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PANELBOARD EMISSION CONTROL: AN HISTORICAL PERSPECTIVE

The short-term future will see a greater understanding of the capabilities and limits of RTO and wet ESP technology

By Steven Jaasund and Gary Raemhild

Sometimes the best view of the future can be seen from the past. That's why we've written this paper. We believe that an understanding of the history of emission controls in the panelboard industry will help everyone understand how this industry got to where it is and what the future holds.

This account focuses on the evolution of technology devoted to the control of air pollution emissions from dryers and presses on the principal panelboard manufacturing processes: OSB, particleboard and MDF. Our focus will be North America.

Our intent is to discuss the trends as they developed, illustrate some of the important mistakes that were made and to give the reader a sense for what the future may bring.

THE EARLY DAYS

The enactment of the Clean Air Act in 1970 and the coincident creation of the Environmental Protection Agency was a dramatic change for industry in North America. Gone were the days of reckless disregard for the environment. Coming was a still growing role of environmental concerns, regulations and ethics.

For the panelboard industry, however, environmental pressures remained slight throughout the 1970s. During this period, pollution control of dryers and presses was driven by local concerns, if at all. The U.S. EPA had larger fish to fry and the states and localities were scrambling to catch up with Federal mandates.

While the regulators scrambled, there was some significant research done by industry. For example, NCASI published several background papers that categorized dryer emissions and continue to provide a valuable insight into this subject. Therewere also several attempts in academia and industry at the development of practical emission control technologies to abate dryer emissions.

In the Northwest, certain locales with heavy concentrations of plywood manufacturing brought pressure on operators to install air pollution control equipment for dryers. In Oregon's Willamette Valley many indirectly-heated veneer dryers were equipped with low-energy wet scrubbers, which did a reasonable job of reducing the familiar blue haze. Also, some direct-fired dryers were equipped with gravel bed filters. None, however, were successful in *eliminating* the dryer smoke; only reducing it.

Before 1980 there was no significant emission control in the waferboard (OSB), particleboard and MDF world beyond secondary cyclones.

THE EIGHTIES

Seven years after the Clean Air Act, the first Clean Air Act amendments were passed. By the early 1980s the effects were beginning to be felt in the panelboard industry. Despite the election of a conservative administration the force of these two federal laws was having the desired effect on states and the local air pollution agencies. One-by-one State Implementation Plans mandated by the EPA were put in place along with powerful regulations demanding pollution abatement from industry. The pressure was greatest in the Northwest.

Regulatory pressure was focused on particulate; whether you called it blue haze, opacity, or simply smoke, if you could see it the agencies wanted it controlled. "VOC" (volatile organic compound) and "HAP" (hazardous air pollutant) were acronyms unknown to the industry. In large part, this was due to the gross underestimation of the emission rate of these pollutants from wood dryers by both industry and regulators.

With growing regulatory pressure as a motivator, advancements in air emission control technology were made. For indirectly-heated veneer dryers low-energy wet scrubbers continued to be the technology of choice. However, these units were ineffective on direct fired dryers. The answer to this problem came with installation of the first wet electrostatic precipitator (ESP) on a direct-fired veneer dryer at the Leading Plywood plant in Philomath, Ore. in 1984. Another was installed at the same mill the following year and a third came on line at the Boise Cascade White City, Ore. mill in 1986.

In OSB, the same trend was developing; Georgia-Pacific installed wet ESPs at the Dudley, NC and Skippers, Va. OSB plants. International Paper also installed one at its Cordele, Ga. OSB operation and Huber did the same at its OSB plant in Easton, Me.

An alternate technology, the electrified fluid bed (EFB), was also being tried on Weyerhaeuser, Potlatch and LP OSB plants. This design utilized gravel filter media and with electrostatic charging of the incoming particulate. By the end of the decade, the race to determine the leading particulate control technology for direct-fired dryers was on. Presses; whether plywood, OSB, particleboard or MDF, were generally left uncontrolled with rudimentary enclosures and roof-mounted ventilators or fans.

THE NINETIES

Ignorance of the quantities of VOCs emitted by wood drying ended in the 1990s and a series of important enforcement actions ensued.

In 1992 the EPA entered into a consent decree with Louisiana-Pacific that required LP to pay a substantial fine and equip most of its OSB dryers and presses with regenerative thermal oxidizers (RTOs) for the control of VOCs. Similar consent decree actions with the other so-called "Tier 1" panelboard producers, Georgia-Pacific and Weyerhaeuser, followed in the mid-'90s. "Tier 2 agreements with Willamette and Boise Cascade would follow.

These actions marked a shift in the mission for emission control technology away from particulate to YOCs. It also ushered in a new technology never before used in the panelboard industry: the RTO.

Included with these agreements were the first requirements for add-on controls on emissions from presses. Until then, press emissions had been ignored because they were relatively low and because of the difficulties involved with capturing the emissions from the press area.

TECHNOLOGIES

• Veneer Dryers…At first, wet ESPs continued to be the technology of choice for both direct and indirectly-heated veneer dryers. However, as a result of the consent decrees, by the mid-'90s regulators began to realize that for indirectly heated veneer dryers, RTOs or RCOs (an RTO with catalyst) could both control condensable particulate emissions and reduce VOCs. Both Georgia-Pacific and Weyerhaeuser installed several RCOs. They came with a pleasant surprise—fuel costs were much lower than feared.

Consequently, at the end of the decade most new add-on air pollution control equipment for veneer dryers were RTOs and RCOs.

• OSB/Particleboard/MDF...Beginning in 1992, RTOs were ordered in quantity under the assumption that the RTO (or RCO) could control both particulate and VOC. This thinking was a mistake, however, as operators learned of the devastating effect that alkali metal oxides (wood ash) had on the heat exchange media of the regenerative oxidizer; i.e. the generalized assumption that all dryer emissions were organic was grossly off base. RTO media beds were failing in as little as six months!

The result was a new role for the wet ESP. No longer the primary solution to particulate stack-emission concerns, the wet ESP was now adapted as a protection device for the RTO. (In some cases, however, particulate control upstream of the RTO is still required to meet stack outlet requirements.) By the end of the decade dozens of existing OSB plants had retrofitted their dryer RTOs with wet ESP systems in order to ensure acceptable heat exchange media life. New, green field plants were also equipped with RTOs both with and without upstream wet ESP systems.

Experience thus far has vindicated the choice of wet ESP technology as an effective means to preserve RTO media life; i.e., several wet ESP/RTO installations achieved media-bed lifetimes of over five years. Nevertheless, there remained some controversy over whether the capital cost of a wet ESP could be justified. Only more experience will determine the real cost/benefit analysis of this question.

The trend in particleboard and MDF drying was less clear. Because either process may utilize direct firing or indirect heating, the type of emission control device can vary widely. Today, one can find almost any type of emission control on these dryers depending on the regulatory situation, the heat source and the wood source. RTOs, scrubbers, fabric filters, wet ESPs and even biofilters are used at plants throughout North America. The clear theme here is that it is the process that dictates the choice of technology, a point that was overlooked in the early '90s during the mad rush to equip OSB dryers with RTOs.

• Presses...Finally, the '90s saw a general trend toward the requirement for press vent emission control at most mills. While fabric filters and scrubbers are employed at a few locations, the predominant technology is either a RTO or RCO. Unlike dryers, the emissions are virtually 100% organic and well suited to these thermal technologies. Thus these installations have been largely successful.

More troublesome than the tail-pipe device, however, is the required press enclosure and ventilation system. There still remains a lot of work to optimize press-vent enclosure designs.

Regenerative catalytic oxidizer on a veneer dryer at Weyerhaeuser plant in Zwolle, La.

The Millennium

The last three years have seen a continuation of the trends in the late '90s with new consent decrees involving 'Tier 2" producers Boise Cascade and Willamette. These agreements followed the pattern of earlier enforcement action by imposing penalties and requiring the addition of thermal oxidizers for VOC control on dryers and press vents. While RTOs or RCOs were virtually universal in these enforcement actions, the use of an upstream wet ESP was dictated by the dryer heating design; i.e., wet ESPs are normally selected only for direct wood-fired dryers.

Recent new plants have also adopted this control strategy: wet ESP/RTO technology for OSB dryers and a mix of technologies for particleboard and MDF depending on local conditions.

Wet ESP on a plywood veneer dryer at Boise in Yakima, Wash.

The Future

New U.S. EPA regulations requiring MACT (Maximum Available Control Technology) standards to promulgate soon will require thermal oxidation on many heretofore-untreated dryers and presses for the control of HAPs. The requirement for these thermal oxidizers may also include the installation of wet ESPs for upstream particulate removal. As the MACT standards are implemented, add-on emission controls on dryers and presses will become nearly universal in the panelboard industry. The result will be that operators will find operation of air pollution control systems to be on the critical path of plant operations.

Technical Trends

The short-term future will see a continuation of the recent past with greater understanding of the capabilities and limits of RTO and wet ESP technology. This maturation of the marriage of these technologies to the panelboard industry will result in smoother operations and fewer (much fewer, we hope) of the catastrophic problems of the past. We are convinced that these add-on emission control systems are here to stay; changes in drying and pressing technology show very little promise of achieving compliance with present MACT and local emission requirements.

The longer-term analysis starts with awareness that the public's "appetite" for clean air, as expressed by political institutions, is insatiable. Time and again, history has shown this to be the case and it is not likely to change in the future. Consequently, we can be sure that when new technology to attain lower emissions becomes available, regulations requiring its implementation will follow close behind. We hope that as these technological "pushes" happen the panelboard industry will be more prepared to deal with these changes than it has been in the past. In our view the key to avoiding the problems of the past lies in understanding the fundamentals of the process and how it will affect a new emission abatement technology.

ECONOMY

The public's continuing demand for cleaner air does not come without a price. Presently, the emission controls for a new, state-of-the-art OSB plant add more than 10% to the capital cost of the project. Further additional costs for environmental controls can drive such new projects offshore where fiber and labor are cheaper anyway. Will the North American market bear these costs or will production move offshore to South America, Australia/New Zealand or Southeast Asia? Also, will Canada follow suit with the U.S. in demanding more emission controls? Perhaps, more than anything, these are the questions that will determine the future of emission controls in this industry.

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