. That said, I am pleased to note that companies, organizations and governments have become more proactively involved in adopting safeguards. Stricter legislation has been imposed by governments and companies are doing more to ensure that they have OSR equipment and trained people to respond efficiently and effectively should the need arise, but there is always room for improvement and additional resources should be allocated accordingly.

The International Energy Agency (IEA) recently predicted that the US will overtake Russia as a top gas producer by the year 2015 and be the world's biggest oil producer by 2017. This will result in the US becoming more energy independent. The IEA also predicts that the US could be a net oil exporter by about 2030 and the United States achieving near energy independence by 2035.

On November 13, 2012 the U.S. Arctic Research Commission released a report based on the question: Just what do governments and oil companies know about stopping a spill in the frozen Arctic? The conclusion calls for increased spending in research coupled with policy changes.

The U.S. Bureau of Ocean Energy Management Regulation and Enforcement (BOEMRE) estimate that the Arctic Ocean holds up to 19 billion barrels of oil and up to 74 trillion cubic feet of natural gas.

> Claiming the Arctic region is not just about proving who has legal sovereignty to the large quantities of oil and gas on the seabed, it is about setting up activities in a responsible manner.

Claiming the Arctic region is not just about proving who has legal sovereignty to the large quantities of oil and gas on the seabed, it is about setting up activities in a responsible manner. Transparency and again communications need to be crystal clear, but so does having the right equipment and trained personnel to operate the equipment.

I have said this before it is not 'if' an oil spill occurs, it is 'when' it occurs, the contingency plans need to be activated and nations in the area should be ready to assist promptly. And we cannot afford to be only reactive.

Exploration and oil extrapolation in the Arctic Ocean is surging ahead, and the climatic conditions can be brutal in that region. The sub-zero temperatures, hurricane-force winds, reduced visibility during the prolonged winter darkness, along with high 10-30-foot seas, certainly makes any clean-up operation challenging but not impossible for us at Lamor.

In early 2011, at an Arctic conference held in Tromsö, Norway, it was predicted that between 2035 and 2040, the Arctic Ocean will be essentially ice-free for extended periods. These longer periods of ice-free waters will likely mean more vessels trying to navigate the narrow straits and channels of the Northwest Passage, a series of waterways along the US coast that snake through Canada's Arctic archipelago of 36,000 islands, including commercial shippers looking for shortened trade routes.

By linking the Atlantic and Pacific Oceans greatly reduces transit times for ships that have relied on the southern route through the Panama Canal. Temperatures in the Arctic are rising faster than anywhere else in the world, making the Arctic region easier to navigate.

For shipping companies hoping to shorten trade routes through the Arctic Ocean it provides them quicker access to economic dynamos such as China and India. The Arctic Ocean's eco-system is considered to be one of the most vulnerable to oil spills in comparison to other regions. The cold weather, the thick ice cover together with slow turnover of eco-systems mean that toxic oil spills will last longer and expose multiple generations of organisms to contamination.

An Arctic oil spill could set off irreversible chain-reactions of contamination. The lack of sunlight also impacts the breakdown of spilled oil and other chemicals. Therefore, it is essential for both corporations and governments to be responsible and take the necessary steps by investing in training and equipment to reduce a catastrophic environmental disaster, and this is where we can help.

We also cooperate closely with governments, maritime administrations and the private sector. A good example of our Arctic operations is the Godafoss oil spill

which occurred in Norway last year, to which Norwegian and Swedish Coastguards responded. Our equipment was deployed and recovery operations in ice and ice sludge conditions were very successful.

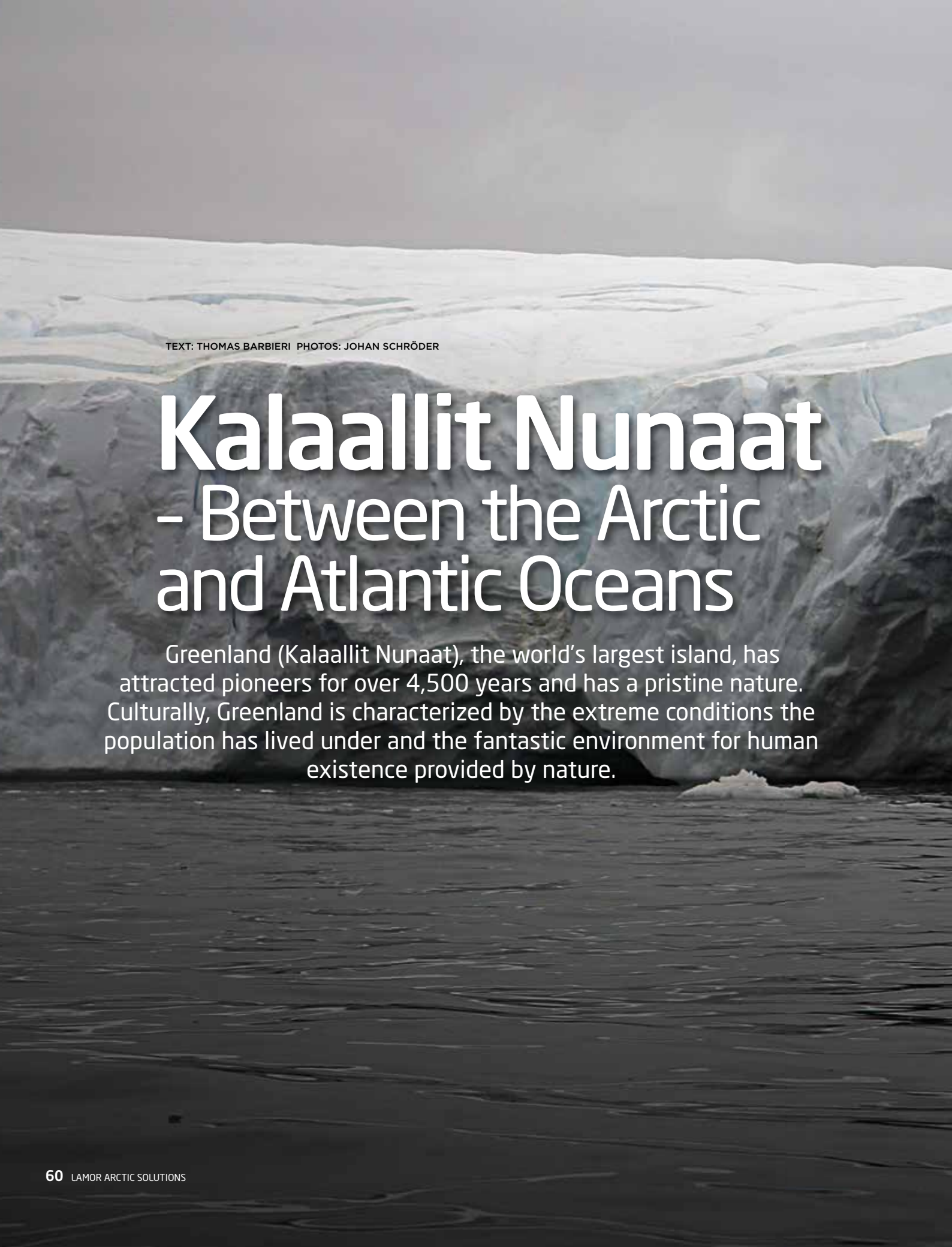
We are not limited to Arctic operations, for example during our seven month deployment in the Gulf of Mexico incident in 2010, we supported the vessel of opportunity program by converting fishing and shrimp boats into oil spill response vessels. I do want to highlight that during that operation three other oil spills occurred simultaneously in Dalian (China), Hong Kong and Lake Michigan, in which our Lamor Response Team (LRT) was also deployed to.

For the GoM incident, we deployed 112 air cargo shipments to the scene which included 460 skimmers, 900 diesel engine power packs and over 300,000 meters of oil containment booms.

I want to conclude by saying collectively, let's be ready, do the right thing and have the best available technology and equipment in any climatic condition or region to tackle oil spills around the world.

The source of knowledge is experience and our knowledge, expertise and commitment in providing the most advanced oil spill clean-up solutions with equipment and training is unparalleled with a global reach in any climatic condition and region.

Thank you!



TEXT: THOMAS BARBIERI PHOTOS: JOHAN SCHRÖDER

Kalaallit Nunaat – Between the Arctic and Atlantic Oceans

Greenland (Kalaallit Nunaat), the world's largest island, has attracted pioneers for over 4,500 years and has a pristine nature. Culturally, Greenland is characterized by the extreme conditions the population has lived under and the fantastic environment for human existence provided by nature.

Steen O. Hansen Chairman of the Board Greenland Oil Spill Responce A/S

Life as sealers and hunters in small isolated communities is reflected in the language, music, myths, clothing, food, homes – everything has been developed from the materials available and with a frugality, ingenuity and impressive sense of strength, quality and simplicity.

Establishing protection based on need

Greenland Oil Spill Response A/S (GOSR) is the first oil spill response company to be based in Greenland. GOSR is a government owned private limited company that is run by the appointed board of directors and the Managing Director of the company.

Established in 2012 as the government of Greenland realized the need to develop a national oil spill response company to primarily service the growing petroleum activities offshore Greenland but in the long run also to build a national oil spill response not relying on the immediate outside help.

"The idea behind the founding of GOSR was originally planted when the Scottish oil and gas company Cairn Energy in 2010 performed the first exploration drilling offshore Greenland in 10 years and subsequently donated the oil spill response equipment that had been stocked in Greenland for the drilling campaign to the government of Greenland," says GOSR's **Lonnie B. Wilms**, Managing Director.

Currently GOSR can provide companies and authorities in-country access to a large amount of relevant oil spill response equipment, including access to a pre-approved dispersant. In the long run GOSR aims at being able to deliver all oil spill response equipment and services necessary for oil and gas companies working offshore Greenland.

The Greenland government has been very open to alternative techniques for combatting oil spills and the Greenland Bureau of Minerals and Petroleum (BMP) has in cooperation with the Danish Centre for Environment and Energy (DCE) facilitated easy and good application procedures for the use of dispersants and in-situ burning.

A vision for action

Newly appointed Managing Director, Wilms explains her mission and vision. "My mission at GOSR is clearly to be able to provide the best resources for combatting oil spills offshore Greenland. My vision for Greenland's OSR operations is that GOSR independently as a company will be able to provide the best spill response equipment and services offshore Greenland and will be setting the bar for what is best Arctic Practice for combatting offshore oil pollution," she notes affirmatively.

Up and running, aiming high

"As Chairman of the Board of GOSR, it is with great expectations and big challenges that we now start placing GOSR on the map of Greenland," **Steen O. Hansen** highlights.

"GOSR has been "born" by the government of Greenland to be an active and respected player in this challenging environment. In close cooperation with the international oil companies we will find our platform from which we will be supplying our services." says Hansen.

"We will focus on high performance, high quality and at the highest safety level carried out by top educated and trained personnel and in close cooperation with the local communities. Local content is one of our key focal areas and it is my firm belief that by including as much local content as possible and to have as many as possible taking ownership of this area as possible, GOSR will be a success," he concludes. ●

GOSR's newly appointed Managing Director, Lonnie Wilms, worked at Greenland's BMP in the Licence Department for over three years, initially as Head of the Section and then promoted to Head of Department. Wilms was focused on BMP's approval processes for the entire offshore drilling campaigns in both 2010 and 2011. Moreover, Wilms held the position as Secretary for the BMP's Contingency Committee and has therefore also been involved in the contingency planning for the 2010 and 2011 exploration drillings offshore in western Greenland.

TEXT: THOMAS BARBIERI PHOTOS: AKER ARCTIC TECHNOLGIES INC

Tomorrow's Multipurpose Icebreaker Today

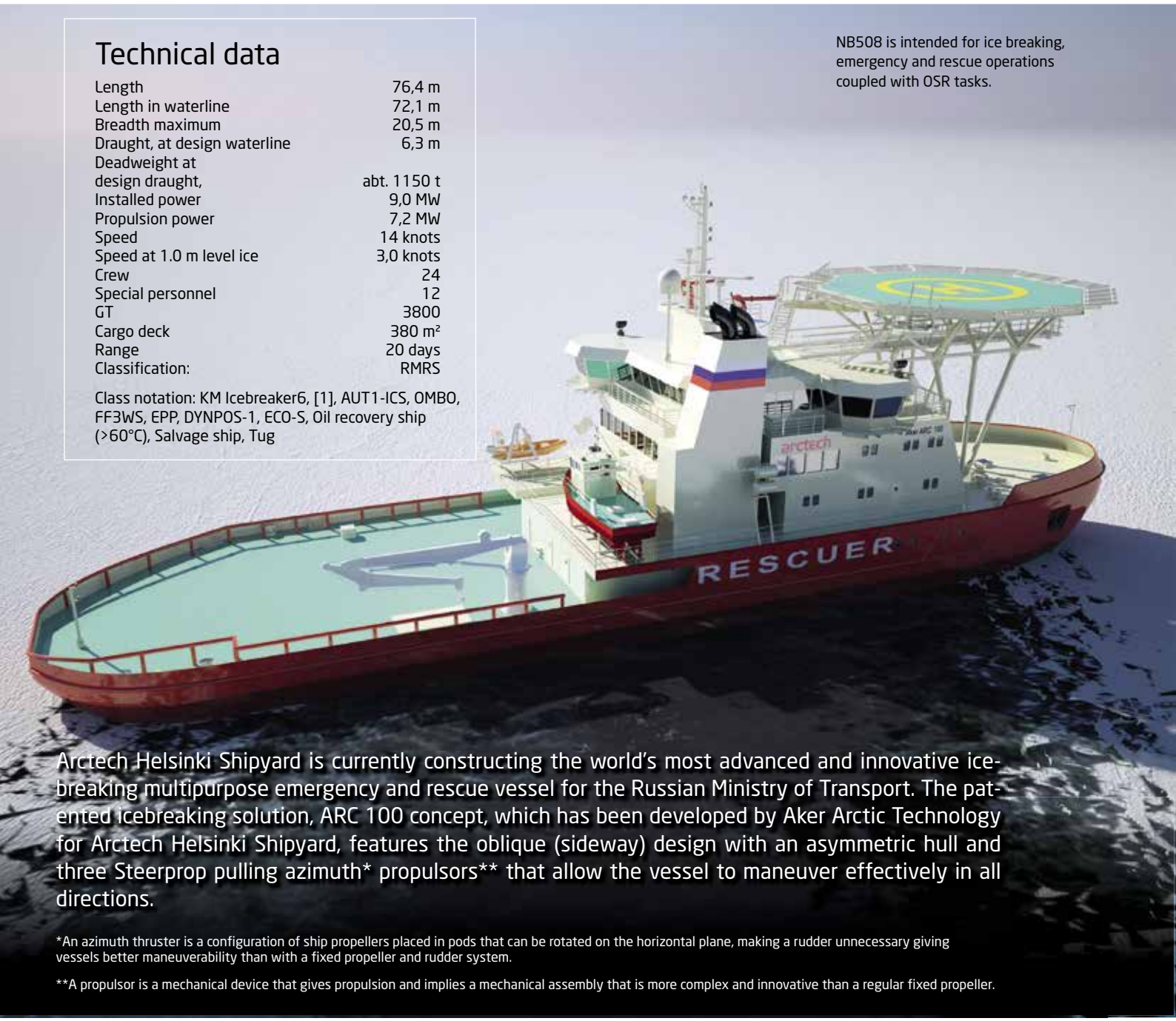
– sideway ice crushing with OSR equipment

Technical data

Length	76,4 m
Length in waterline	72,1 m
Breadth maximum	20,5 m
Draught, at design waterline	6,3 m
Deadweight at design draught,	abt. 1150 t
Installed power	9,0 MW
Propulsion power	7,2 MW
Speed	14 knots
Speed at 1.0 m level ice	3,0 knots
Crew	24
Special personnel	12
GT	3800
Cargo deck	380 m²
Range	20 days
Classification:	RMRS

Class notation: KM Icebreaker6, [1], AUT1-ICS, OMBO, FF3WS, EPP, DYNPOS-1, ECO-S, Oil recovery ship (>60°C), Salvage ship, Tug

NB508 is intended for ice breaking, emergency and rescue operations coupled with OSR tasks.

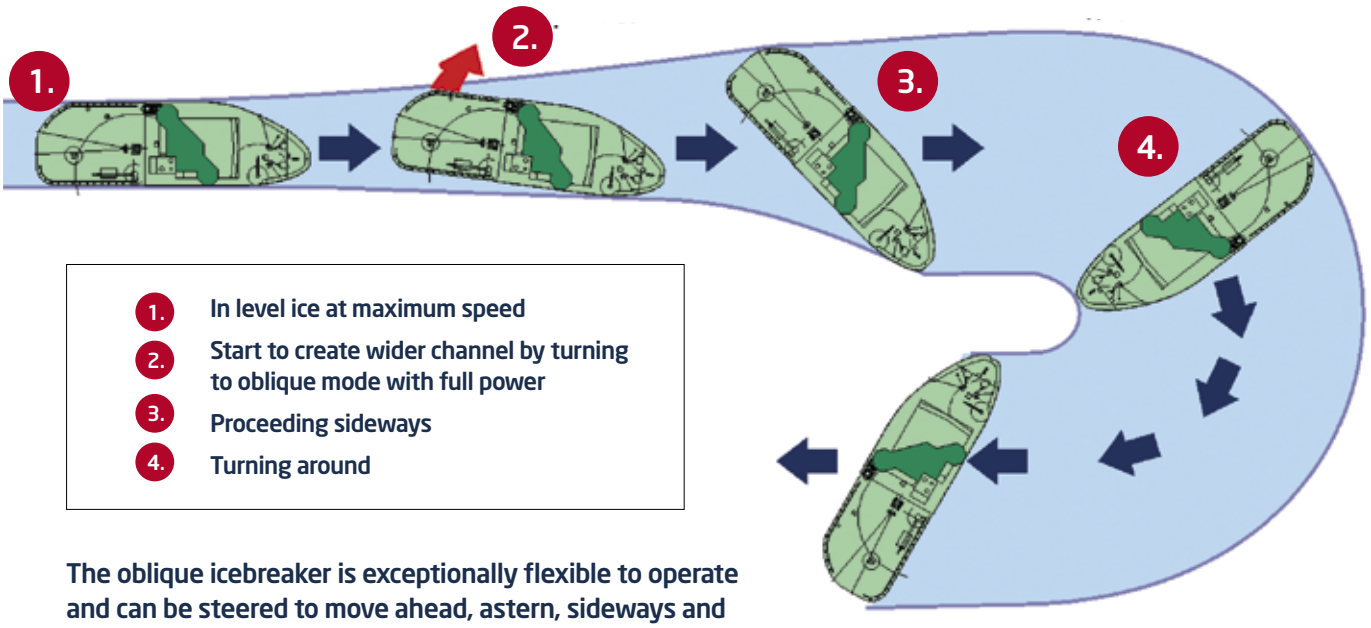


Arctech Helsinki Shipyard is currently constructing the world's most advanced and innovative ice-breaking multipurpose emergency and rescue vessel for the Russian Ministry of Transport. The patented icebreaking solution, ARC 100 concept, which has been developed by Aker Arctic Technology for Arctech Helsinki Shipyard, features the oblique (sideway) design with an asymmetric hull and three Steerprop pulling azimuth* propulsors** that allow the vessel to maneuver effectively in all directions.

*An azimuth thruster is a configuration of ship propellers placed in pods that can be rotated on the horizontal plane, making a rudder unnecessary giving vessels better maneuverability than with a fixed propeller and rudder system.

**A propulsor is a mechanical device that gives propulsion and implies a mechanical assembly that is more complex and innovative than a regular fixed propeller.

Unique and technologically advanced operation



1. In level ice at maximum speed
2. Start to create wider channel by turning to oblique mode with full power
3. Proceeding sideways
4. Turning around

The oblique icebreaker is exceptionally flexible to operate and can be steered to move ahead, astern, sideways and turn on the spot in ice, which is a unique and technologically advanced innovation.

Arctech, a joint venture between STX Finland and United Shipbuilding Corporation (USC), Russia, signed the approx. EUR 76 million ship building contract with the Russian Ministry of Transport in November 2011. The hull of the vessel is being built by Yantar Shipyard (a USC company) in Kaliningrad, Russia and will be transported to Finland for outfitting, finalizing, optimization and commissioning by Arctech in Helsinki with delivery scheduled for late 2013.

The hull form of NB 508 has an unique design and can proceed in 1.0 meter thick ice ahead and astern. In the oblique mode NB 508 will be able to forge a 50 meter wide ice-channel in 0,6 meter thick ice. Moreover, the oil recovery sweeping width has a 50 meter reach. The electric power plant onboard consists of three main diesel generator sets with a total power of 9.0 MW.

Obliquely break the ice and uniquely catch the oil

"There is demand for innovative icebreaking vessels in the Russian market. This rescue vessel represents a totally new technology, which enables its versatile use in the Gulf of Finland and it is designed in accordance with the highest international and Russian requirements and standards," highlights **Esko Mustamäki**, Managing Director, Arctech Helsinki Shipyard.

"Oil combat in ice conditions is one of the major challenges for the international oil industry. After many years of development work, the oblique (sideway) icebreaker concept represents a breakthrough approach for the solution. The design of this next generation icebreaker is based on our ARC 100 concept which was developed specifically for Arctech Helsinki Shipyard. Drilling permits in the Arctic region will only be granted if multipurpose OSR equipped vessels and actionable contingency plans are in place to ensure rapid mobilization and response to any incident," says **Mikko Niini**, Managing Director Aker Arctic Technologies Inc.

The new vessel is equipped with a helideck suitable to manage a Kamov Ka 32 helicopter and a workboat for oil boom handling. Moreover, NB 508 has a knuckle boom type offshore crane (25 tons) for moving loads and handling of the workboat.

"The NB 508 is intended for icebreaking, emergency and rescue operations coupled with OSR tasks. The advanced Lamor in-built oil recovery system (LORS) is suitable for operations in heavy seas. The vertical side of the hull is utilized as a sweep arm, and when the vessel moves forward obliquely (sideways) through oil spills, the oily water is guided through a hull hatch to the brush skimmers and tank compartment," says Lamor's Project Manager, **Lars Snellman**.

SERVS has the largest inventory of oil spill response equipment worldwide:

- 11 escort and response tugs
- Nine oil recovery barges
- 108 skimming units
- 49.7 miles of various booms
- Five hatchery protection sites
- Five response centers
- 350+ vessels participating in fishing/vessel program

Part of this program includes the ongoing training of over 400 Alaska based Vessels of Opportunity (VoO) in the local Prince William Sound and its outlying ports. This program, successfully in effect for over 20 years, was the model used to initiate the VoO program in response to the Macondo spill in April of 2010.

Alyeska's SERVS program is the largest oil spill prevention and response organization in the world, with a mission to prevent oil spills and to protect the environment by providing rapid and effective response services to the Valdez Marine Terminal and Alaska crude oil shippers.

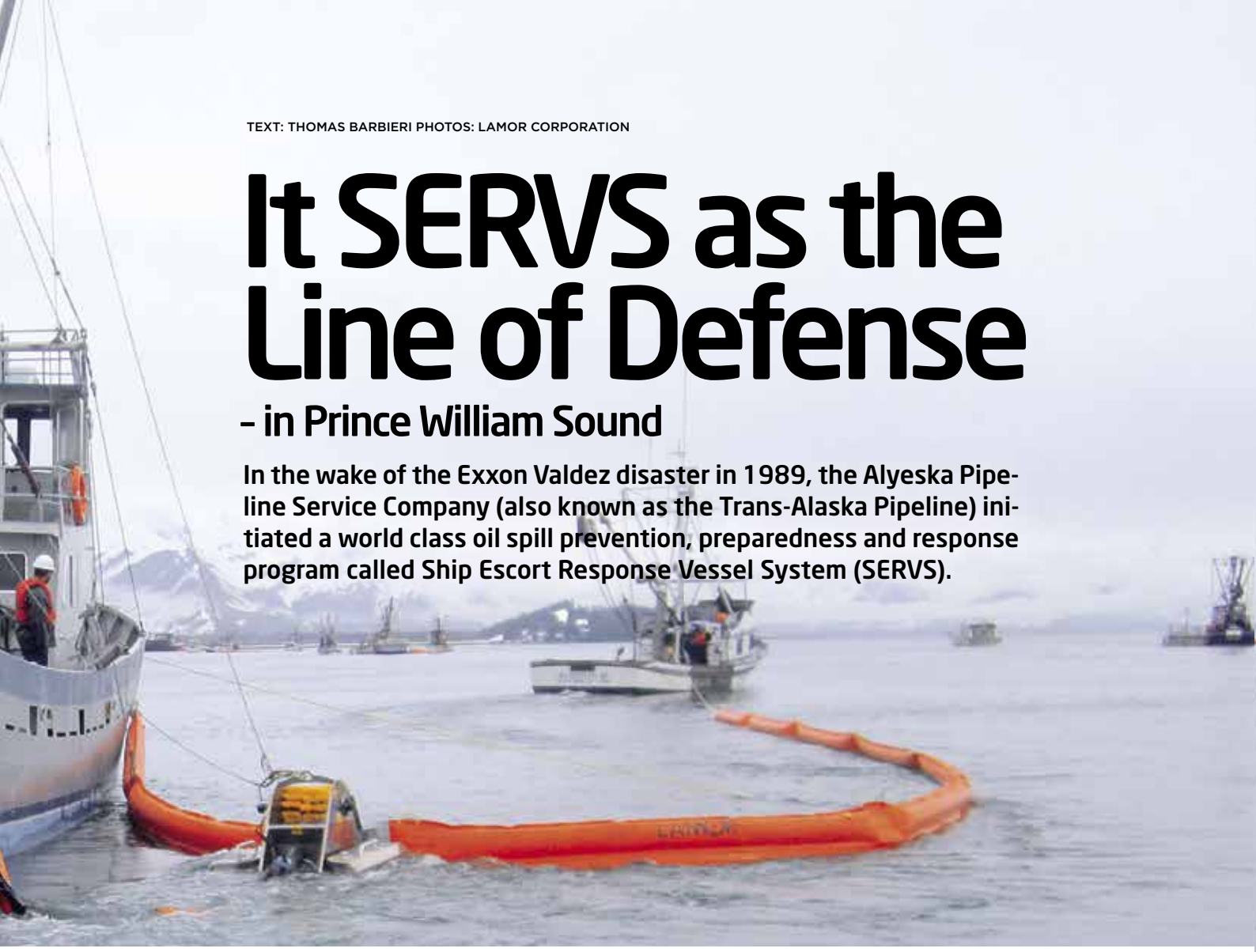
In April 2012, Lamor provided training to Alaskan fishermen who become oil responders during an incident. The training was con-

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

It SERVS as the Line of Defense

– in Prince William Sound

In the wake of the Exxon Valdez disaster in 1989, the Alyeska Pipeline Service Company (also known as the Trans-Alaska Pipeline) initiated a world class oil spill prevention, preparedness and response program called Ship Escort Response Vessel System (SERVS).



ducted in Valdez, Alaska on the Lamor Multimax 50 skimmer, powerpacks and inflatable light booms.

"Converting a fishing boat into a VoO can be somewhat challenging due to the layout of fishing equipment etc., however, we are able to overcome these challenges and convert a fishing vessel with innovative solutions that work. Next step is to provide instruction and training on how the OSR equipment works to be effective minimizing environmental and ecosystem damage," says Lamor's **Vince Mitchell**, VP Special Projects.

Two classroom days, involving "station" training were conducted with over 150 participants, predominantly fishermen. "We covered the theory and the hands-on practical operations of the skimmer, powerpack and boom," says Lamor's **John Kolonyi**, Sales Engineer.

"Moreover, we asked for the participants practical input on how this skimming system could be best configured to work on their vessels and their input was not only impressive but innovative too," he highlights.

The classroom days were followed by an on water deployment day. The vessel selected for deployment of the system was the seine (dragnet) type vessel *Tatyana Renee* in conjunction with the deflection boom towing vessel *Sherin D.* The skimmer was deployed in a modified "J" boom towing configuration from the *Tatyana Renee* and the simulated discharge of the recovered oil was into a SERVS 249 Barrel capacity barge towed on the side.

"The deployment was very successful the Lamor skimmer package was easy to work with and very compact with the inflating booms. The skimmer was light and very easy to tow and can be utilized even with light horsepower bow-pickers as the second vessel during an OSR operation. This technology would be a good addition to the SERVS inventory of equipment," says Captain **Scott Smith** of the *Tatyana Renee.*

"By design, the skimmer recovers very little water with the oil and the ability for dual rotation of the recovery brushes allows for excellent recovery of spilled oil over the entire viscosity range, which is very important as the spilled oil weathers over time. It was light, easy to deploy and use with two Alaska fishing vessels able to comprise a

ALASKA

The State of Alaska's name is derived from Alyeksa which is an antiquated spelling of the Aleut word that means 'great land' or 'great country'. The oil companies building the Trans-Alaska Pipeline also used the name when forming Alyeska Pipeline Service Company in 1970.

complete skimming system," Mitchell emphasizes.

SERVS serves and exceeds its duties

SERVS is at the forefront of prevention and response for US marine crude oil transportation, providing a first line of defense for the waters of Prince William Sound and it maintains one of the world's largest inventories of oil spill response equipment.

Today, the mission of SERVS is to maintain a constant state of readiness to assist tankers in the safe navigation through Prince William Sound and to provide oil spill response services to the Trans-Atlantic Pipeline's Marine Oil Shippers, Valdez Marine Terminal and the pipeline in accordance with oil spill response agreements and plans.

The Alyeska Pipeline Company is strongly positioned to respond to any incident and now meets or exceeds both state and federal requirements with equipment in place throughout Prince William Sound. Training is essential and ongoing continuously to respond to oil spill incidents. More than 400 professionally trained employees are available to conduct land and water response operations and more than 350 fishing vessels are contracted for incident response.

Lessons learned from the Exxon Valdez oil spill led to the Oil Pollution Act of 1990, which mandates that laden single-hull tankers be escorted by at least two towing vessels as they travel through Prince William Sound. The purpose of the tanker tugs is to monitor conditions and alert the tanker of potential problems before they occur and help the tanker avoid any possible dangers or prob-

The Trans-Alaska Pipeline is 1,300 kms long and a maximum discharge of 2.136 million barrels per day (339,600 m^3/d).

lems. In addition the tanker tugs help a disabled tanker as quickly as possible, or will begin a response effort in the event of a spill to water.

OSR that works

Depending on the size and type of the vessel, the Lamor team of design engineers can supply several custom made oil recovery solutions. Lamor's oil containment booms enclose the oil on and below the water surface and its larger skimmers are deployed from the sides of a vessel recovering oil from the ocean surface. Smaller skimmers are used on the beaches to clean-up oil that washed ashore.

Lamor supported the VoO program during the 2010 Gulf of Mexico (GoM) oil spill, training local fishermen and converting their fishing vessels (shrimper and fishing) to oil spill response vessels.

"We designed skimmer and oil containment boom configurations for the VoO program. Moreover, being a significant and major clean-up and response provider in GoM incident, we provided expert consultations to the command center that was set up to engage in the oil spill operations. The Lamor Multimax skimmer was especially developed for this purpose, based on earlier experiences in spill operations. Our brush skimmers, certified by Bureau Veritas, recover all types of oil, crude, weathered heavy viscous as well as light oils," says Mitchell.

The Alyeska Pipeline

The Trans-Alaska Pipeline, also known as the Alyeska Pipeline in Alaska, connects oil fields in northern Alaska to a sea port where the oil can be shipped to the lower 48 states for refining. Construction of the Alyeska Pipeline presented major challenges because of the remoteness of the terrain and the harshness of the environment it had to pass through. Since its completion in 1977, the pipeline has transported over 14 billion gallons of oil.

The Trans-Alaska Pipeline was built in response to the oil embargo imposed by the Organization of Arab Petroleum Exporting Countries (OPEC) on October 17, 1973 as a reprisal for US support of Israel during the Yom Kippur War. The effects of the embargo were far reaching and gasoline prices soared, shortages were common and rationing of gasoline was implemented sporadically. The US was highly dependent on OPEC oil imports and then President Richard Nixon responded by proposing the Trans-Atlantic Pipeline to reduce dependency on foreign oil imports.

Prince William Sound's world-class tanker escort system consists of two high-powered tanker tugs accompanying each laden tanker through the sound. Several tugs are operated by Crowley Marine and managed by SERVS, which is a part of the Alyeska Pipeline Service Company. The Coast Guard station in Valdez oversees all the operations in Prince William Sound.

TEXT: THOMAS BARBIERI PHOTOS: ARCTECH

Break the Ice the Multipurpose Way

In early January 2012, a keel laying ceremony held at the Arctech Shipyard in Helsinki marked the start of the construction of an ultramodern multi-functional icebreaking supply vessel. The ship is specially designed to service the oil drilling platform located on the northeastern part of the Sakhalin Island shelf, near Russia's Pacific coast.

Technical Specifications

Length	99.9 m
Length in waterline	93.9 m
Breadth maximum	21.7 m
Draught, at design waterline	7.6 m
Deadweight at design draught, abt	3950 t
Installed power	18.0 MW
Propulsion power	13.0 MW
Speed	15 knots
Speed at 1.5 m level ice	3.0 knots
Bollard pull more than	128 tonnes
Crew	24 + 26
GT	7100
Cargo deck	700 m²
Range	30 days
Classification	Dual class LR and RMRS

The underlying shipbuilding contracts were signed by Sovcomflot (SCF Group), Russia's largest shipping company, and Arctech which is a joint venture between Russia's United Shipbuilding Corporation (USC) and STX Finland. As a result of this cooperation, the American oil and gas corporation Exxon Mobil is due to have two ideal, year-round, supply vessels for its Sakhalin-1 oil drilling project, operated by its Russian subsidiary Exxon Neftegas Limited.

The international character of the project is evident from its brief history, which started at the end of 2009, when Sovcomflot took part in Exxon Mobil's tender for the construction and long-term use of two icebreaking supply vessels for its installations near Sakhalin. The vessels are supposed to service the underwater oil drills in Arkutun-Dagi, a major new phase of the Sakhalin-1 project. In June 2010 Sovcomflot was declared the tender's winner.

Next generation and multipurpose

The multifunctional icebreaking supply vessels NB 506 and NB 507 will be delivered for the Sakhalin-1 Arkutun-Dagi oil and gas field where they will be used in year round operation. Both vessels will be similar in design, measuring 99.9 m in length and 21.7 m in breadth and they will have accommodation spaces for 50 crew members and special persons and 195 evacuees.

The vessels will represent the next generation of multifunctional icebreaking supply vessels and they are designed for the extreme environmental conditions of the Sakhalin area. They will be operating in thick drifting ice in temperatures as cold as -35° C. The vessels will be capable for ice management and escorting purposes and they will be equipped to carry various types of cargo and to perform operations related to oil spill recovery, fire-fighting, ocean towing as well as stand-by and rescue. The icebreaking capability will be extremely high; the vessels will be able to operate independently in 1.7 meter thick level ice, and penetrate consolidated 20 m deep ice ridges.

The vessels will have a specially designed stern to navigate in ice and a diesel-electric machinery, with twin azimuthing podded type rudder propeller units for propulsion. The power generation station will consist of four main diesel generator sets with a total power of 18 MW. The rudder propellers will ensure reliable reversing capability and excellent maneuverability even in the most difficult ice conditions. For maneuvering and position keeping, two bow tunnel thrusters are provided.

In order to facilitate maneuvering in ice conditions, the designers of the ships' hull made it possible for both vessels to break ice not only with their bows, but also with

their sterns, thus allowing for reverse movement.

Working together

Despite a Russian company being the winner in the tender process, not all works are being completed by Russian subcontractors. The main work went to a joint venture of USC and STX Finland.

Most of the work will be completed in Helsinki, but the list of the project's subcontractors includes e.g. Russia's Vyborg Shipyard, which produced most of the blocks for both ships.

International cooperation

"The next stage in the implementation of the activity most in demand with Russian and international oil companies are the development of offshore energy projects. Using offshore equipment that meets the highest environmental and energy efficiency standards as well as the requirements of maritime safety is the key to successful implementation of these projects, in the Arctic and sub-Arctic regions," says **Ilya Klebanov**, Chairman of Sovcomflot's Board of Directors.

"I am confident that Russo-Finnish cooperation in mutually beneficial areas, using high technology in the construction of specialized vessels, has excellent prospects and will be fully exploited," Klebanov highlights.

Sergey Frank, Sovcomflot's President & CEO, said: "We are very pleased with this cooperation and are grateful to our partners for the opportunity to participate in the project. We were honored to win the tender for the maintenance of such a large and complex project as Sakhalin-1, and are particularly pleased that we are expanding the long-term and mutually advantageous cooperation with such a respected client as Exxon Mobil. It is important that Russian shipbuilders are full-fledged participants in today's event."

"The vessels to be built represent a new generation of multifunctional ice-breaking supply vessels, designed in accordance with the highest international and Russian requirements and standards. Such ships are very much in demand with Russian and international oil companies, especially in the context of the development of energy projects in the Arctic shelf. The vessels will be registered in Russia, and will operate under the national flag of the Russian Federation and will have Russian crews," notes Frank.

"The construction of multipurpose sup-

ply vessels is the first order for Arctech Shipyard. Of course, this is a new example of Russo-Finnish cooperation in this field and it is gratifying that the new generation of enhanced ice-class vessels is being built jointly by Russian and Finnish experts. Russia has a long experience of cooperation with Finnish shipbuilders. We see this breakthrough in shipbuilding for offshore energy projects not as an alternative, but as a powerful stimulus for our domestic shipbuilding," says USC's President, **Roman Trotsenko**.

Lamor's scope of supply comprises arctic brush skimmers, 15m sweeping systems, heavy duty oil booms, GT A 115 cargo oil pumps and a 10m boom towing boat. "The OSR equipment is designed for work in Arctic conditions that feature the latest Lamor technologies and innovations for heating capabilities for skimmers and oil transfer hoses. We will also supply all the electric hydraulic power units. The OSR equipment is fitted inside the hull, ready to be deployed in harsh Arctic weather conditions," says Lamor's COO, **Rune Högström**.

"These new buildings guarantee the full employment to Helsinki Shipyard. Moreover, we will be hiring additional expertise to meet demand and future projects," says Archtech's **Esko Mustamäki**, Managing Director.

"Cooperation with the client has gone well and at the moment the project is proceeding as planned. The next challenge and goal is to launch the vessel by the summer," says Archtech's **Juha Sinkkonen**, Shipyard Director.

The vessels to be built represent a new generation of multifunctional ice-breaking supply vessels, designed in accordance with the highest international and Russian requirements and standards

EMSA OSR Drill with Icebreaker Kontio

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

European Maritime Safety Agency (EMSA)

is a European Union agency charged with reducing the risk of maritime accidents, marine pollution from ships and the loss of human lives at sea by helping to enforce the pertinent EU legislation. It is headquartered in Lisbon. EMSA was founded in 2002, after the EU adopted substantial packages of legislation relating to maritime security in the wake of major shipping disasters in European waters, such as the oil tankers Erika and Prestige. It was felt that a specialized technical agency was necessary to overview the enforcement of this legislation and help in its implementation.

In March 2012, the European Maritime Safety Agency (EMSA) in accordance with its operational plan for the EMSA network of stand-by oil recovery vessels in the Baltic Sea conducted its quarterly drill in in the Gulf of Bothnia. In conjunction with the OSR drills, the Finnish icebreaker Kontio was deployed. Kontio is equipped with Lamor Free Floating (LFF100) skimmer, stiff sweep with brush and weir modules, heavy duty oil booms as well as oil transfer pumps.

Kontio is one of three EMSA stand-by ORVs in the northern Baltic Sea, with a total net storage capacity of 11,000 m³. Its crew is fully trained in accordance with IMO OPRC level 1 and 2. "These quarterly drills are an important aspect of maintaining skills, readiness and equipment in the event of an OSR operation," says Lamor's **Juha Muhonen**, VP Finland & Baltic Countries.

CLAIMING THE ARCTIC -mare liberum

TEXT: THOMAS BARBIERI

A frozen 'treasure' is soon to be discovered since its fortification is melting rapidly.

The Arctic Ocean is becoming more accessible and the momentum is rising as several countries are vying for a claim to the Arctic seabed and its vast purported natural resources. The United Nations Convention on the Law of the Seas (UNCLOS) is the umbrella organization that defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment coupled with the management of marine natural resources.

Countries in the region are increasing their lobbying efforts and activities providing their perceptions of evidence and justifications to UNCLOS to determine who will eventually gain the rights to legally acquire the riches from the seabed of the Arctic.

The UNCLOS replaced the 17th Century rule known as 'Freedom of the Seas' that was developed by a Dutchman utilizing what was coined as the 'canon shot' to determine the national boundaries of a country with coastal territorial waters. The waters beyond the 'canon shot' were considered mare liberum (free seas).

Countries that border the Arctic region are Russia, Norway, Denmark (Greenland), Canada and the US and they are disputing who owns what of the continental shelf. Tensions and verbal diplomatic spats have escalated between the nations. Under international law, no country currently owns the North Pole or the region of the Arctic Ocean surrounding it and those countries bordering it are limited to an exclusive economic zone (EEZ). UNCLOS allows foreign vessels including naval vessels the right of innocent passage in the EEZ.

The Arctic nations have a vested interest in pursuing their rush to claim these oil and gas resources because under the Arctic Ocean there is estimated to be 25% of the world's current oil and natural gas resources. The question that remains is who has the rights to drill where and who will profit from these natural resources. To settle this dispute, UNCLOS has set out, with the expertise of geologists and other specialist scientists, to determine if the continental shelf is part of the seabed that can be proven that it belongs to any single country.

Trying to bridge the ridges sientifically

In mid-2009 Russia's former President **Medvedev** stated in a television interview:

"Our main goal is to transform the Arctic into a resource base for Russia in the 21st Century". In 2007, Russia made the first move by planting a flag on the ocean floor beneath the North Pole. This caused additional tensions. That said, **Neil Armstrong** placed an American flag on the moon in 1969. And Norwegian **Roald Amundsen** placed a flag on the geographic South Pole in 1911.

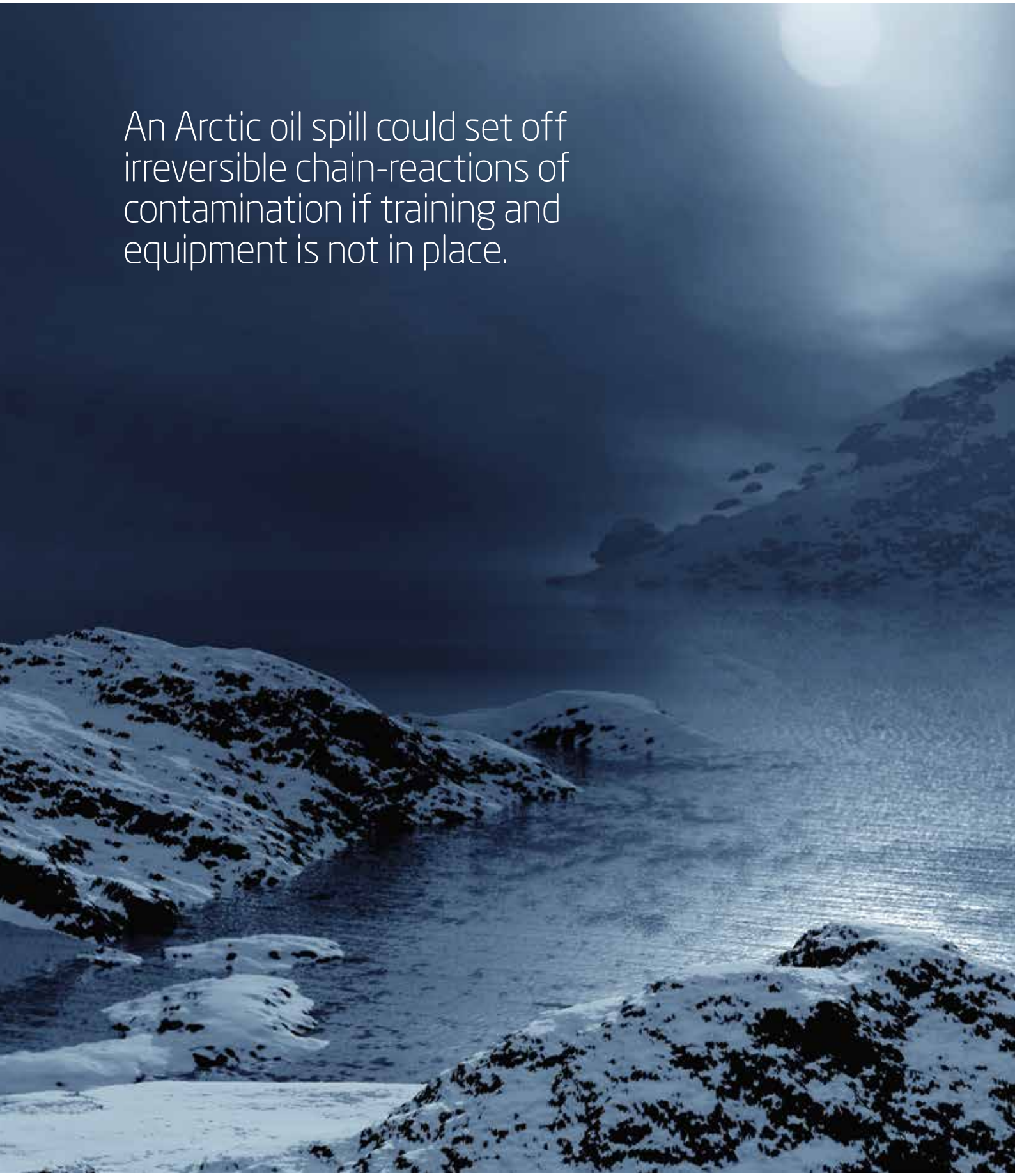
However, scientists from Russia have also been busy trying to prove that the Lomonosov Ridge, a 1,240-mile underwater mountain range that cuts across the Arctic Ocean, is geologically part of the Russian mainland coupled with Mendeleev Ridge that are extensions of the Eurasian continent.

Denmark (via Greenland), also has its interests in claiming the ridge, stating it is an extension of Greenland, which is a self-governing province of Denmark. This is followed by Canadian scientists submitting a paper to the respected Journal of Geophyical Research claiming proof that the Lomonosov Ridge is part of the North American land mass. Former Canadian Natural Resources Minister Gary Lunn stated: "We will be reaffirming our commitment about defending and protecting our sovereignty in the Arctic".

The Arctic coastal nations are submitting their claims to the UN Commission on the Limits of the Continental Shelf (CLCS) for evaluation whilst the dispute of ownership and sovereignty continues. Currently all nations are trying to solve this issue through the umbrella organization UNCLOS, however, in accordance with article 287, any nation can opt to settle the dispute via the International Tribunal for the Law of the Seas, to date this has not happened.

A new geopolitical battleground

In early 2011, at an Arctic conference held in Tromsö, Norway, U.S. Rear Admiral **Dave**


An Arctic oil spill could set off irreversible chain-reactions of contamination if training and equipment is not in place.

Temperatures in the Arctic are rising faster than anywhere else in the world.

between 2035 and 2040, there is a pretty good chance that the Arctic Ocean will be essentially ice-free for about a month." These longer periods of ice-free waters will likely mean more vessels trying to navigate the narrow straits and channels of the Northwest Passage, a series of waterways along the US coast that wind through Canada's Arctic archipelago of 36,000 islands, including commercial shippers looking for shortened trade routes.

By linking the Atlantic and Pacific oceans greatly reduces transit times for ships that have relied on southern route through the Panama Canal. Temperatures in the Arctic are rising faster than anywhere else in the world, making the Arctic region easier to navigate. For shipping companies hoping to shorten trade routes through the Arctic Ocean that provides them quicker access to economic dynamos such as China and India.

That said, the Arctic Ocean causes more diplomatic rows pursuant to the usage of waterways. Canada, Denmark, Norway, Russia and the US all regard parts of the Arctic seas as "national waters" i.e. territorial waters out to 12 nautical miles. There also are disputes regarding what passages constitute "international seaways" and rights to passage along them e.g. the Northern Passage.

Beyond profits and sovereignty

As the need for energy continues to rise and while onshore oil reserves dwindle, the search for oil offshore continues to surge. This increases the risks for accidents. The harsh climatic conditions in the Arctic Ocean make the exploration and extrapolation very dangerous. The waters of the Arctic are particularly extreme for drilling because of the punishing cold, long periods of darkness, dense fogs, and hurricane-strength winds.

Lamor's knowledge, expertise and commitment in providing the most advanced oil spill clean-up solutions with equipment, training, and a dedicated response team known as the Lamor Response Team (LRT), is unparalleled with a global reach in any climatic conditions and regions. "We have expertise and equipment for tackling hazardous accidents such as oil spills in all terrains and climates," says **Fred Larsen**, CEO of Lamor Corporation.

The Arctic Ocean's ecosystem is considered to be one of the most vulnerable to oil spills in comparison to other regions. "The cold weather, the thick ice cover together with slow turnover of eco-systems mean that toxic oil spills could last longer and expose multiple generations of organisms to contamination," he says. "An Arctic oil spill could set off irreversible chain-reactions of contamination. The lack of sunlight also impacts the breakdown of spilled oil and other chemicals. Therefore, it is essential for both corporations and governments to be responsible and take the necessary steps by investing in training and equipment to reduce a catastrophic environmental disaster, and this is where we can help," Larsen says confidently and categorically. ●

TEXT: VINCE MITCHELL PHOTOS: LAMOR CORPORATION

FIGHTING OILSPILLS IN ARCTIC CONDITIONS

– with reliability and efficiency

The unprecedented seasonal retreat of sea ice in the arctic has been observed and is presently occurring. This inevitably will create a surge in shipping traffic activities such as tankers, bulkers, container ships, tugs with barges and fishing vessels, in addition to the passenger cruise ships, research and icebreaking vessels.

Finnish multipurpose OSR vessel Halli.

Lamor OSR equipment in icy conditions.

This increased activity will also include oil and gas exploration, development and production activities creating multiple challenges to the environment and those nations boarding the arctic region. Specifically contamination risks include spills of both persistent oils i.e. many crude oils and heavy refined products, to non-persistent oils i.e. diesel and petrol.

Behavior of Spilled Oil

The foremost physical properties effecting oil when spilled is its density (specific gravity, the oils ability to float) and its viscosity (the oils ability to flow and the thickness).

The behavior of any oil spilled in arctic conditions will differ compared to oil spilled in more temperate climates. The major differences that will impact the oil spill responders include:

Evaporation: This occurs when the lighter, more volatile components are lost mainly due to the speed of the wind, temperature and the thickness of the oil slick. Evaporation rates of spilled oil in the arctic are less than in warmer sea and air temperatures.

Spreading: Discounting the presence of ice, the spreading of oil on the surface of the sea is primarily a function of the water temperature and to a lesser degree the air temperature. Oil spilled in the arctic will be more viscous and spread less than oil spill in warmer waters.

These will cause differences in the behavior of the spilled oil that may affect the equipment selection and tactics available for use by the responders. It can be generally stated that the presence of ice reduces the overall efficiency of the response spilled oil recovery operations.

There may be other considerations that may in fact be favorable for spill responders when operating in the arctic regions. These may include: an increase in the thickness of the spilled oil, reduced weathering and formation of emulsion (water in oil mixture), reduction of the waves due to the dampening effects of ice and the blockage of shoreline impact due to the presence of land fast ice.

Safety of Responders and Equipment

In any response to spilled oil the safety of the spill responders is paramount. In addition to the marine safety hazards all responders may be exposed to on oil spills in any location which may include: noise, fire and explosions, ergonomic, crane operations, chemical and respiratory exposures, wildlife and aircraft operations, additional concerns in the arctic regions may also include cold stress (including hypothermia), small boat operations which may involve ice and icing conditions, increased risks of slips, trips and falls and even sunburn. Ample consideration should be given, ahead of an event if possi-

The behavior of any oil spilled in arctic conditions will differ compared to oil spilled in more temperate climates.

ble, to mitigate or design out, wherever possible, the effects of any potential hazards.

Mechanical Containment and Recovery Equipment

This is the most "traditional" of the oil combating techniques and involves what commonly comes to mind when one thinks about response to oil spills; the use of oil containment booms and oil recovery skimmers. The vessel platforms selected for this offshore mechanical containment and recovery should be suitable for the harsh environmental conditions, provide adequate facilities for sustained operations and ideally at a minimum be ice classed and equipped with controllable pitch propellers for sustained slow speed operations.

Equipment selected for use in the arctic should be robust, simple and ideally fitted cold temperature adaptations, to prevent equipment freezing (engine oil heaters, hydraulic oil heaters, hot water or steam heating) and the ability to avoid or process any ice that may be encountered.

Oil Containment Booms

Oil booms can be used to collect oil, contain oil, protect areas at risk and assist in shoreline cleanup if needed. In offshore open water use in the arctic regions (~1-2/10's ice), oil booms can effectively be used to collect and contain spilled oil increasing the oil thickness for collection by skimmers. All oil booms have common components that give the boom its freeboard, draft and buoyancy to weight ratio. The most common boom construction materials include Polyvinyl Chloride ("PVC"), Polyurethane/Polyvinyl ("PU") and rubber coated ("Neoprene").

All oil booms have some type of floatation material which can range from air to solid foam and some type of tension member/ballast weight which commonly ranges

Lamor has advanced arctic oil spill clean-up equipment, knowledge and expertise and continues to strategically invest in its R&D activities.

from chain to lead weights. It should be noted that all oil booms will eventually fail in increasing ice conditions due to the tremendous forces produced by the ice on the boom system. Generally, for offshore use in arctic regions a heavy duty neoprene fabric boom with air floatation and a chain tension member/ballast weight provides a highest strength, best performing, robust boom most suitable for offshore service.

As the concentration of ice increases, the spreading of the oil will be impeded and reduced as the ice acts as a natural booming material, concentrating the oil into the narrow channels or into pockets in the ice.

Oil Recovery

Once oil is collected in a sufficient thickness, it can be removed, or skimmed, from the surface of the water. Skimmers are either stationary or advancing and the most common type of oil skimmers is Oleophilic (oil attracting), Weir, Vacuum, Hydrodynamic and Mechanical. While there are many different individual and varieties of oil skimmers, the two most prevalent skimmers used offshore are the oleophilic and weir skimmers.

The weir type of skimmer presents a "lip" or weir at the oil/water interface. The oil then flows, via the influence of gravity, into the collection hopper for pumping into temporary storage. While weir skimmers can have a very high theoretical recovery rate and are relatively inexpensive, they tend to recover a large quantity of water along with the oil, very viscous oils may have trouble flowing over the weir lip and they are vulnerable to clogging from debris or ice making their efficient use only during periods of very low ice concentrations.

The oleophilic skimmer presents an oil attracting material to the oil/water interface. The oil adheres to the surfaces and is subsequently scraped from the collecting surface, into the collection hopper for pumping into temporary storage. The skimmers attracting surfaces can include synthetic, metal and fiber materials in rope, belt, brush or disc configurations. The recovery capacity is a direct function of the surface area of the recovery material and the ability to effectively scrape it off.

Adaptations of the oleophilic brush skimmer principle that has been specifically adapted for arctic use in broken ice conditions has been developed by Lamor. The company has conducted extensive testing and has a variety of real life experiences in the neighboring Gulf of Finland and Baltic Sea. Lamor is a leader in the development of reliable and effective equipment for use in the arctic by providing efficient and practical solutions based on their experience. Moreover, Lamor has operated in western Siberia, the Arctic Ocean (Prirazlomnoye) and eastern Russia (Sakhalin).

In this proven design and technology, the oil attracting brush material is rotated through the oil/water interface with the recovered oil then scraped off for recovery. This brush conveyer can operate at advancing speeds up to 4 knots, recover all viscosities of oil with an extremely low (< 5%) water content. This system can be enhanced with the use of an outrigger jib arm(s), and sweeping booms along with additional deflection booms. These systems can either be side mounted or mounted within the recovery vessel's hull with many degrees of automation.

Lamor Oil and Ice Separator (LOIS)

In ice conditions, oil will be mixed in with or coating the ice pieces. The LOIS operates on the principle of the vessel moving through the water (from 1 - 3 knots), the ice pieces are pushed beneath the grids of the LOIS unit. The ice pieces are forced up and down and the surrounding water washes the oil from the ice pieces. The natural buoyancy of the oil floats into the LOIS and to the oleophilic skimmer unit mounted on the LOIS or in the recovery vessels' hull.

Lamor Arctic Skimmer

This skimmer was specifically designed to operate in the extreme cold and under broken ice conditions. It incorporates a static deflection grid or larger pieces of ice and any smaller pieces of ice that are recovered in the recovery hopper are crushed by feed screws which feed the recovered oil to the discharge pump. A steam or hot water connection is standard to assist in the pumping of viscous products. This arctic skimmer can be utilized in free floating or vertically suspended operations.

Lamor Oil Recovery Bucket

The Lamor Oil Recovery Bucket is designed to be mounted to and deployed from an excavator or crane. This is an active skimming system with complete control of the skimming unit. The bucket itself can be utilized for the heaviest of oil products and solid materials, including the processing of ice pieces. This is best utilized for recovery of pockets of oil found in the ice.

Mechanical containment and recovery tactics

Oil must be collected in the thickest layer possible for the most efficient skimming to occur. This generally involves longer lengths of "deflection" booms into a collection pocket where the skimmer is located. In the arctic regions the use of these deflection booms is only possible during "open water" conditions with ice coverage ~1-2/10 or less. This is due to the ice being deflected and concentrated along with the oil.

As the amount of ice increases, shorter lengths to no "deflection" boom can be used. As the ice further increases, the ice itself acts as a natural containment boom and "pocket" recovery tactics in areas of oil trapped by the ice become feasible. Lamor does not offer

non-mechanical or dispersants methods in their product portfolio for combating spilled oil offshore especially in the arctic region.

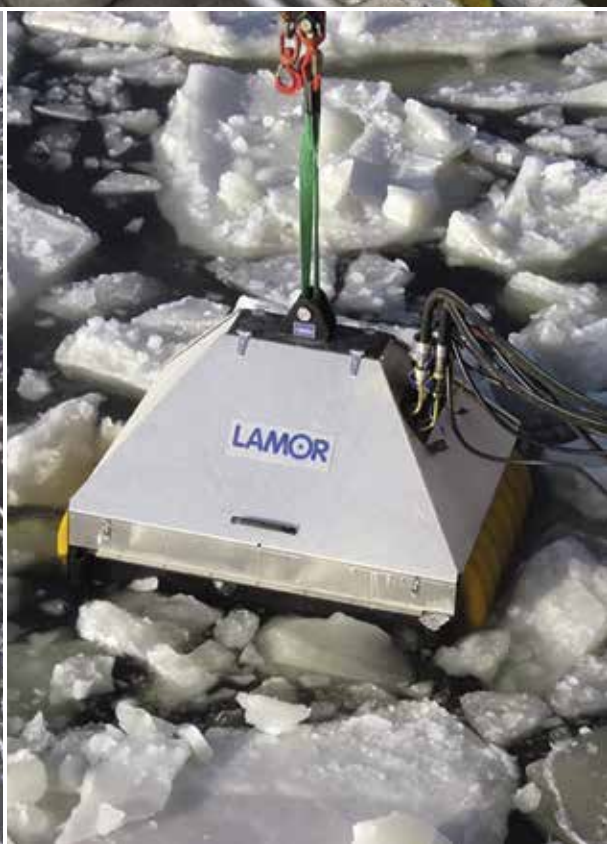
The bottom line

In evaluating the reliable and effective tools for oil spill response operations in the arctic, it becomes clear that except for the equipment developed by a few companies, most notably Lamor, the majority of the response equipment currently in use in the arctic regions is adapted from equipment used in more temperate climates. That said, additional research, testing, field and full scale trials have been initiated with knowledge gained and advancements made. These types of efforts will need to be funded and pursued to provide the absolute best in prevention, preparedness and response to potential oil spill in the arctic regions of the world. Lamor has advanced arctic oil spill clean-up equipment, knowledge and expertise and continues to strategically invest in its R&D activities. ●

Lamor Side Collector

(bottom l-r)
Viscous oil recovery with LORS built-in 8 brush conveyor system.

Lamor Arctic skimmer.



Keeping Maritime Activities Clean and Safe

TEXT: THOMAS BARBIERI, ANN CHARLOTTE FOGDE & BSAG

In the Clean and Safe Maritime Activities program, the Baltic Sea Action Group (BSAG) has analyzed the different threats and risks of maritime activities to the Baltic Sea, listed by the Helsinki Commission (HELCOM) in its Baltic Sea Action Plan. The aim is to tackle issues not dealt with efficiently yet, issues that are not taken care of by any identified party, and to promote solutions with long range effects.

Icebreaker on Baltic Sea.

BSAG combines resources and opportunities provided by the public, private and civil sectors. "In the Clean and Safe Maritime Activities program we have extensive collaboration with maritime and oil combat and rescue authorities, NGOs, educational institutes and private companies, of which one valuable partner is Lamor," says **Mathias Bergman**, Secretary General of BSAG.

Based on research by and consultation with leading authorities in the respective fields, BSAG has launched activities in the fields of navigation safety, oil combat and response capacity and waste discharges.

Safety of navigation

An estimated 2000 vessels traffic the Baltic Sea at any given moment today. The traffic is expected to increase to around 3500 vessels by 2015 (see The Baltic Sea – Clear and Present Danger article on page 33). At the same time as the overall risks of sea transportation grow, manning onboard has been minimized and fatigue is common among mariners. Notably, fatigue is one of the most common causes of accidents. Against this background it is of utmost importance to improve both the technical and the human aspects of ship operation.

BSAG has started a project that aims at the development of a novel and highly advanced vessel traffic management system, including the new AIS+ software, ultimately covering the entire Baltic Sea. This process is taken forward together with the Finnish maritime authorities, other Baltic Sea region maritime authorities, Technology Research Centre of Finland and a global provider of advanced IT solutions.

To address the educational aspects of sea transport safety, BSAG is involved in two projects aiming at improving advanced navigation and ships´ operation training tools, and basic training of seafarers. In this project BSAG assists the Finnish ships´ owners and leading technology providers of simulation and arctic ship operation to make ends meet.

Oil spill response

BSAG and Shell organized a seminar in Helsinki on the 7-8 June 2011 to review preparations for a major oil spill in the Baltic Sea region. The event was Shell´s Baltic Sea Commitment to BSAG, presented at the Baltic Sea Action Summit in February 2010. The participants including Government, academia, NGO's, and representatives from the oil and gas industry concluded that if an oil spill in ice should take place, we must do everything to ensure everyone is prepared.

The increase in marine traffic in the Baltic Sea has raised the potential of an oil spill in the region. Oil recovery in cold or even icy, shallow waters with thousands of islands presents its own unique challenges for which industry, the Government and agencies must be well prepared.

The international seminar organized by

With the increase of marine traffic on the Baltic sea, concern of OSR equipment is high on the agenda.

The City of Helsinki hosted a reception for the participants of the Oil spill in ice seminar. From left: Mathias Bergman, Secretary General of BSAG and Chairman of the seminar. Jorma Ollila, Chairman of the Board of Shell, and from Shell Project Manager Bronwyn Sharples and Robert Blaauw, Senior Adviser.

BSAG and Shell reviewed current and future oil spill risks and scenarios in the ice-prone part of the Baltic Sea. State of the art oil spill in ice response (OSR) capabilities and country examples were presented.

"Identifying and sharing best practices among the OSR organizations and enhancing their capabilities in the Northern Baltic Sea is vital. The cleanup response could be better and it is all the Baltic Sea States' interest to take it seriously. Man is the biggest cause to accidents," says Bergman.

BSAG with support from Shell have involved key stakeholders from the oil industry, Government, agencies, NGO's and academia, to ensure good oil spill response plans for the region. The seminar and workshops were designed to share research conclusions and develop and establish a regulatory and organizational framework to ensure the region is prepared for a worst case scenario.

"We are extremely pleased and proud to be able to support BSAG with this seminar. We see this as an important step in the process of assessing the oil spill response capability in the ice-prone Baltic Sea and helping with the review of actions towards addressing possible gaps. Oil spill prevention and response remain a top priority for us at Shell and we will continue to support work like this that can improve the ability to respond to oil spills and improve the safety of operating in ice," says **Robert Blaauw**, Shell Arctic Theme Lead.

The source of knowledge is experience

For over two decades, Lamor has delivered OSR equipment and training to the Finnish oil spill response vessels, the Swedish Coast Guard and most recently to the Norwegian Coast Guard. The European Maritime Safety Agency (EMSA) has engaged Lamor in a service contract since 2005 for the Baltic Sea.

Lamor's EMSA service contract is a substantial addition to the Baltic response readiness, which secures a rapid and efficient response to oil spills. Selected oil tankers are pre-fitted so that in case of an incident they can rapidly be converted to oil recovery vessels by deployment of Lamor Side Collectors and heavy duty oil booms. This ensures that the OSR tanker is operational at the scene of the incident within 15 hours.

In addition to the service contract for the Baltic Sea, Lamor also has a second contract covering the southern Atlantic coast region. Lamor has also delivered OSR equipment to an icebreaker operating in the northern Baltic Sea and other EMSA contractors on the Mediterranean and Black Sea.

It is fundamental that collectively investments in safeguards are implemented in e.g. training, preparedness and best available technology (BAT) and solutions to reduce oil transportation accidents which can for decades harm the environment and eco-systems. This is where the expertise of Lamor steps into the scene.

Lamor's knowledge and commitment in providing the most advanced oil spill clean-up solutions with equipment, training, and preparedness is unparalleled with a global reach in any climatic conditions and regions.

"Our business is to tackle some of the most environmentally destructive and hazardous elements such as oil spills and we are committed in providing the right solutions for all aspects of oil clean-up operations and preparedness. Moreover, I am pleased that so many nations, NGO's and companies realize the need for oil spill response training and equipment. I fully support BSAG, Shell and HELCOM for their focus on this heavily trafficked sea. It is not 'if' there will be an oil spill in the Baltic Sea, but 'when'," says **Fred Larsen**, CEO of Lamor Corporation.

Lamor's COO, **Rune Högström** explains: "We have developed our equipment for 30 years and acquired expertise in oil spill clean-up operations and learned along the way. For example we tested how ice and sludge react in recovery situations in Arctic conditions in a 1,000 m² size area and noted that there will be approx. 20 – 40 m³ sludge in all broken ice conditions, no matter what the temperature is. This causes a big problem for conventional skimmers, whereas Lamor skimmers do not collect any ice sludge at all. Conventional skimmers get clogged and ices up within minutes of operation in sludge.

The Baltic Sea – Clear and Present Danger

unless prepared, trained and actively engaged

TEXT: THOMAS BARBIERI PHOTOS: HELCOM, LAMOR CORPORATION

The hunt for 'black gold' continues relentlessly and demand for this energy source continues to surge worldwide. Large corporations are exploring and finding vast new untapped oil fields off-shore in the Arctic Ocean. The massive offshore rigs endure very harsh sea and climatic impacts coupled with the need and rise of shipping transports along the coast of Norway into the Baltic Sea and beyond. Thus, correspondingly the risks of oil related accidents to occur will be doubled within the next four years compared to 2011.

Early training, preparedness and well-organized response operations coupled with effective equipment are the essential tools needed to be in place for proactively reducing the environmental impacts and effects from oil and other hazardous materials pollution accidents. By 2015, estimates are that 25% of the 3,500 ships sailing the Baltic Sea will be oil and other chemical transporters. The forecasts also predict that over 130 million tons of oil will travel on the Baltic Sea by this time.

Counteractive measures should be in place and governments, NGO's and corporations are actively seeking solutions to ensure that they collectively have the necessary resources, personnel and equipment to counter this clear and present danger. Moreover, new and stricter legislation pursuant to responsibility, accountability and operational methods have been introduced and implemented.

European Maritime Day and BRISK-RU project

In May 2011 the Helsinki Commission (HELCOM) released an analysis of the Baltic Sea situation at the European Maritime Day Conference in Sopot, Poland. The main topic of the seminar was to discuss the environmental risks of maritime transportation and the need for sufficient resources to combat accidental oil spills at sea. The event provided the first opportunity to reveal the results of the BRISK Project's comprehensive and unique risk analysis of shipping accidents and pollution in the Baltic Sea, based on a single methodology and covering the whole sea area.

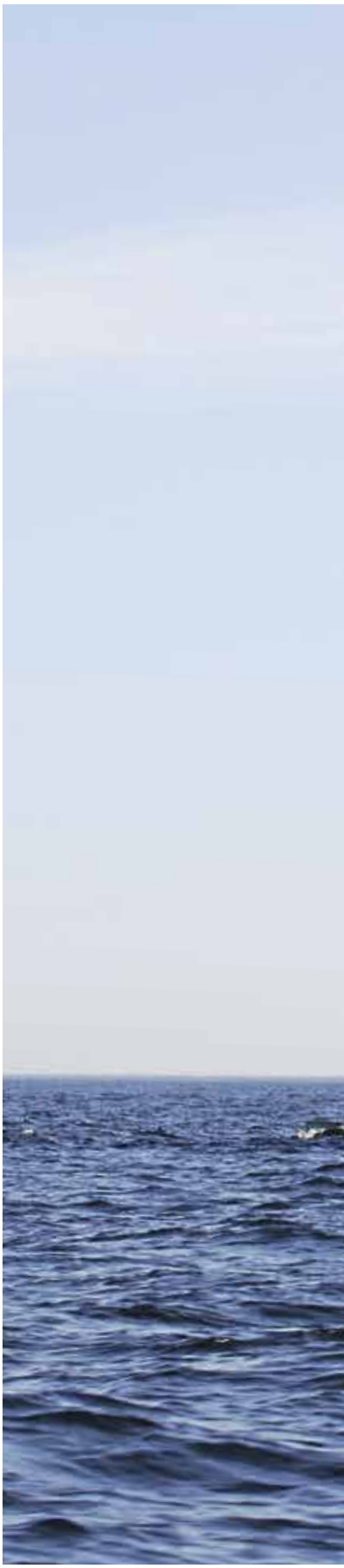
The BRISK-RU project (2010 -2012) is developed as a Russian component for the the seminar and presentations at the recent HELCOM BRISK meeting in Sopot May 18 – 20 were well supported by all of the anti-pollution players in the Baltic region and will surely act as a valuable information source for the oil spill response in the future. "I am honored that HELCOM invited Lamor to this interesting and important gathering and we will support the values and the goals of the group in the future," says **Christoffer Wallgren**, Regional Manager Europe.

EU-financed project "Sub-regional risk of spill of oil and hazardous substances in the Baltic Sea" (BRISK) and is financed by the Nordic Council of Ministers. The overall objective of BRISK is to substantially contribute to the development of an appropriate level of preparedness in the whole Baltic Sea area to tackle major accidental spills.

Budget of the project is approx. €3.3 million with approx. €2.5 million to be allocated from the European Regional Development Fund. Both projects are developed as a response to the increased risk of accidents and environmental damage in the Baltic Sea due to significant increase in ship traffic in the Baltic Sea with a common objective of reaching the goals of the HELCOM Baltic Sea Action Plan and the EU Baltic Sea Strategy.

HELCOM's analyses reported that catastrophic oil spills of 5,000- 150,000 tons in the Baltic Sea could occur once every 26 years, and large spills of 300-5,000 tons are expected to occur as frequently as once every four years, while the major risk area is the south-western Baltic and the Kattegat (Norway/Sweden/Denmark).

"The risks of the largest spills of 5,000 – 150,000 tons of oil in the Baltic Sea are limited to certain hot spot areas along the main oil shipping route, including route junctions in the Baltic Proper and Kattegat as well as



Finnish oil spill response vessel Seili, equipped with Lamor's oil spill recovery technology, participating in oil spill response exercises off the Estonian coast.

HELCOM's BRISK and BRISK-RU projects aim to increase the preparedness of the Baltic Sea countries to combat major pollution caused by shipping activities.

narrow straits that lead to the Baltic Sea through the Great Belt," says Peter S. Poulsen, the BRISK Project Manager. "On contrary, the risk of spills of 300 – 5000 tons of oil is more evenly distributed throughout the Baltic Sea and as likely on the main oil route as on some other routes, particularly in the waters of Gotland, the Åland archipelago and along the Polish coast."

There are also substantial differences in the intervals between possible spills in these two size ranges in different sub-regions of the Baltic Sea area. These intervals are the shortest in the Sound and the Kattegat, closely followed by the south-western Baltic Sea, and the longest in south-eastern Baltic Proper. Spills are expected to be also less frequent, than in the Sound and Kattegat, in the Gulf of Finland and Gulf of Bothnia (more than four times) and northern part of the Baltic Proper (almost three times).

Mapping the environment

The risk assessment is accompanied with mapping of environmental sensitivity to oil in the entire Baltic Sea. Seventeen key environmental parameters have been selected and mapped including several habitats, species of marine flora and fauna, and protected areas, as well as human activities. This work reveals that particularly coastal waters, archipelagos and shallow waters are highly sensitive area to oil spills. The sensitivity maps will be further used by the coastal states to assess the impact of oil.

Based on the risk analysis, the nine HELCOM countries will identify the missing emergency and response resources needed to effectively tackle major spills of oil and hazardous substances with the aim to improve and optimize response capabilities in their areas of responsibility.

HELCOM's BRISK and BRISK-RU projects aim to increase the preparedness of the Baltic Sea countries to combat major pollution caused by shipping activities. The Admiral Danish Fleet leads the project, and ten partners from eight countries are involved in it. The BRISK-RU project, financed by the Nordic Council of Ministers, carries out activities in the Russian Federation complementary to the BRISK activities. The Lead Partner of the BRISK-RU project is the Central Marine Research & Design Institute Ltd. in St. Petersburg, and the coordinator is the Information Office of the Nordic Council of Ministers in Kaliningrad.

The Baltic Sea today is one of the busiest seas in the world, accounting for more than 15% of the world's cargo transportation. Both the numbers and the sizes of ships have grown in recent years, especially oil tankers, and this trend is expected to continue.

The Baltic's narrow straits and shallow waters, many of which are covered by ice for prolonged periods in winter, make navigation very challenging, and increase the risk of shipping accidents.

The Baltic Sea coastal countries already have substantial resources to effectively respond to pollution at sea in the region, and operational procedures for joint, international response operations have been put in place within the framework of HELCOM. Yet, the need for further, deepened cooperation has been recognized by all Baltic Sea countries.

Three tier approach

HELCOM applies a three tier approach to response to pollution at sea, where minor spills are addressed by one country, medium-size spills require assistance from several neighboring countries, and the largest spills are addressed by all coastal states and if necessary with use of external assistance. BRISK will focus on tier II accidents corresponding to sub-regional level of co-operation.

First of all, based on a common methodology a comprehensive Baltic-wide analysis will be done within BRISK to check whether the existing emergency and response capacities in each sub-region of the Baltic are sufficient to tackle medium-size and large spills. No such overall risk assessment for the Baltic has been done so far.

Based on the risk assessment, the Project will identify missing resources and will help prepare pre-investment plans on how the Baltic Sea countries should jointly fill in the identified gaps.

The sub-regional approach when building the response capacities applied in BRISK is the most cost-efficient as countries can "share" their resources to build a common pool of response vessels and equipment sufficient for a given sub-region.

Moreover, the Project will facilitate and speed up the process of developing and concluding sub-regional agreements between neighboring countries for joint response operations. Through these activities the Project will substantially and in a concrete way contribute to the development of an appropriate level of preparedness in the whole Baltic Sea area.

BRISK project partners

- Admiral Danish Fleet HQ – lead partner
- Swedish Coast Guard HQ
- Finnish Environment Institute
- Estonian Board of Border Guard
- Marine and Inland Waters Administration of the Ministry of the Environment, Latvia
- Central Command for Maritime Emergencies in Germany
- Coastal Research and Planning Institute, Klaipeda University, Lithuania
- Maritime Institute in Gdansk, Poland
- Maritime Office in Gdynia, Poland
- HELCOM
- Russian partners from St. Petersburg and Kaliningrad

HELCOM response at work

- to ensure swift national and international response to maritime pollution incidents
- to ensure that in case of an accident the right equipment is available and routines are in place to respond immediately in cooperation with neighboring countries
- to analyze developments in maritime transportation around the Baltic and investigate possible impacts on international cooperation with regard to pollution response
- to coordinate the aerial surveillance of maritime shipping routes to provide a complete picture of sea-based pollution around the Baltic, and to help identify suspected polluters


IMO

TEXT: THOMAS BARBIERI

The Baltic Sea – PSSA

The International Maritime Organization (IMO) has identified and declared the Baltic Sea as a one of ten, Particularly Sensitive Sea Areas (PSSA). Other sea areas to be given PSSA status were e.g. around the Canary Islands Atlantic and the Galapagos Island.

The Great Barrier Reef, Australia.

IMO's mission statement, as stated in Resolution A.1011(26), which sets out the Strategic plan for the Organization (for the six year period 2010 to 2015):

The mission of the IMO as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation. This will be accomplished by adopting the highest practicable standards of maritime safety and security, efficiency of navigation and prevention and control of pollution from ships, as well as through consideration of the related legal matters and effective implementation of IMO's instruments with a view to their universal and uniform application.

PSSA

status is given to sea areas that are especially vulnerable to risks caused by transport and other harm. **Jorma Kämäräinen** of the Finnish Maritime Administration sees the significance of the new status as mainly psychological. "The special status is a reminder of the vulnerability of the Baltic Sea. In two years IMO should bring forward new regulations for approval concerning security in areas such as sea lanes, traffic control systems, and restrictions on transport," he says.

Russia's increased oil transport through the Gulf of Finland, as well as the increasing transport of other hazardous substances in the Baltic, remains one of the biggest risks facing the sea. The new PSSA status applies to all parts of the Baltic Sea, with the exception of Russian waters at the far eastern end of the Gulf of Finland, and off the enclave of Kaliningrad. Russian ships will have to abide by international rules when they are outside Russia's own territorial waters.

PSSA is an area that needs special protection through action by IMO because of its significance for recognized ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities. The criteria for the identification of particularly sensitive sea areas and the criteria for the designation of special areas are not mutually exclusive. In many cases a PSSA may be identified within a Special Area and vice versa.

The following PSSA's have been designated:

- the Great Barrier Reef, Australia (1990)
- the Sabana-Camagüey Archipelago in Cuba (1997)
- Malpelo Island, Colombia (2002)
- the sea around the Florida Keys, US (2002)
- the Wadden Sea, Denmark, Germany, Netherlands (2002)
- Paracas National Reserve, Peru (2003)
- Western European Waters (2004)
- Extension of the existing Great Barrier Reef - to include the Torres Strait -proposed by Australia and Papua New Guinea (2005)
- Canary Islands, Spain (2005)
- the Galapagos Archipelago, Ecuador (2005)
- the Baltic Sea area, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden (2005)
- the Papah naumoku kea Marine National Monument, US (2007)

Lamor Oil Ice Separator (LOIS) deployed in Arctic conditions.

Arctic Oil Exploration and Extrapolation

– a fragile frontier yet to be fully discovered

The exploration for oil in the Arctic Ocean continues full steam ahead, but there are immense risks to the environment and ecosystems. Demand for oil continues to surge and companies are taking more and more risks. Companies will continue to drill for oil in remote areas, such as the Arctic region, and there are clear and present dangers.

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

By investing in the best available technology (BAT) and solutions coupled with training and preparedness, offshore oil exploration and drilling can be conducted in a more responsible and safe manner. This is where the expertise of Lamor steps into the scene.

Lamor's knowledge, expertise and commitment in providing the most advanced oil spill clean-up solutions with equipment, training, and a response team known as the Lamor Response Team (LRT), is unparalleled with a global reach in any climatic conditions and regions. "Lamor's dedication to tackle some of the most environmentally human-caused destructive and hazardous elements such as oil spills is what we do, and I can say that oil clean-up operations is what we are fully dedicated in doing," says **Fred Larsen**, CEO of Lamor Corporation.

The Arctic Ocean's ecosystem is the most vulnerable to oil spills in comparison to other regions. "Cold weather, the thick ice cover together with slow turnover of plants and animal life mean that toxic oil spills could last longer and expose multiple generations of organisms to contamination," says Larsen. "The lack of sunlight also impacts the breakdown of spilled oil and other chemicals. Thus, it is essential for both governments and corporations to be responsible and invest in safeguards, training, and equipment, in order to quickly and efficiently take the appropriate steps to reduce a catastrophic environmental disaster," he says emphatically.

Lamor Oil Ice Separator (LOIS) installed on Finnish vessel.

We do more at Lamor, we subject our equipment to very harsh and challenging conditions to ascertain their effectiveness and efficiency.

Environmental stewardship

The U.S. Bureau of Ocean Energy Management Regulation and Enforcement (BOEMRE), estimates that the Arctic Ocean holds up to 19 billion barrels of oil and up to 74 trillion cubic feet of natural gas. For the global energy market this is significant since such vast resources amounts to approx. 25% (or more) of the world's undiscovered oil and gas resources. Territorial disputes surface between nations that border the Arctic Ocean i.e. Canada, Greenland, Iceland, Norway, Russia and the US.

Larsen explains: "With those remarkable estimates, it is no wonder that corporations are striving to explore, locate and establish offshore oil drilling operations. However, they need to do so responsibly and work together with companies like ours that have invested in R&D, have experience and the best solutions for handling accidents in Arctic conditions. The sub-zero temperatures, hurricane-force winds, reduced visibility during the prolonged winter darkness, along with high 10-30-foot seas, certainly makes any clean-up operation challenging but not impossible for Lamor."

"Lax oversight and inadequate response capacity adds to the challenge," says Larsen. "It is a teamwork effort, and an Arctic oil spill could set off irreversible chain-reactions of contamination thus, investing in training, equipment, and preparedness, is irrefutably the best way for any oil cluster related company to commit themselves to."

Your solution to pollution

Having the right partner in oil spill prevention and preparedness is vital. Lamor's product portfolio comprises the patented oleophilic brush skimmer systems, oil containment booms, oil transfer pumps and workboats as the main categories. "We rely on Bureau Veritas to certify all our equipment in accordance with international standards. We have also adopted Ohmsett's test

program and facilities as part of our new commissioning for our new technological innovations and solutions for oil spill recovery and clean-up operations. That said, we do more at Lamor; we truly subject our equipment to very harsh and challenging conditions to ascertain their effectiveness and efficiency," says Larsen confidently with a smile.

Lamor's equipment has been deployed and their capability proven by continuous testing in the harsh winter conditions simulated in Siberia. From the outset in the 1980s Lamor, together with The Finnish Environment Institute (SYKE – a government agency), developed equipment to perform in the extremes of the Northern Hemisphere winter and this has resulted in the development of a robust and dependable equipment portfolio. "We work in close cooperation with SYKE in developing new technologies for Arctic oil response and recovery, for example the Lamor Oil Recovery Bucket Skimmers," says Larsen.

An arsenal of Arctic oil spill recovery equipment

Lamor's Arctic product range comprises the Lamor Arctic Skimmer, Ice Bow Collector, Lamor Oil Ice Separator and the Lamor Oil Recovery Bucket Skimmer, which all come in various sizes depending on the customer's requirements. The Oil Ice Separator and the Oil Recovery Bucket differ somewhat from Lamor's standard brush wheel or conveyor belt type skimmers. "Our Oil Ice Separator is an ice vibrating unit and the Oil Recovery Bucket in that it is deployed using a crane, thus combining the efficient cleaning of the Lamor Brush Wheel skimmer with the powerful surface cleaning and digging function of an excavator scoop, enhanced by the proven pumping performance of a positive displacement Lamor GT A Archimedes screw type pump," says Larsen.

The Lamor Oil Recovery Bucket LRB 150 - 300 has proven its efficiency in many spills, e.g., in the Gulf of Finland, off the coast of Estonia in icy winter conditions in 2006, and it has been thoroughly tested in Arctic conditions. The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology (SINTEF) test reports from Trondheim in 2007 and Svalbard in 2008 show that the Lamor Oil Recovery Bucket has excellent ice handling and no free water content in recovered oil.

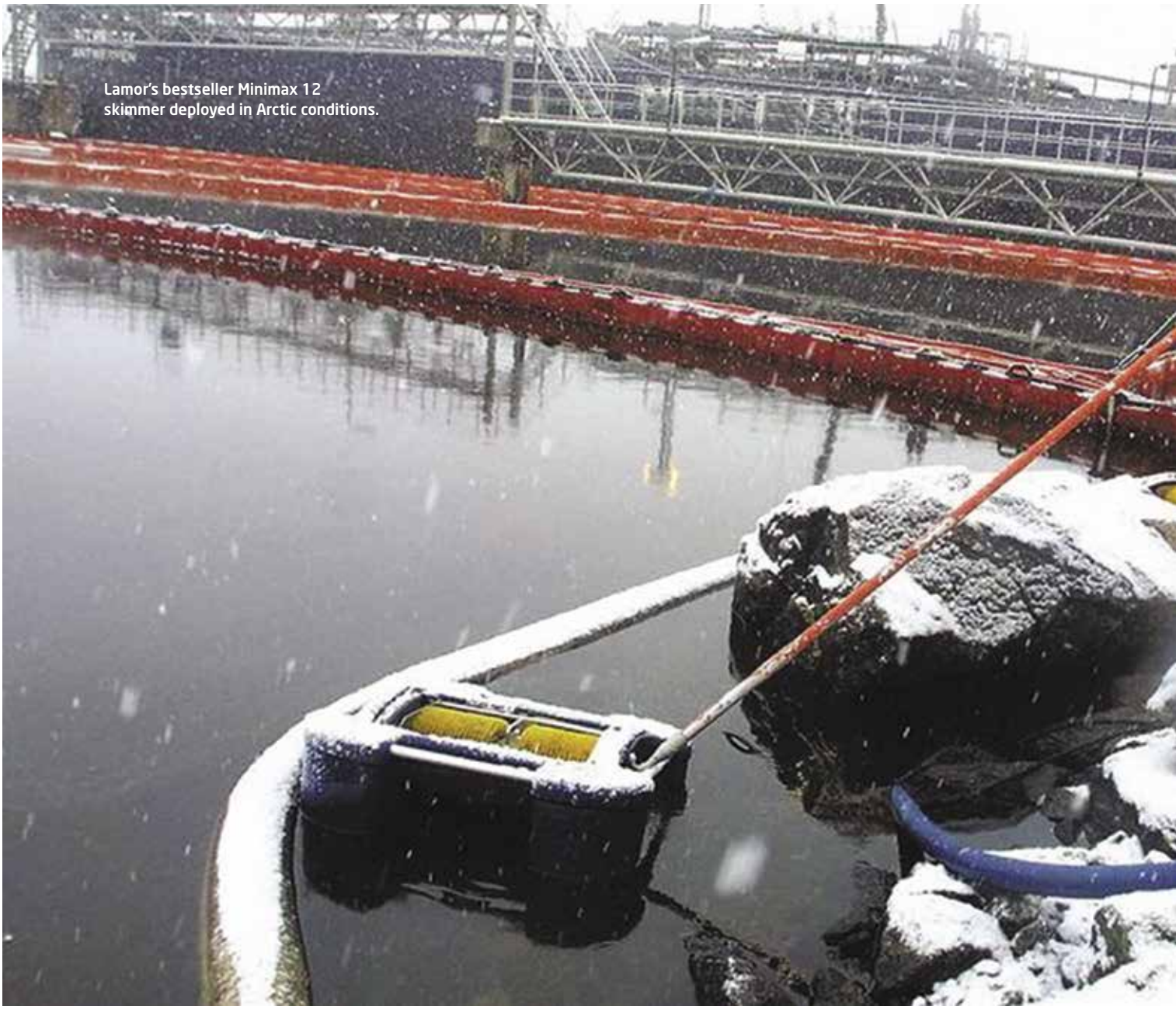
Lamor has carried out thorough tests together with the Finnish governmental organizations in the Gulf of Finland and the Gulf of Bothnia during harsh winter conditions in order to maximize efficiency, durability and dependability in the oil recovery equipment.

Having the right partner in oil spill prevention and preparedness is vital.

Lamor's COO, **Rune Högström** explains: "We have developed our equipment for 30 years and acquired expertise in oil spill clean-up operations and learned along the way. For example we tested how ice and sludge react in recovery situations in Arctic conditions in a 1,000 m² size area and noted that there will be approx. 20 – 40 m³ sludge in all broken ice conditions, no matter what the temperature is. This causes a big problem for conventional skimmers, whereas Lamor skimmers do not collect any ice sludge at all. Conventional skimmers get clogged and ices up within minutes of operation in sludge."

Lamor has developed a new skimmer type that meets the requirements and has all the necessary features for efficient and suc-

Lamor Oil Recovery Bucket Skimmer.



Lamor's bestseller Minimax 12 skimmer deployed in Arctic conditions.

cessful oil recovery in icy conditions. This new Multipurpose Brush Skimmer works as a free floating skimmer in "normal" response operations at sea, but by uncoupling the float unit and connecting the skimmer head to a wire or crane, the skimmer can be used to collect oil in icy offshore conditions. No ice processing is needed.

The design is robust, and has an anti-freeze design, e.g., the brush wheels are covered and protected, there is a double heated pump hopper for the GT A pumps that have annular hot water injection and hot water lubrication, and the oil transfer hoses are also heated. The skimmer is equipped with double acting scrapers facilitating use in different types of oil.

Appropriate equipment and teamwork

Lamor is the world leader in the development of reliable and effective equipment for use in the Arctic. This includes Lamor's proven design and technology coupled with efficient and practical solutions based on empirical research, testing and oil-spill recovery experience. "Our Arctic enhancements include steam heated hoses, steam heated double plated skimmers, heated brush cleaners, heated skimmer oil collection hopper, heated storage tanks, hot water injection for oil transfer pumps, engine heating and hydraulic oil heating, just to name few," says Larsen.

"The key to successful Arctic oil spill recovery and clean-up operations are: the advancing system, independent multi-purpose vessels with excellent maneuverability, Lamor's skimmers to collect the heavy oil in icy conditions, and our heating arrangement from skimmer to tank operated by a skilled and well trained crew," Larsen reveals.

"Each spill presents a different set of cir-

Lamor on scene in Arctic conditions, to name a few

2011 **Norway, Ytre Hvaler National Park:**
Container ship grounded, Lamor oil spill recovery equipment installed on Swedish Coast Guard's vessels were used

2010 **Estonia, Tallinn:**
Emergency landing on frozen lake threatened capital's water reservoirs, On scene commander and oil spill response

2006 **Estonia, Gulf of Finland:**
Sunken ship spill, oil in ice, On scene commander

USA, Alaska:
Pipeline land spill, Pump operation and surveyor

2005 **Russia, St. Petersburg:**
Port spill during winter, Arctic skimmers, Oil spill management

2001 **Russia, Nizhnevartovsk:**
Pipe line spills, heavy oil in ice, Oil spill operator

2000 **Russia, Noyabrsk:**
Land oil spill during winter conditions with oil in ice, Oil spill coordinator

1996 **Russia, Nefteyugansk:**
Oil in ice oil recovery operations and spill management

cumstances that must be considered as part of the response, and different circumstances require different response actions. It is much easier to prevent spills than to respond and clean them up...it's teamwork," concludes Larsen.

Lamor OSR equipment was used in the clean-up operations from the sinking of the Runner 4 which collided with an ice-breaker off the coast of Estonia.

Prirazlomnoye oil field located offshore in the Pechora Sea, is the main objective of Gazprom Neft Shelf.

An Energy Superpower

– with vast natural energy resources

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Russia is an energy superpower and the country has vast and rich natural resources. Besides gas and coal reserves (some of the largest in the world), Russia today is ranked as the world's biggest oil producing nation accounting for well over 12% of the global output. Moreover, the country exports more than 70% of its oil to the world markets. That said, Russia's output of oil amounts to a third of what collectively the Organization of Petroleum Exporting Countries (OPEC) produces.

The country has relied on oil production for decades, however there has been a notable geographical shift. The initial oil recovery started in the late 1920s in the Ural -Volga region, stretching from the Ural Mountains to the Volga River in what is known as European Russia. Production began to decline and new oil reserves were found in western Siberia. Now the focus of Russia's oil and gas extrapolation and production is in the Arctic Ocean and in eastern Russia. The country also has adopted a new Energy Strategy that encompasses much stricter environmental legislation and sustainable development, resulting in oil and gas giants obligated to follow the laws outlined in the Energy Strategy.

Gazprom Neft Shelf (GPNS), is the fifth largest company in the Russian Federation and a 100% subsidiary of Gazprom Group, Russia's biggest company. The company's main activity is associated with development of offshore oil and gas fields on Russia's Arctic shelf and the implementation of comprehensive exploration projects and programs in Gazprom's licensed areas. The main objective is the Prirazlomnoye field development, located offshore in the Pechora Sea.

"We are striving to achieve performance excellence in our key businesses aimed at facilitating sustainable development of the Gazprom Group as a world's largest energy company. In the coming years GPNS will focus on oil recovery, transportation, and predevelopment operations in the Prirazlomnoye oil field as well as in other offshore Arctic fields," says **Leonid Khmarinov**, Managing Engineer, Environmental Control Department, GPNS.

The company will proceed with geological exploration and geophysical activities, as well as the construction of infrastructure facilities in Gazprom's licensed areas and fields which are located on the continental shelf, Yamal Peninsula and in Yakutia.

"Meeting the requirements of federal laws on environmental protection and Gazprom's environmental policy provisions is a high priority for us," says Khmarinov factually.

Right OSR equipment for the environment

Environmental pollution prevention measures include amongst others the Oil Spill Contingency Plans (OSCPs). "The OSR

Lamor Arctic Skimmer deployed in western Siberia.

equipment, as a part of the approved OSCP for the Prirazlomnoye field was put out to tender in 2010, and Lamor Corporation was awarded the tender. The equipment is destined for the special crews located on the Prirazlomnaya field. These crews are trained to manage OSR operations during possible oil spill incidents and are capable of operating Lamor's OSR equipment," says Khmarinov.

Khmarinov is pleased with the decision that GPNS opted to invest in Lamor's OSR equipment since it proved to be the most efficient and effective, coupled with its faultless performance in various OSR operations. "We needed a reliable partner who had experience and state-of-the-art OSR equipment. This we found in Lamor Corporation. Moreover, we are knowledgeable about the equipment and the flawless and effective performance carried out in numerous operations in the various regions of our activities e.g. in western Siberia. We know that we can entirely rely on Lamor's OSR equipment performance," Khmarinov highlights.

The source of knowledge is experience

"I used Lamor's OSR equipment in Nizhnevartovsk, Noyabrsk, Nefteyugansk, Tyumen and in Orenburg during various incidents. No matter what the climate or terrain, offshore too, Lamor proved to be the right choice in every situation regardless of the challenge," Khmarinov adds.

"What impresses me most about Lamor is the continuous development of new technologically advanced OSR equipment that is excellent in oil spill clean-up operations. The communication is vital and we are fully informed of more advanced and new effective solutions as they come on stream," says Khmarinov sincerely.

"In the autumn, GPNS together with Murmansk's Maritime Basin Emergency and Rescue Department have a scheduled

Lamor equipment – flawless and effective performance in numerous operations no matter what the climate or terrain.

joint OSR exercise in the Varandey Region in which Lamor's OSR equipment will be used," says Khmarinov.

The Priarzlomnoye oil field

Prirazlomnoye oil field was discovered in 1989 and has an estimated oil reserve of 610 million barrels. The recoverable oil reserves under ABC1 + C2 category are 72 million tons. The productive horizons belong to the Permian coal-bearing formations and occur at a depth of 2.3 – 2.7 thousand meters. Construction of 40 wells (19 production, 16 injection, 1 absorption and 4 back-up wells) is envisaged for its development. "The planned oil production level is 6.58 million t/yr," says Khmarinov.

"We have commissioned new reinforced ice-class shuttle tankers that will be assisted by high powered ice breakers as they make their way over more than 1,000 kms of sea passage through the ice that lies between the field and the Belokamenka terminal," says **Vasilii Vasetckii**, Deputy Chief, GPNS Fleet Operations and Maritime Security. He is also the dedicated person from GPNS to represent the International Code of Conduct for Maritime Security.

From offshore to refineries and beyond

Oil transfer is carried out in two stages. "The 360,000t floating platform Belokamenka will be installed in an ice-free part of Kola Bay, up to 1,100km away. Oil from Prirazlomnoye will be transferred to Belokamenka by ice breaking shuttle tankers of up to 220,000t. The crude will then be exported by up to four 150,000dwt to 170,000dwt supertankers. There will also be two 16MW multifunctional icebreakers for assisting the tankers as well as carrying out safety and environmental tasks. The platform will be supported by a supply base at Arkhangelsk. There, the oil will be reloaded into much larger supertankers for shipment to European refineries," Vasetchkii explains.

"We are the maritime fleet operators for Gazprom Group. For the Prirazlomnoye field two cutting edge versatile ice-breaking supply vessels of high capacity have been built specially, as well as a floating crane with a 400 t capacity that has a 4.6 m draft and a 360° swinging jib arm," says Vasetchkii.

"Moreover, we have entered into a long-term, 25 years contract with Sovkomflot which is a Russian maritime shipping company specializing in petroleum and LNG shipping. The large scope of activity in the Prirazlomnoye field needs the corresponding scope of environmental protection measures and Lamor meets our increasingly high demands for OSR equipment. I feel Lamor and its equipment portfolio is the world leader in this area and a reliable partner with a sound reputation," Vasetchkii notes.

Scope of supply

Lamor's scope of supply includes an 19m long oil recovery vessel with the built-in oil recovery system LORS on both sides. "In addition to oil recovery, our vessel can also be used as a multi-purpose vessel for boom deployment, dispersant spraying, service tasks and as a safety patrol boat," explains Lamor's **Nikolai Kildishov**, VP Russia & CIS.

Kildishov highlights some of the vessel's benefits: "The vessel has hull mounted brush skimmers, which enables recovered oil to be delivered directly to the recovered oil storage tanks in the mid-ship without the need of using oil transfer pumps. Another great advantage is that the brush conveyors are in direct connection with the oil on the water surface which notably improves the high viscous oil and debris collection capabilities, but also collecting of light oils in Arctic conditions. Moreover, the vessel is built according to ice class Ice 2 and certified by the Russian Maritime Register of Shipping (RMRS)."

In addition to the oil recovery vessel, Lamor will also deliver two Landing Crafts LC9000 with cabins, which also are certified by RMRS, and a rubber inflatable boat as well as Bow Collectors to be fitted on already existing workboats. "We also provided four kms of oil containment booms and a boom washing machine," says Kildishov.

Lamor Foam Filled Oil Boom deployed in icy conditions.

Lamor Oil Storage Tanks, delivered to Gazprom Neft Shelf.

TEXT: THOMAS BARBIERI PHOTOS: SWEDISH COAST GUARD

On February 17, 2011 the 17,000-dwt Icelandic container ship M/S Godafoss, en route to Denmark, grounded off the southern coast of Norway threatening the Ytre Hvaler National Park, and the western Swedish coast line. The ship was carrying approx. 800 tons heavy fuel oil and approx. 440 containers onboard.

The Swedish Coast Guard and Norwegian Coast Guard were alerted that approx. 200 tons of heavy fuel oil (IFO 380) had spilled into the freezing waters threatening the entire eco-system of the national park. The three oil recovery vessels from the Swedish Coast Guard (KBV 050, KBV 051 and KBV 001 Poseidon) and the Patrolcraft 307 were deployed to the scene equipped with in-built Lamor Oil Recovery Systems (LORS).

The LORS equipment includes twin side built-in stiff brush systems, and we also installed an oil recovery bucket, a free floating offshore skimmer with umbilical hose, a weir skimmer with brush adapter and oil transfer pumps GT A 115," says Lamor's **Rune Högström**, COO.

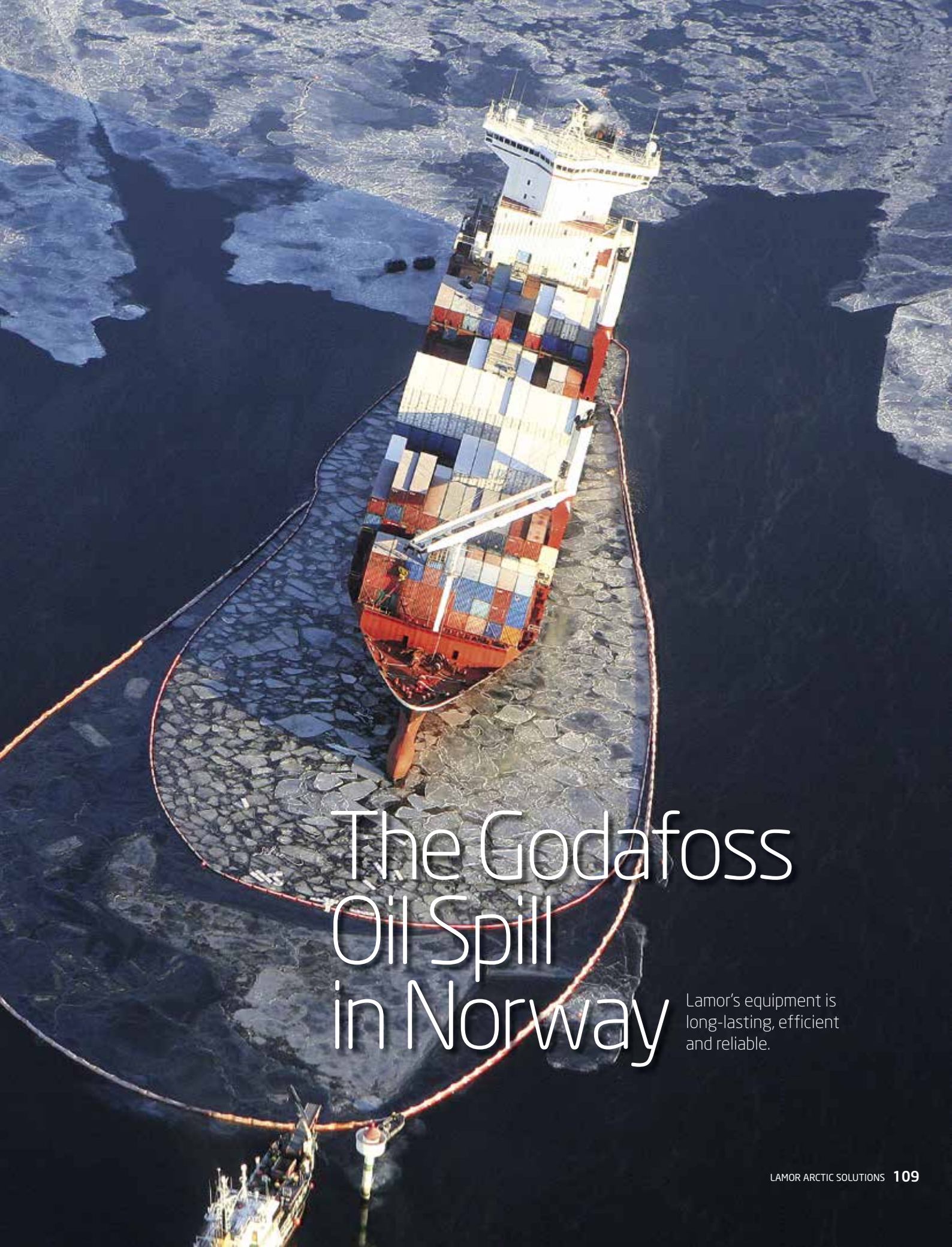
KBV 001 Poseidon is equipped with Lamor's newest and most advanced oil recovery systems that effectively collect and recover oil at speeds of up to 4 knots. "KBV 050 and KBV 051, built in the 1980s, proved to be reliable and effective in supporting the demanding clean-up operations in the icy conditions," says Swedish Coast Guard Director, New Building, Commodore **Åke Dagnevik**.

During the oil recovery collection, the challenge was the freezing temperature which solidified the oil immediately. However, this obstacle was overcome due to the heated brush cleaner on the Lamor skimmers coupled with precautionary heating set-up from skimmer to collection tanks.

Högström says: "We have an excellent liaison and close relationship with the Swedish Coast Guard and we continuously develop oil spill recovery equipment and train their professionals in the use and operation of our oil recovery equipment."

"So far, a total of 110m^3 of IFO 380 heavy fuel oil spilled was collected of which approx. 60m^3 was collected from the open sea by the our three Swedish Coast Guard vessels on scene," says Dagnevik.

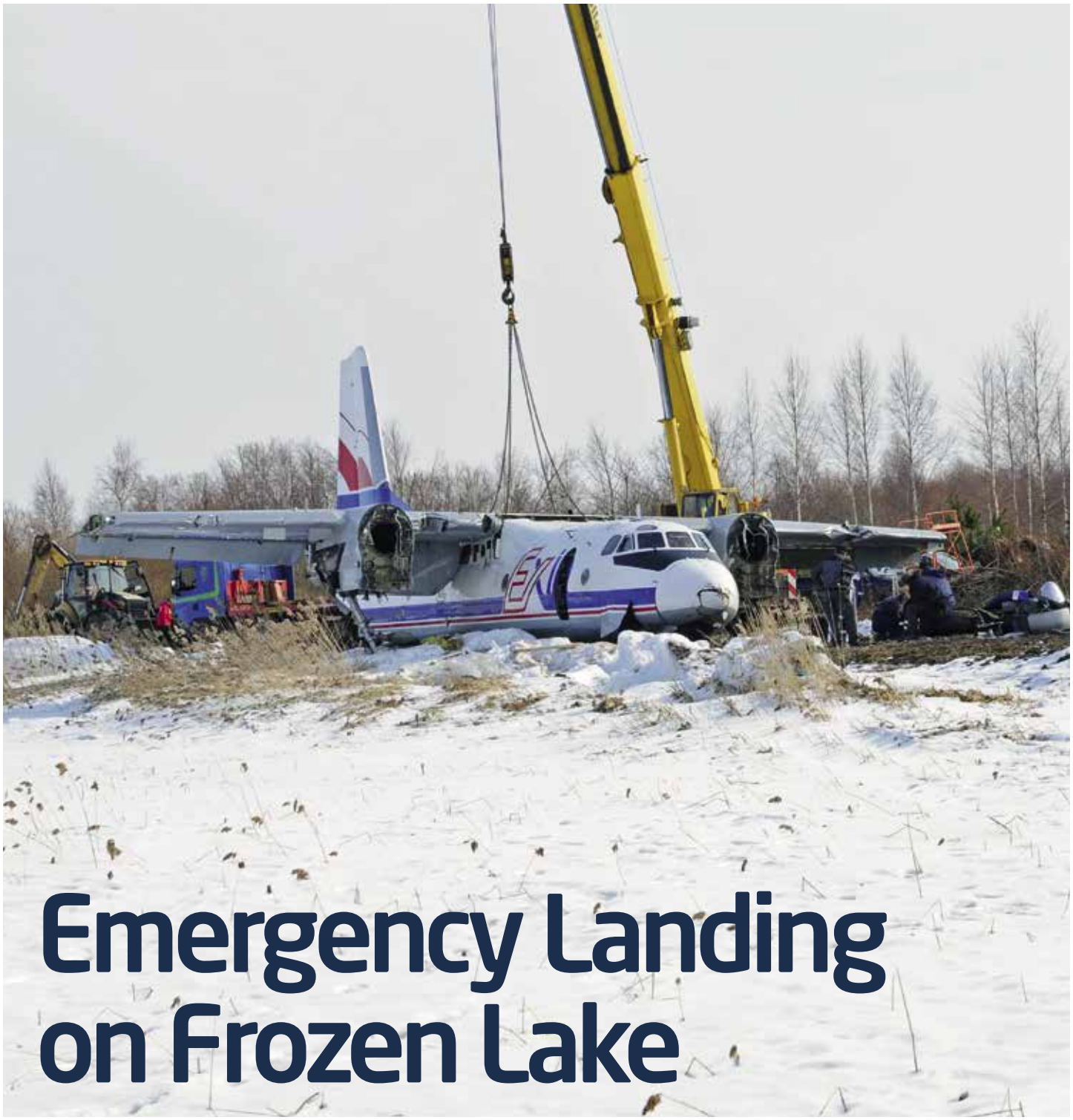
KBV 001 Poseidon responding to the Godafoss spill.



The Godafoss Oil Spill in Norway

Lamor's equipment is long-lasting, efficient and reliable.

TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION



Emergency Landing on Frozen Lake

– Threatens Drinking Reservoir

A month prior to the Gulf incident, Lamor was contacted by aviation insurers to urgently respond to an incident in Estonia.

FACTS

Lake Ülemiste: 59°24°N 24°46°E, surface area 9.6 km², average depth 2.5 m, max. depth 6 m, surface elevation 35.7 m. Lake Ülemiste is Tallinn's main drinking water reservoir.

In-situ burning was tried.

Holes were drilled in the top ice layer and air was used to move the oil to the designated collection area.

The company deployed its equipment and the Lamor Response Team (LRT) to Lake Ülemiste, near Tallinn after an Antonov 26 cargo plane made an emergency landing. The lake, which was frozen solid, is the principal drinking water reservoir for the city thus a vital water source for the residents of Tallinn. Oil leakage from the fuselage of the plane was found under the ice and Lamor was tasked to ensure that the lake was immediately cleaned from any oil or other fluids that could harm the city's reservoir.

City water supply

Lennart Meri Tallinn Airport or also known as Ülemiste Airport is located on the eastern shore of Lake Ülemiste and handles both domestic and international flights. The Tallinn Water Company, AS Tallinna Vesi, has a treatment plant on the north shore of the lake, which supplies 90% of the water to the city.

Quick response

On March 18, 2010, a DHL Antonov An-26 aircraft made an emergency landing on the ice on Lake Ülemiste and 1.5 tons of fuel leaked into the water. Fortunately, none of the 6 crew members were injured. On March 25 Lamor was contacted by aviation insurers to urgently respond to the incident in Estonia. The following morning, the Lamor Response Team (LRT) was on scene in the early morning hours to assess the incident and at noon (12:00 am) LRT presented their solution to solve the exceptional oil recovery of hazardous liquids that had leaked under the ice. The same afternoon, oil recovery equipment was assembled and deployed from Lamor's warehouses.

Initial oil spill response operations deployed oil —containment booms at the emergency landing site and the water intake on the opposite side of the lake was protected by sorbent booms. A fixed configuration of Lamor foam filled booms (FOB) was installed permanently to protect the intake after the ice had melted.

Devising and adapting solutions

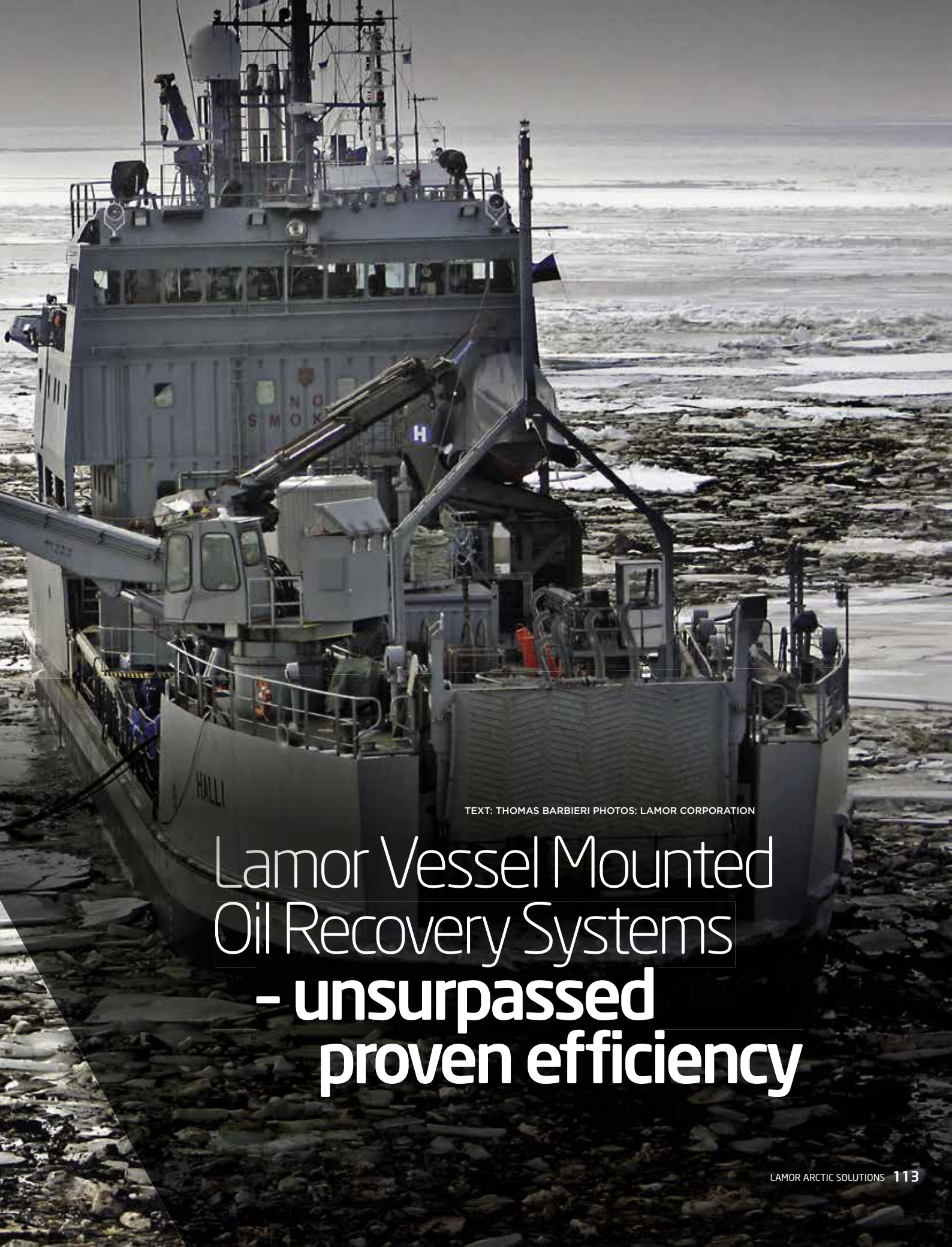
In-situ burning was tried; a test was conducted to remove the oil by burning, however, the amount of oil concentrated was too small to keep the fire burning.

Lamor site incident office, LRT and equipment containers remained on site until the area was reported safe to the public and there was no risk for pollution.

The incident was exceptional and Lamor devised a new and effective method for recovering hazardous substances and liquids under ice. During a three week period, all oil leakage, hydraulic oil and pollutants were recovered successfully.

Fred Larsen on Lake Ülemista assessing the ice.

Finland's largest oil spill response vessel M/S Halli (61.5 m) is equipped with Lamor in-built oil recovery skimmers and Lamor oil recovery bucket. The M/S Halli was deployed for the clean-up efforts off the northern coast of Estonia from the sinking of the Runner 4 that lay 70m beneath the water surface. The Dominican-registered ship collided with a Russian ice-breaker and was carrying an estimated 100 tons of heavy fuel oil and 35 tons of light fuel oil.



TEXT: THOMAS BARBIERI PHOTOS: LAMOR CORPORATION

Lamor Vessel Mounted Oil Recovery Systems – unsurpassed proven efficiency

The Lamor Vessel Mounted Advancing Oil Recovery Systems are based on the proven chain brush conveyor technology that offers the highest possible performance and safety for offshore oil spill recovery operations. Deployment of the recovery system makes the entire vessel an "oil slick processing system".

Lamor's COO, **Rune Högström** explains: "The most typical configurations are Bow Mounted, Over the Side of the vessel, Built-In to the vessel hull or between the Catamaran hulls mounted recovery systems. What makes our equipment unique is that the system can be installed on a vessel without significant modification to the hull steel construction which reduces conversion costs and enables the vessel to be used for other activities until needed for an oil spill recovery operation."

Speed and safety

A great deal of attention has been paid to speed and safety aspects during operation, and hence the system deployment is semi-automated as far as possible. "The recovery system has to be deployed and retrieved repeatedly during a full scale operation, in order to transit and offload recovered oil. That said, our systems enable safety in operations that are conducted at night and in difficult weather and sea conditions. The Lamor advancing skimming systems operate efficiently at vessel speed up to 2.5 to 4 knots, which results in excellent maneuverability and very high oil encounter rate," says Högström.

Flexible solutions

The Lamor oil recovery systems can be applied to various sizes of workboats and vessels ranging from 7 m to more than 100 m long, and each system is tailor-made and designed by Lamor's design engineers to fit the specific vessel in question in the most efficient and cost effective way.

"Maximized safety of use has been gained by using automatic or semi-automatic deployment of the skimmers and other relevant equipment including the sweep booms from reels, automatic boom outrigger arms, skimmer lifting/lowering from storage to skimming position," Högström highlights.

OSR – a full service concept

The recovery system is designed with a forward facing brush conveyor type oil recovery system with certified recovery capacities ranging from 30 m³/h to 400 m³/h (per one skimmer unit/vessel side), depending on the system size and design.

Högström states: "The heavy duty brush conveyor system will recover all types of oil, including extremely high viscosity crude oil emulsion, while recovering very little free

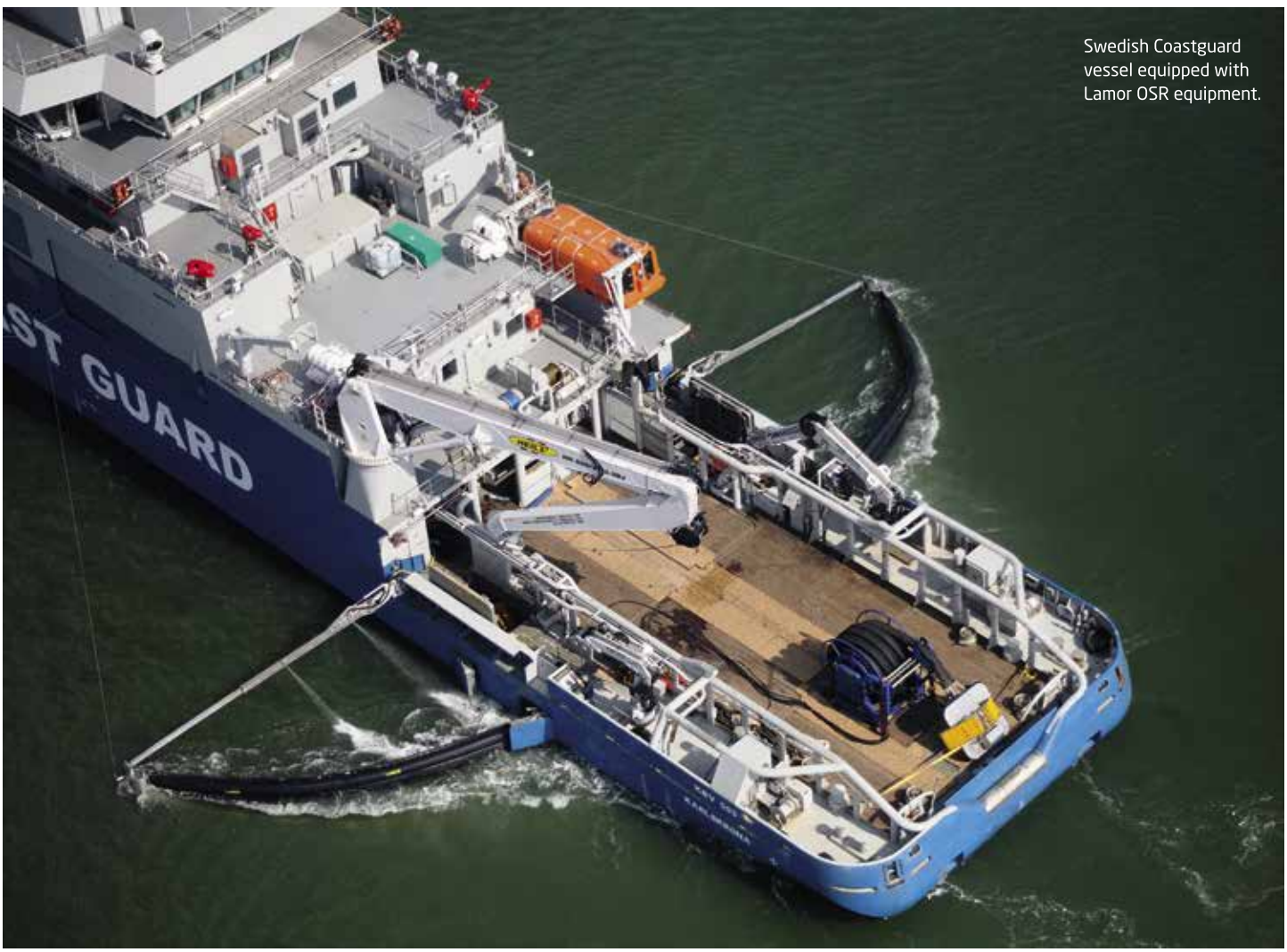
Essential Benefits of the Lamor System:

- Safe to deploy, only one (max 3, depending on the installation) person required to control the deployment
- No - or minimum - manual work required; all controls from hydraulic control valve or remote control
- Ready to use rapid deployment, deployment time: ca. 10 minutes
- Minimal interruption of vessel's other main operations
- Less than 5 % free water in recovered oil makes maximum use of valuable storage volume
- Mechanical parts Safe for EX zone 0, electric components Zone 1
- In use from tropical to arctic climate. Possible to arrange heating to all equipment of the system
- Easy to maneuver with the ship with minimal coordination required, therefore minimal workload on the bridge, thus increasing safety
- Easy to maneuver in high currents and high waves, up to 2.5m significant, in swells even higher.
- Brush belt recovery range: light to bitumen products
- Regularly drills can be held for the crew to maintain their skills; equipment is always ready to use and on place.
- Minimal maintenance cost
- Proven technology. Installed on 496 vessels and work boats around the world.

water. Moreover, it is unaffected by the presence of small floating debris, slush and small ice pieces or sea weed, which can block other type of skimmers."

Due to the capacity, safety and user friendliness, the Lamor vessel mounted Oil Recovery Systems are approved by customers and have been used in multiple oil recovery operations worldwide. "Our support will follow through the whole project, design, supervision, training, and after sales service," Högström guarantees.

M/S Halli, Finland's largest oil recovery vessel with Lamor equipment.



Swedish Coastguard vessel equipped with Lamor OSR equipment.

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