A perfect storm

Tony Bacon, Shawcor Pipeline Performance, recalls surviving stormy conditions whilst attempting to tackle numerous complex pipeline projects simultaneously.

The prelude

Summer 2010

The forecast for 2012/13 was looking good for Western Australia LNG; the Wheatstone project was gathering pace. Its 33 km, 24 in. and 34 km, 14 in. of infield lines needed multi-layer polypropylene foam insulation (MLPP), and there was a 210 km, 44 in. trunkline for fusion bonded epoxy (FBE) and concrete weight coating to go with it.

Figure 1. Kabil MLPP.

Figure 2. Kabil stacked coated pipes.

Winter 2010

Forecast set fair; Wheatstone enquiries expected soon. Some rumblings from the giant Ichthys project that it was getting serious (truly a giant – 892 km, 42 in. trunkline with 98 km, 18 in. insulated infield lines). As a result, 2012/13 and 2014 could be extremely busy.

Shawcor Pipeline Performance was also hearing that the Julimar field could be developed with a 46 km, 18 in. insulated tie-in to the Wheatstone trunkline. This would really stretch the company's capacity should all three projects go in the same time period.

Summer 2011

The storm was rapidly developing; tenders had been submitted for Wheatstone, Ichthys and Julimar was coming out for bid. Also, after the tsunami that badly affected the Japanese nuclear industry, it was looking more likely that Ichthys would go ahead.

Spring 2012

Almost unbelievably, the company was hit full force by the storm. All three projects got FID and Shawcor was favoured with all the coating contracts. There could have been panic and a risk of shipwreck, but through good planning and execution, there was not.

The magnitude

In order to put all this combined work into perspective, Shawcor considers a nice insulation project to be in the order of 20 km of 12 in. pipe size; say one month's double shift production for one plant. This perfect storm amounted to roughly 15 times that yardstick, while the trunkline workload was arguably five times what could be expected in a 'normal' year.

In an ideal world, the projects would have come neatly one after another, but of course that was not the case. The schedules overlapped such that the site in Kuantan (Malaysia) with MLPP capability could not easily handle it all. Resources would be stretched risking a breaking point, from supply of raw materials to land for pipe storage, port handling, labour and technical expertise. How could Shawcor cope?

The planning

Early warning of the impending workload was critical, and for this the company had to thank its Australian team. Tony Bacon explained: "It was an exciting time. We all knew that there was massive potential for Western Australia projects but trying to decipher reality from all the rumour and chatter on the street was near impossible. We just had to be aware of all the possible permutations of pipeline routes, chances of getting FID and so on."

The regional management team in Singapore reviewed the three year look ahead on a regular basis, and by winter 2010, could see the possible need for another insulation plant in the region. The engineering group was then instructed to draw up designs for a new plant at the company's site in Kabil (Indonesia) just in case.

Discussions were also being held with both the Kuantan and Kabil port authorities, to enhance capacity and allow Shawcor to guarantee priority berthing for pipe carriers. This resulted in a new extension being built in Kabil, allowing the accommodation of larger ships from the Japanese pipe manufacturers, and in Kuantan an existing quayside was lengthened.

The Asia pacific group was also checking within the other areas of Shawcor on the availability of experienced project managers, supervisors, operating and quality personnel to supplement the existing workforce so that any such call for assistance would not come as a surprise.

"Head Office was rarely concerned with the Asia-Pacific region as we functioned compliant with financial targets without much interference. However, once we were forecasting multipliers of normal annual revenues, they took notice and were very concerned on our ability to execute. Their proactive support was an instrumental part of our eventual success," commented Bacon.

As it was never possible to forecast exactly when anything would happen, flexibility was key. And the key to flexibility was ensuring sufficient capacity for the major projects whilst also satisfying the needs of the local customers. The strategy chosen was to combine the capacity of Kabil and Kuantan, and offer a single contract with dual site execution to Shawcor's clients as appropriate.

The execution

Site management

The awards of the contracts were spread out over six months but the pressure was instantaneous. Management and the key staff of Kuantan and Kabil were brought together for weekly planning and progress meetings, which all visualised on what was called 'the wall of work'.

Table 1. Total combined figures of Shawcor's mentioned projects

Peak workforce	3600
Man hours worked	13 200 000
Total plant shifts	7300
HSE: fatalities/serious incidents	0/1
HSE: lost work case frequency	0.3 per million manhours
Joints processed	110 000
Total pipe movements	4 800 000
Tonnage in/out	1 725 000
Number of pipe vessels received	119

Upgrades

During the bidding process, the Kuantan insulation plant had two new top-of-the-range extruders installed in place of the existing extruder. These extruders provide precise monitoring and control of barrel temperatures, pressure and screw speed, and are all clearly displayed on touch screen monitors. Being smaller, they are easier to maintain and to changeover for different plastics (including ULTRA™ and SUREBOND™).

Also, the custom coating plant in Kuantan was extended, and injection moulded equipment was installed to allow the application of thick solid polypropylene insulation to bends. Previously, this work was sent away to Norway, which was not ideal. A new custom coating facility was also added to the Kabil site; the first project handled was three layer polypropylene coated bends and spools for Inpex Ichthys.

Yard equipment

With the encouragement of Shawcor's clients, reachstackers (used for handling containers) were acquired and modified to lift and transport pipes, carrying up to 40 t at a time. These had the advantage over conventional cranes, in that the driver controlled the lifting gear remotely so there was no need to have men close by the pipes to manipulate hooks. This thus eliminated one big area of risk. The use of reachstackers also meant better utilisation of storage yard space, with a 30% reduction in the area required compared to using cranes.

New insulation plant

As previously mentioned, once all the contracts had been secured, the green light was on for the construction of the dedicated MLPP in Kabil. As all the engineering had largely been completed, long-lead items, such as extruders, were immediately ordered and building works commenced. Within 18 weeks, the plant was ready for commissioning and it completed its first project for a local client shortly thereafter. By 4Q12, the plant was ready to perform qualification trials for the Inpex Ichthys flowline work and for the Apache Julimar.

Labour

The workforce had to gear up for an extended period of double-shift work in all plants in both Kabil and Kuantan. New employees went through a safety induction, standard operating procedure (SOP) training and on-the-job training through a buddy system.

Kuantan was on peak level activities for seven consecutive quarters from Q412, with close to 2200 people working onsite during the busiest period. Bacon recalled: "[In Kuantan] for such prolonged period of peak level workload, the biggest challenge was to avoid fatigue and to make sure every worker worked safely and went home safely to their family every day. [Similarly in Kabil] we weren't just interested in safety on our site, but also in how the workers got to and from home on their motorbikes. We issued new crash helmets to everyone, and if they weren't wearing them, they weren't allowed in past the security gate."

There was cross-site training where key crew members went from Kabil to Kuantan in order to learn about the MLPP application process; from Kuantan to Orkanger (Norway) for injection moulded polypropylene familiarisation' and also from Kuantan to Kabil for the use of reach stackers. Both sites had specialist extrusion engineers hired to oversee the

Figure 3. Reachstacker loading coated pipes.

Figure 4.

MLPP application process plus great support from the process improvement engineers dedicated to each process.

Global support

The site management teams were strengthened with the arrival of several experienced workers from other Shawcor facilities. Fortunately for Asia-Pacific, some large facilities – like Leith – were able to lend their expertise to assist in a variety of functions including project management, quality, production supervision and HSE.

Shawcor's corporate divisions also provided heavyweight assistance primarily with engineering, and the Shawcor manufacturing systems provided an array of process improvement techniques. Additionally, the corporate research and development laboratory in Toronto (Canada) had backed up regional technical resources with their expert advice (which was where some of the simulated service tests were conducted).

Accreditation of site laboratory to ISO 17025

One of the contracts required all QC testing to be performed to ISO 17025 to ensure impartial, unbiased results. A section of the Kabil laboratory was modified for controlled access and laboratory management and procedures developed to comply with the standard. Finally, staff were trained and vetted to gain the accreditation within nine months. The polymer laboratory in Kuantan was also accredited to ISO17025 in June 2013 in time for production.

Preservation

Due to the size of the projects, Shawcor knew that the MLPP insulated pipes would be stored onsite for a lengthy period, certainly for 12 months or more. To mitigate and reduce chances of coating protected surfaces deteriorating over an extended period of storage, preservation measures were implemented at the coating ends by covering them with the company's End Seal Tape, and thus, preventing moisture from reaching the epoxy primer and reducing its bond to steel.

Loading pipe vessels

The trunkline load out campaigns were very intense, for example Wheatstone required a minimum 600 joints per 24 hrs and for Ichthys a minimum of 350 joints per 24 hrs. Both projects loaded out without major issues and on time with loadout rates of up to 750 joints per 24 hrs being achieved. The projects were subjected to very strict Australian quarantine regulations, which required all pipes to be high pressure, washed internally and externally at load out.

After the storm

A conventional storm normally blows itself out after three or four days. This particular storm gave Shawcor two years of intense activity. The flexibility in scheduling work between the two sites, and the ability to draw in resources from multiple areas of the company, were crucial to gaining a successful outcome for the company and – more importantly – for its customers showing Shawcor capabilities to execute major projects in any location around the world.

Now, even in these much quieter times, the company can look forward to facing more storms like this with confidence.