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## SPECIAL PRINT | CONCRETE PRODUCTS

New curing system for Western Materic



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# New curing system for Western Materials, USA

For over sixty years, Western Materials has been dedicated to providing their customers with quality products including concrete architectural and hardscape products that they manufacture as well as other building materials. With locations in Yakima, Pasco and Wenatchee, Washington, USA, Western Materials offer exceptional service to Eastern Washington, Northeast Oregon and surrounding regions.

In 2005, due to rising fuel costs, Western Materials began exploring ways to more efficiently cure their concrete products. Western Materials' wide variety of architectural and hardscape products requires a high degree of curing temperature and humidity control. Virtually all products have differing curing temperature and humidity levels and duration (time) to achieve the required compressive strengths for cubing and splitting as well as to meet the market's shrinkage and color requirements.



*Fig. 1: A total of seven (7) curing chambers are designed for the concrete block curing process in an outdoor location.*



*Fig. 2: The chambers, seen from the side, provide excellent access for production traffic and the design and colors underscore Western Material's corporate identity.*

During a concrete industry tradeshow, the management of Western Materials met with Kraft Energy Systems, Inc. and realized that the curing phase of the production cycle, when done properly, could not only be energy efficient but also provide cement savings and help to produce a more consistent and higher quality concrete product. Based on these discussions, energy and material savings, curing flexibility and consistency became the cornerstones around which Western Materials and Kraft Energy would design the curing system project. At the time Western Materials' curing system was very typical of what is found throughout the industry.

It consisted of non-insulated curing chambers, located outdoors, and a steam curing system that operated inefficiently as identified by its high gas consumption leading to high monthly fuel bills. Also a cause of high fuel bills was the curing system's lack of temperature, humidity and duration controls which also created flexibility and consistency challenges.

## Curing Project Design

In addition to "off-the-shelf" curing equipment, Kraft Energy designs custom or bespoke concrete curing system solutions based on client specific requirements and expected results. After an in-depth analysis of Western Materials specific production circumstances including available raw materials, cements, curing temperature, relative humidity and duration, product mix (product sizes, colors and type), existing production and transport equipment as well as return-on-investment, product quality, flexibility and consistency goals, Kraft Energy engineered a combination Vapor Curing system incorporating Radial Air Circulation and Convect-Air™ Heating & Drying system.



Fig. 3: Motorized and weather protected outlet (one per chamber) for forced air exhaust and drying



Fig. 4: Weather protected access covers for radial air circulation units (one per chamber).

Two of the most important design considerations that speak for the above described curing system were flexibility and the locally available raw materials that, through their highly absorptive properties and the market requirements, required precise relative humidity control.

The combination of a Vapor Curing system with radial air circulation and a Convect-Air heating & drying system provides Western Materials with the option of running most any curing cycle possible. They have the

ability to cure at different temperatures from 100°F (38°C) to 150°F (66°C) as well as the ability to cure at low or high relative humidity and complete the cycle with either a forced air exhaust or an aggressive drying cycle in order to achieve specific end product moisture values.

All curing phases are automatically controlled through the AutoCure™ Automatic Curing Control System via temperature and humidity sensors to measure data within the system and a PLC system and GUI (color

touch screen) that measure and control various product curing/drying cycles for maximum flexibility based on concrete product type and mix design as well as ambient/seasonal conditions. Drying and curing consistency are additionally supported by the use of high volume radial ventilators that assure +/-3% temperature and humidity consistency throughout the curing environment.

In addition to the design of the curing system, Western Materials and Kraft Energy decided to maximize energy efficiency and improve product quality through well designed curing chambers. To this end, it was decided that the existing curing chambers would be replaced with insulated sandwich panel clad galvanized steel frame chambers designed for outdoor installation including seismic, rain, wind and snow loads. The curing chambers were built to local building codes and designed for seismic construction typical in this area.

The insulated curing chambers with a high thermal resistance value (R-value) not only keep the heat inside and the cold outside but prevent condensation from forming on the interior ceiling which can cause concrete surface discoloration due to dripping. The curing chambers were further outfitted with insulated aluminum roller-shutter doors that operate automatically in conjunction with the new AutoCure™ control system and the customer's chamber loading and unloading schedule.

Additional highlights of the construction include:

- use of color coordinated building trim to reinforce the customer's corporate identity
- design of a 2' high by 1' wide concrete curb around the perimeter of all curing chambers not only provides a clean dry surface for mounting of the insulated sandwich panels, but also protection to the panels from damage due to loading/unloading and a secure location for the mounting of the vapor distribution pipe
- a heated, well lighted and easily accessible equipment room/corridor at the rear of the curing chambers for installation of all curing and drying equipment, distribution pipe, air duct, water, gas and electrical supply, electrical distribution cabinets and spare parts lockers.



*Fig. 5: The curing chambers were built to local building codes and designed for seismic construction typical in this area.*



*Fig. 6: The combination of a Vapor Curing system with radial air circulation and a Convect-Air heating & drying system provides Western Materials with the option of running most any curing cycle possible.*

The curing systems and chambers were designed, fabricated, installed and commissioned by Kraft Energy. The installation schedule was challenging due to working in outdoor winter conditions while minimizing down time of the plant during demolition and installation.

All electrical components and the installed electrical system were designed to meet UL field approval. And, based on the customer benefits of UL approval, including accelerated local inspector approval and equipment commissioning, Kraft Energy has applied for, tested and passed UL product certification on all electrical panels and vapor generators produced in its factories.

## Results

Upon installation of the system and after several months of operation, Western Materials achieved benefits of the new system that had far exceeded their expectations, including:



*Fig. 7: When asked what benefit they have seen with the new system, Troy Brown said "Product quality... We knew we were going to save energy and cement but we were amazed by the increase in quality of our products. With more color consistency, less chips and breakage, our products are the best they have ever been."*

- 5% to 11% reduced cement load
- Water savings of 50% in the curing chambers
- Fuel savings of 60%
- Color consistency
- Less chips and breakage
- Uniform splits
- Increased customer satisfaction
- Ground-face product improvements
- Production of vapor is virtually instantaneous where as steam could take up to thirty minutes

## FURTHER INFORMATION



Western Materials  
1202 S. First Street  
Yakima, WA 98907  
T +1 509 5753000, F +1 509 4533186  
[www.westernmaterials.com](http://www.westernmaterials.com)



Muehlenberg 2  
49699 Lindern, Germany  
Phone: +49.5957.9612-0  
Fax: +49.5957.9612-10  
[info@kraftcuring.com](mailto:info@kraftcuring.com)  
[www.kraftcuring.com](http://www.kraftcuring.com)