MEGTEC

MEGTEC Systems
Industrial & Environmental Products
1-800-558-2884
www.megtec.com

A Hatton-Brown Publication

NOVEMBER 2006 • $5

PanelWorld

VENEER • PLYWOOD • COMPOSITES • GYPSUM • LAMINATES™

UPGRADES BOOST OUTPUT AT NORTHWEST OPERATION

EMISSIONS:
- MACT UPDATE
- NORBORD'S CHALLENGE
- TECHNOLOGIES

MEGTEC, NORBORD IMPLEMENT EFB/RTO PARTICULATE CONTROL SYSTEM

Norbord was committed to a dry pre-filter system upstream of the RTO.

These three CleanSwitch RTO modules from MEGTEC Systems each have a rated capacity of 55,000 acfm, a thermal efficiency up to 95% and MACT-compliant emission rates. They handle the process emissions from the two OSB dryers used at the Norbord mill in Bemidji. Each dryer has a dedicated electrified filter bed (EFB) system to control particulate emissions.

NBEMIDJI, Minn. Norbord Inc. knew up front what it needed in an abatement system for volatile organic compound (VOC) emissions at its OSB facility here. The only problem was figuring out how to get there. For Norbord, the best approach proved to involve combining a great partnership with an open mind and a strong willingness to look beyond the conventional.

The management team at Norbord knew this project would not lend itself to a cookie-cutter solution because it wanted a system unlike any in operation in the industry. The company determined regenerative thermal oxidizer (RTO) technology was the best approach for meeting the clean air standards at the Minnesota operation. And while it had no VOC abatement program in place until this new system went online a little over 12 months ago, this was no typical situation.

"We had a key requirement from the outset, and that was we were committed to having a dry pre-filter system for removing particulate matter," says Dave Wold, production manager at the Bemidji mill. "Up to that point, we had no RTOs because there wasn't a need for a VOC abatement system."

Key objectives for the team at Bemidji included selecting a system that would meet the VOC destruction requirements, operate with high efficiency, minimize downtime and have a level of redundancy built in to ensure continuous dryer operation. But these objectives hinged on a system component that could not be changed, and as it happened, was not in line with conventional wisdom in the industry.

The company had installed an electrified filter bed (EFB) system at the Bemidji operation during the mid-1980s to control particulate emissions from two MEC triple-pass dryers. While the system was successful in operation, the new MACT standards required the plant to consider installing an RTO system to control VOC emissions. But Norbord was committed to pairing the EFB system with an RTO system, which is not the usual configuration.

Norbord eventually chose MEGTEC Systems, De Pere, Wis., for the project. MEGTEC reports more than 2,500 oxidation systems installed worldwide in many industries. Its RTO designs for the wood products industry include pilot-driven designs that are modular and cleanable, with plug-resistant, alkali-resistant ceramics and corrosion-resistant materials.

What was totally new for MEGTEC on this project was running a dry EFB versus a traditional wet electrostatic precipitator (WESP) system upstream from the RTO. The advantage of the EFB system is that it captures particulate without the use of water, thereby eliminating the need for water treatment, which is a byproduct of a more traditional WESP filtration system. EFB systems do have a lower performance in particulate removal compared to state-of-the-art WESP systems. However, WESP systems can lead to increased RTO maintenance.

The dry EFB approach had the advantage of increased thermal efficiency from fuel cost savings because the flue gas was not cooled down by the introduction of water as with the WESP system. Along with this, the absence of water from the overall system meant the ducting connection between the pre-filter and the RTO system and the ID fans could be constructed from carbon steel. This would also minimize corrosion of the RTO inlet section. Furthermore, no chemicals would be required for water treatment, thereby eliminating any additional hazardous discharge and the resulting effluent processing.

PILOT TEST

Due to the unique nature of the system requirements, MEGTEC was commissioned by Norbord to conduct an extensive 14-month pilot test. In 2003, MEGTEC designed and constructed a 1,000 cfm RTO pilot unit and installed it at the discharge of the existing EFB systems at the Bemidji facility. The EFB systems were originally installed in the mid-1980s and were designed with only 12-inch-deep filter beds. These units were also reaching the end of their useful life. If the RTO pilot test revealed promising results, Norbord planned to upgrade to a more advanced EFB system for the final full-scale system. In fact, part of the pilot program was to re-design the EFB to provide longer life.

"Norbord was fully committed to a dry system because they did not want to deal with the water, the chemicals and effluent treatment issues associated with a WESP system," says Rod Schwartz, business director for wood products with MEGTEC. "Through our piloting efforts we were able to meet that goal with an out-of-the-box solution for an RTO system designed to accept a heavy particulate load and resist alkali attack from the wood ash salts present in the process stream."

A key component of the pilot program was identifying the best media for the RTO/EFB pairing. In the process, MEGTEC tested both structured and random media to get a clear understanding of the advantages and disadvantages of each and how they behaved over time. Ceramics suppliers for the pilot included Ceram, Koch, Lantec and Norton.

"We felt there was a lot of misinformation about the advantages and disadvantages of how the different media types would perform with high particulate flow," Schwartz says. "Instead of believing what we felt was unsubstantiated, we decided to test it ourselves. We weren't comfortable just picking a media type and trying to make it work. That's why we tested both types side-by-side to identify the best media that was going to resist plugging and alkali attack."

The Bemidji operation currently runs two rotary OSB dryers, which feed two high-efficiency Fisher-Klosterman cyclones. Each dryer has a dedicated EFB system that has been upgraded from the original system installed in the 1980s. Each dryer produces about 50,000 wet acfm per hour, while the dryers run 22,000 to 24,000 lbs of dry material an hour per unit. The process emissions from both dryers are routed to a common manifold ducted to three separate CleanSwitch RTO modules.

Each CleanSwitch unit in the system has a rated capacity of 55,000 acfm, a thermal efficiency up to 95% and MACT-compliant emission rates. When the three units are all running, the system electrical load is only one-third compared to conventional RTO design with the low-pressure drop media and redundant module.

The CleanSwitch takes its name from MEGTEC's patented valve that keeps cleaned air totally separate from dirty process exhaust. The valve utilizes a double-air seal that ensures the integrity of the valve is maintained for the life of the equipment.

MODULAR DESIGN

Between cleanings, the emissions load is shared equally between all three RTOs. When pressure drop begins to build, indicating that a cleaning is necessary, one of the three RTO modules is taken off-line, cooled and cleaned.

The system is designed so two RTO modules can process the total flow from both rotary dyers. In this way, Norbord gets the advantage of higher thermal efficiency between cleanings. Yet, when cleanings are necessary, there is still no mill downtime. This modular design configuration was a key feature for Norbord.

"In this industry, there are perhaps 70 to 80 RTOs in operation," says Jim Cash, senior product engineer with MEGTEC. "Most of these installations utilize a single, large RTO for multiple dryers. If the RTO has a fault, then the entire system goes down. Norbord did not want that to happen, which is why system redundancy was such a strong design consideration.

"This modular RTO system is designed to get dirty. Norbord has a cleaning cycle that pulls each module off-line about every three months. The cleaning process only takes about a day, but there's still no disruption in production."

The CleanSwitch units each have the same proprietary media bed developed in the pilot test. The production experience was predicted quite well by the pilot tests. Cleaning is easy, predictable, and bed pressure drop returns to like new after each cleaning when a unit goes back online. In addition, MEGTEC recently completed a full annual system check at Bemidji as part of its periodic maintenance and found no surprises.

"The pilot study was truly instrumental to the overall success we've seen with our RTO system," Wold says. "We knew from the outset that RTO technology was the best way for us to go in removing VOCs. Everything has worked out as planned as was identified in the pilot study."

"Pairing an EFB with an RTO is definitely not the norm in the wood products industry," Schwartz says. "The bottom line is, RTOs are great filters and they will catch the particulate. But we were asked to design a system that could handle a heavy particulate load and that's exactly what we've done. And as far as we know, this is the only RTO/EFB system in the country."

Cash adds: "This is a clear case where we were able to test ideas, apply our Design for Six Sigma skill set and draw on a range of statistical tools to implement a pilot test and then directly apply what we learned to design the best possible system." PW

This article was supplied by MEGTEC Systems and Norbord. MEGTEC operates manufacturing and R&D facilities in the U.S., France, Sweden, Germany and China, with sales, service and parts centers. MEGTEC is owned and supported by Sequa Corp.

Norbord conducted an extensive 14-month pilot test, pairing an RTO with its EFB system. In 2003, MEGTEC Systems designed and constructed this 1,000 cfm RTO pilot unit and installed it at the discharge of the existing EFB systems at the Bemidji facility. The EFB systems were originally installed in the mid-1980s, designed with only 12-inch-deep filter beds and reaching the end of their useful life. If the RTO pilot revealed promising results, Norbord planned to upgrade to a more advanced EFB system for the final full-scale system. Success of the pilot study led to EFB system upgrades that included 24-inch deep filter beds, a new ionizer design with an advanced automated cleaning system, and improved maintenance features.

PRINCIPLES OF EFB TECHNOLOGY

Electrified filter bed (EFB) technology was pioneered by EFB, Inc., Newton Center, Mass. It has been extensively applied to the control of particulate emissions from green wood dryers in North America since the mid-1980s.

The principal mechanism of filtration is very similar to that of electrostatic precipitators (ESP). After being ionized, fine particulate matter is separated from the exhaust gas stream and deposited electrostatically on the surface of pea-sized gravel.

Particulate-laden flue gas is first passed through a corona ionizer system where the particulate is given an electrostatic charge. Spiked metal pin electrodes are hung concentrically within a circular entrance duct that is electrically grounded. These electrodes are held at a high negative DC voltage, which causes a corona discharge to form at the tip of each pin. The electrical ions formed by the corona attach themselves to the passing particulate. The high-intensity ionization design effectively charges the particulate near the saturation level.

Particulate material is removed from the flue gas stream in the electrostatic filter bed section. This filter bed consists of pea-sized natural gravel held between wide slats of metal called inner and outer louver cylinders. A caged-style high-voltage electrode is held between the inner and outer cylinder, which polarizes the filter gravel and induces caps of positive and negative charges on them. The negatively charged particulates are attracted to and thereby become attached to the positive caps on the gravel. The EFB achieves high filtration of particulate by virtue of the immense electrostatic collection surface available in the gravel bed.

Upon collection of the particulate in the gravel bed, the gravel is continuously cleaned and recycled for reuse in the filter by means of a pneumatic transport system. The collected dust is then conveyed in dry, low pressure, low temperature air to a silo or bunker equipped with a small dust collector. The flue gas stream, now free of fine particulate matter and condensable hydrocarbons, is then ready for emission or further treatment (via an RTO) depending on the specific requirements of the plant. PW