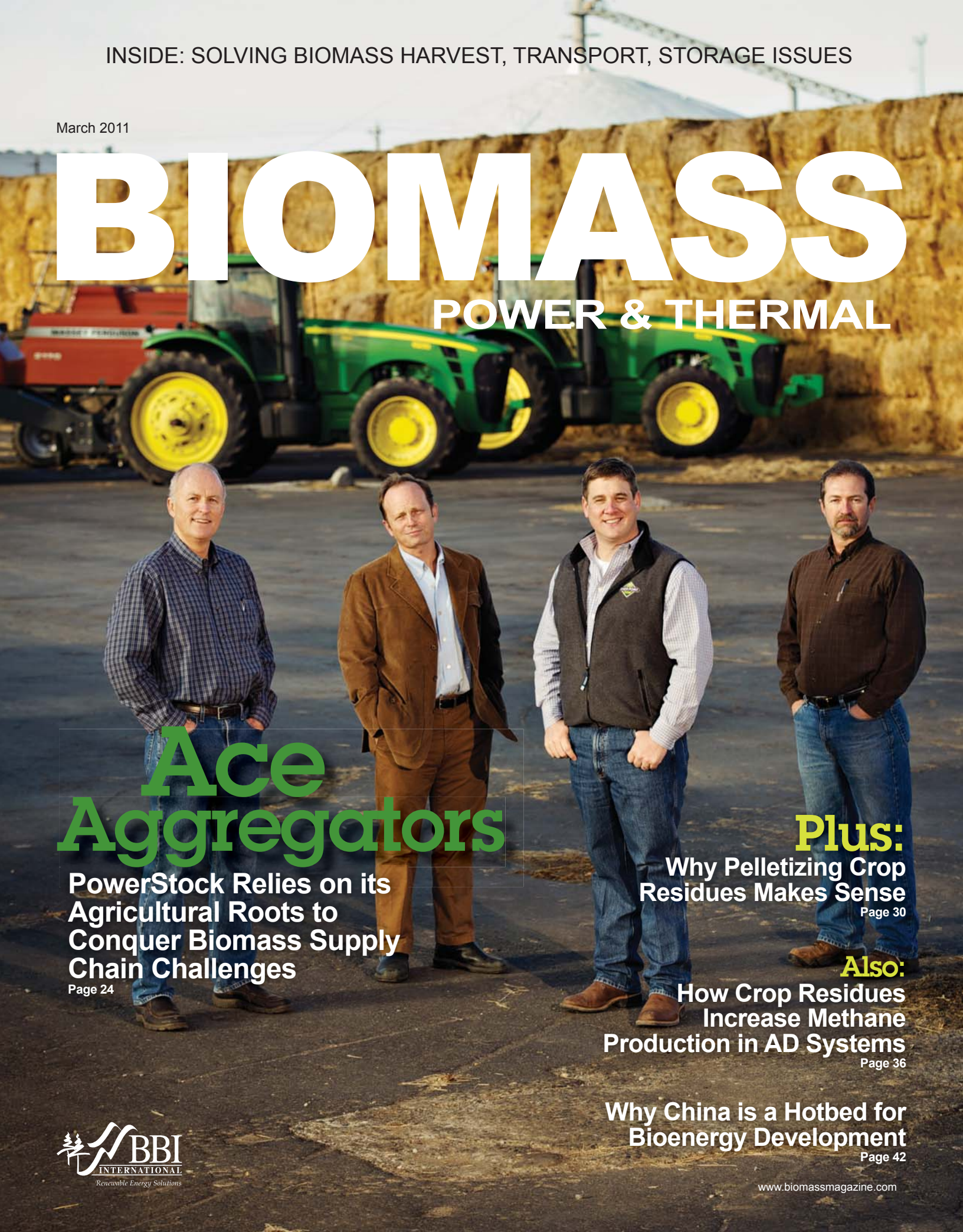
INSIDE: SOLVING BIOMASS HARVEST, TRANSPORT, STORAGE ISSUES

March 2011

# BIOMASS

## POWER & THERMAL



# Ace Aggregators

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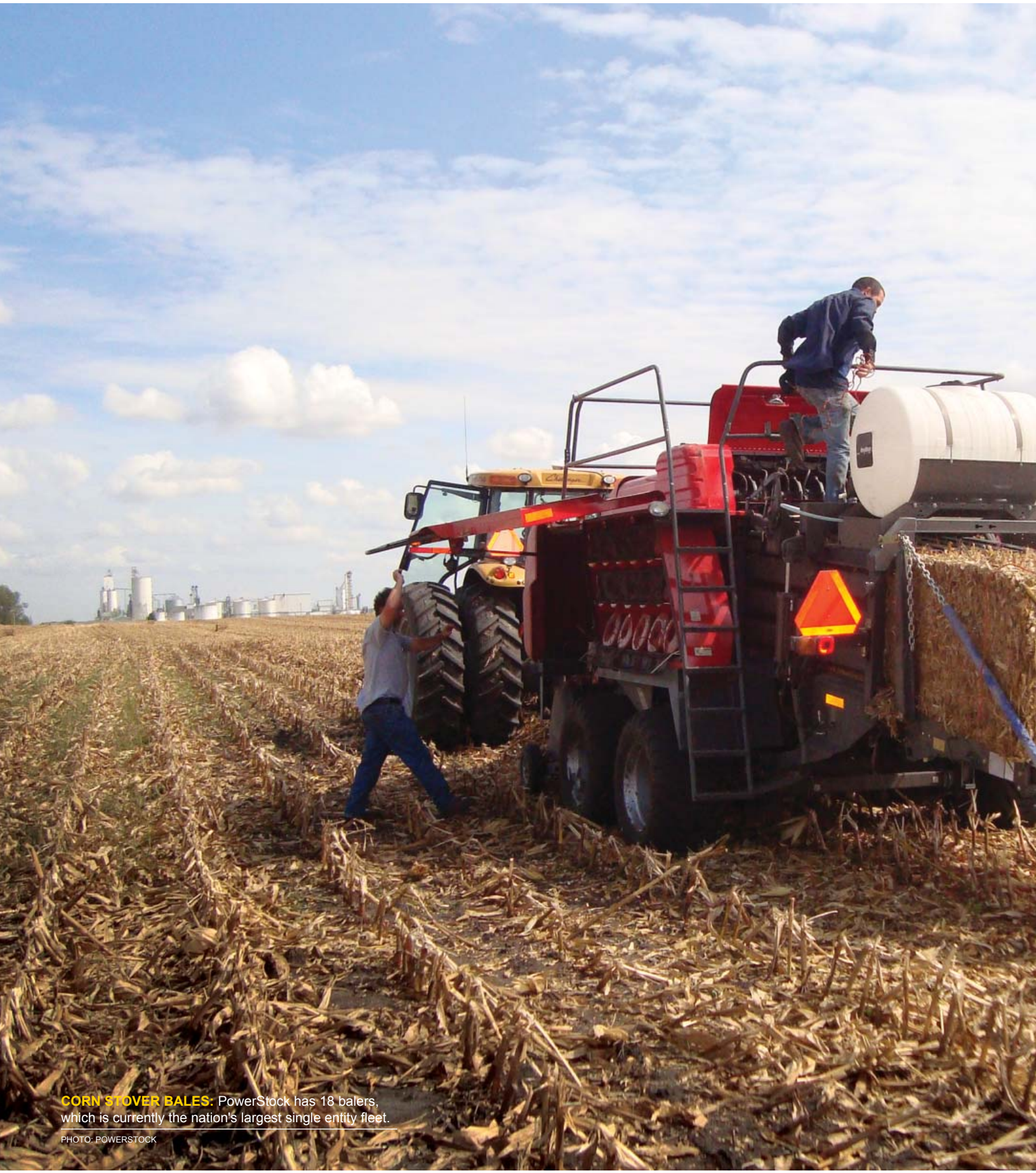
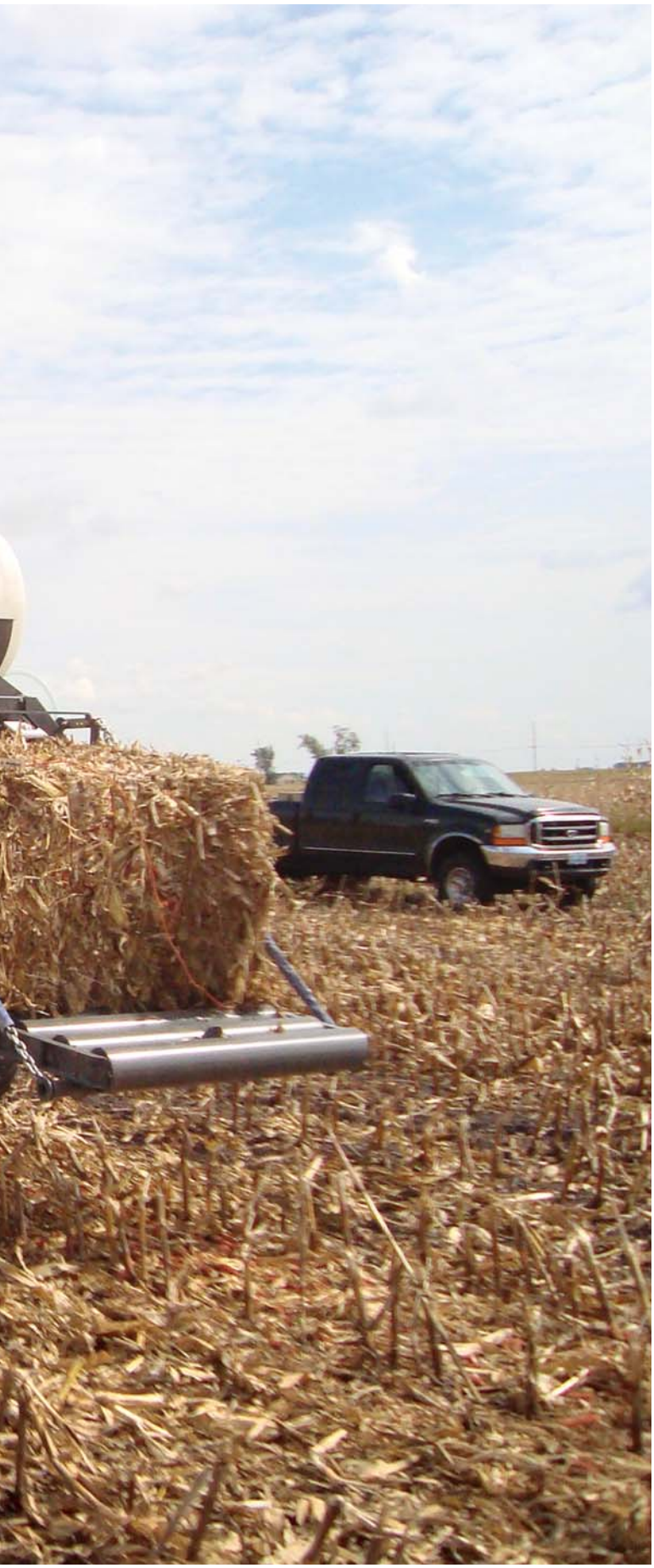


**CORN STOVER BALES:** PowerStock has 18 balers, which is currently the nation's largest single entity fleet.

PHOTO: POWERSTOCK



# Supply Chain Champs

When it comes to harvesting, collecting, storing and transporting agricultural biomass, PowerStock has decades of experience.

BY ANNA AUSTIN

PowerStock founders and affiliates, who were instrumental in helping to build Oregon's straw export market and the Western U.S. hay industry, formed the company to address a growing demand for agricultural biomass as an energy source.

With more than 25 years of experience in collecting, baling, shipping and storing agricultural residues, parent company Pacific Ag Solutions, the largest ag residue and forage harvest company in the country, realized that it was uniquely positioned to provide supply chain solutions to the biomass energy sector. In fact, members of the company's senior management team have spent the bulk of their careers in ag or ag-related industries. Bill Levy, president of Pacific Ag Solutions and PowerStock and a fourth-generation Oregon farmer, founded the company in 1998 while attending college at Oregon State University. The company's vice president of operations, Rod Phelan, has been in the business since the 1980s and has har-

vested millions of tons of ag residue in his career, sending it through a supply chain to Asian markets.

While supplying biomass for energy production is different than supplying it to the customers and markets that Pacific Ag Solutions traditionally serves, each supply chain segment comes with benefits, not just for the company but also the economy, says Harrison Pettit, PowerStock's vice president of business development, who joined the company early last year, after working at Pacific Ethanol Inc.

One of those benefits is massive job creation. An element of the ag biomass industry that has not been widely understood is the economic impact just from employment around harvest, collection and storage of biomass for a large-scale project, Pettit says. "For example, a big project using corn stover could easily require 400 to 500 employees just for the harvest portion. It's almost 10 times the amount of conversion jobs—sure they're not as well-paid or as highly skilled—but it's a very large number of people."

Harvesting also requires a lot of machinery. "We currently have the nation's largest single entity fleet of large square balers at 18," Pettit says. "That number is small compared to what a full-scale biofuels or bioenergy project would require, so it speaks to the fractured nature of the traditional Western export feed and forage industry. It also speaks to the importance of having a good working relationship with equipment manufacturers so that we can make sure to have the right amount of equipment when it is needed."

## Demand Leads to Supply

Thus far, the company has been hired mainly by large-scale project developers or technology providers rather than individual farmers, but there's a reason for that, according to Pettit. "The demand side for the project needs to exist in order to develop that supply chain," he says. "The corn stover exists because the corn is being raised, but there needs to be more substantiation in harvest and delivering it." On the flip side, supply uncertainty must be reduced.

In the biofuels sector, PowerStock is currently engaged in a few commercial-scale projects. One is the Spiritwood Energy Project in Jamestown, N.D., which is a 20 MMgy cellulosic ethanol plant that will use an as of yet undecided biomass feedstock gathered from a 70-mile radius around the plant. Last fall, PowerStock and North Dakota State University in Fargo completed a feedstock feasibility study for the project.

On the power production side, PowerStock has done some work with Portland General Electric, which operates a 585-megawatt coal-fired power plant in eastern Oregon. "It's the only [coal-fired power plant] in the state, so it's a bit of a lightening rod," Pettit says. "PGE has an agreement with the [U.S.] EPA and the Oregon Department of Environmental Quality to close this plant by 2020, so we're working

with them to figure out if they can convert some or all of this facility to biomass." So far, PowerStock has helped PGE test-fire corn stover pellets at the facility at blend rates of 3, 5 and 7 percent.

In smaller projects, PowerStock is working with Novus Pacific, which secured a USDA Rural Energy for America Program loan for an anaerobic digestion facility that may be sited at the Port of Morrow in eastern Oregon. The digester will utilize local crop biomass and a small amount of livestock manure to generate 1,000 MMBtu of methane gas to heat an existing ethanol plant, according to Pettit.

## Step-by-Step Process

The development of feedstock supply chains for these projects must be carried out similarly to technology processes, going from bench to pilot to demo to commercial stages, Pettit says. "The same phased development has to occur when building a large-scale feedstock supply—[the project

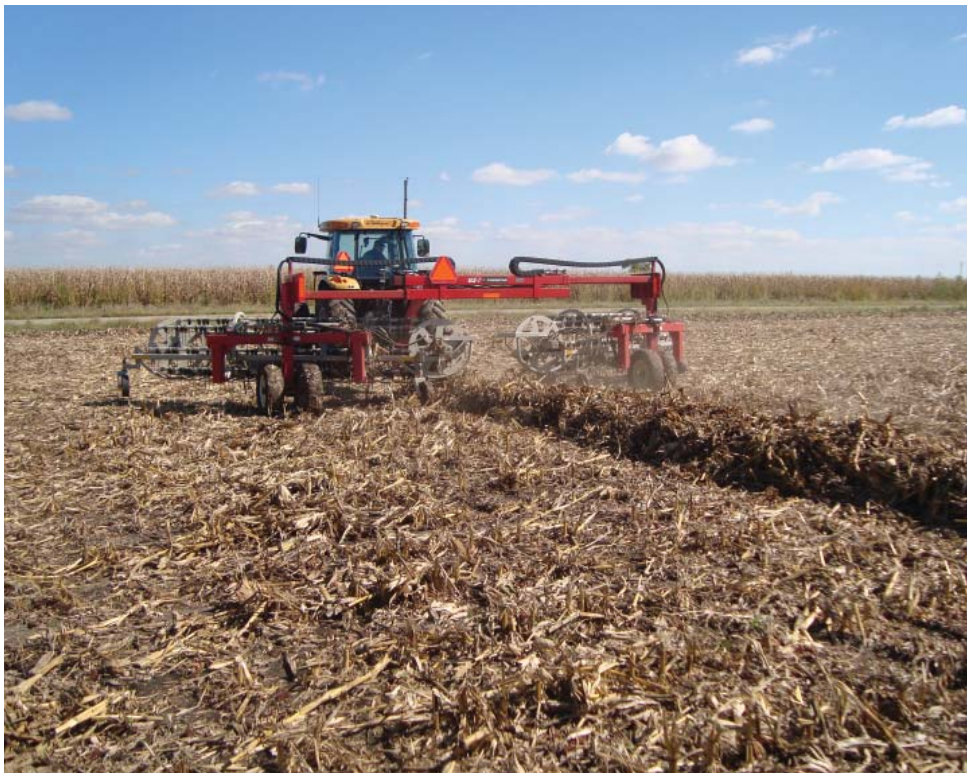


PHOTO: POWERSTOCK

**RESIDUE RECOVERY:** Harvesting corn stover is labor-intensive and would benefit local economies by providing much-needed jobs.

developer] can't just get 100,000 acres under contract and know the cost of delivering that in a year," he says. "It's a multiyear process where you increase the scale each year to find out where the sensitivities are and where you can reduce cost."

Another caveat when developing a supply chain is that despite the great amount of anticipated demand for ag biomass, there's still no infrastructure. "You couldn't have coal-fired plants if you didn't have railroads," Pettit says. "This infrastructure still needs to be created, and the first stage is to build these first plants and demonstrate a system. There will be a commodity market for ag biomass just like there is right now with wood biomass."

The first step in developing a supply chain is performing a feasibility study prior to an experimental harvest. Developers need to study the composition of the harvested feedstock during storage to determine how it weathers and how much degradation is occurring. The constituent matter in the stored material must also be indentified and then harmonized to the end use, whether that involves collecting and storing feedstock for a digester, a cellulosic ethanol plant or for combustion at a power plant, Pettit says. "It's often not well understood. Each has its own requirements based on maximizing the value of the feedstock for the end use. For example, for the fermentation process for fuels, you don't want anything nonfermentable in that bale. You're just carrying something of no value, or negative value. If you're going for a power process, you're looking for Btu."

Another issue is that existing harvesting and collecting equipment wasn't developed for bioenergy, rather it was designed for the feed and forage industry. "While our understanding can make a significant difference, the equipment will need to adapted," Pettit says, adding that the company works closely with equipment manufacturers when making modifications. "Equipment alone is a huge potential area of optimization and cost savings," he says. "That's somewhat obvious, but a very important variable is the density of the material you're handling, and that's very much related to equipment."

When formulating a supply chain, project developers also need to consider the distance from the fields to the plant, or size of the project radius. "Acreage has a big influence on project feasibility," Pettit says, as well as the participation of local growers. "The further you go, the more miles you have to go to deliver it. It also spreads your equipment out and you're less efficient in your asset utilization—you'll need more, which adds to the cost. It really all comes down to the number of acres required, but there are a lot of variables that affect a delivered dry ton and it changes with every project."

PowerStock also offers a proprietary design for storing large, square bales of ag residue, which it has coined StackPad. Its design involves a storage base that is built up so the bales aren't contaminated from the ground and are stacked in a stable fashion, Pettit says. The company has also developed a tarping system that protects the feedstock. "We've developed this system over many years of doing this, making plenty of mistakes along the way," he says. "It is not really a technology, rather, it is know-how."

## Building Momentum

In terms of future activity, Pettit says the company's legacy business remains strong, but PowerStock is mainly focusing on the bioenergy industry. "That's the larger opportunity, and we really see the momentum starting to build on projects," he says.

PowerStock predicts that a lot will happen in terms of facility development in 2013 and 2014. "On the feedstock supply side, 2011 will be very busy, especially in the Midwest," he says.

That potential for activity is largely dependent on government policy, Pettit says. "We'd like to see more clarity, less uncertainty and stronger policy signals," he says, adding that the company is supportive of the Biomass Crop Assistance Program. However, uncertainty regarding the funding and duration of the program could erase some of its initial benefits. "You can't build a 20-year asset based on a program that lasts two years," he says. "It may be very helpful in the early years of a project, and it's better to have it than not to have it, but you can't build a project with the assumption that something will be there—you've got to have other possible financing to support your project."

Perhaps most importantly, according to Pettit, for a project to move forward successfully, everyone—the growers, the harvesting companies, the project developers—needs to be rowing in the same direction. "Our main emphasis is that we can utilize our experiences of scale, understanding the logistics, the handling, and operating practices of what was traditionally a feed and forage industry, and apply them to new, unique market requirements," he adds. "Because of the potential scale, it'll be a much larger one. To us, it's another leg on our forage and fiber markets stool."

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