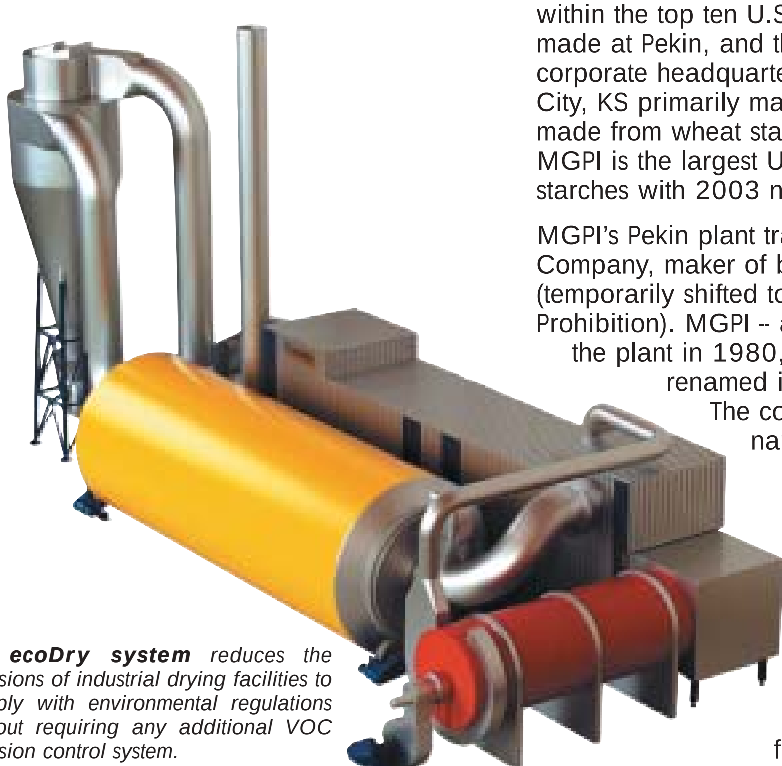
First U.S. installation pays off...

NEW EUROPEAN DRYING TECHNOLOGY HELPS U.S. ETHANOL PRODUCER BEAT EPA EMISSION LIMITS WHILE CUTTING COST OF PROCESS ENERGY

Seeing tougher EPA emission limits and rising fuel costs on the horizon, Pekin (IL) ethanol producer MGP Ingredients of Illinois (MGPI) heard the bell toll for a drying system installed in the early 1990s to turn spent-grain byproducts into animal feed. Replacing it turned lemons into lemonade as new European closed-loop drying technology previously untried in the U.S. proved it could not only beat the tighter EPA requirements posted in mid-2002 by consuming its own process pollutants, but also cut energy costs by more than 20% and greatly reduce maintenance.

MGPI's annual capacity of 90 million gpy easily ranks the company within the top ten U.S. ethanol suppliers. More than 60% of that is made at Pekin, and the remainder comes from a smaller distillery at corporate headquarters in Atchison, KS. A third MGPI plant, in Kansas City, KS primarily manufactures various food and pet industry products made from wheat starch and wheat protein. Tallying all of its products, MGPI is the largest U.S. producer of specialty wheat protein and starches with 2003 net sales reported at $192,372,000.



The **ecoDry system** reduces the emissions of industrial drying facilities to comply with environmental regulations without requiring any additional VOC emission control system.

MGPI's Pekin plant traces its roots to 1892 as the American Distilling Company, maker of bourbon and corn whiskey, cordials and vodkas (temporarily shifted to medical and industrial alcohols during Prohibition). MGPI -- at that time named Midwest Solvents Co. -- bought the plant in 1980, added wheat processing two years later and renamed itself Midwest Grain Products of Illinois in 1985. The company "went public" in 1988, took its present name in October 2002 to emphasize its increasing focus on specialty food / beverage ingredients, and now trades under the NASDAQ symbol MGPI.

Typically employing around 140 people, the Pekin plant annually processes more than 25 million bushels of wheat and corn with a capacity to produce around 78 million lbs of both wheat starch and wheat protein in addition to ethanol and food-grade alcohol including finished vodkas.

The residues of wheat processing -- some 70,000 tons of it – combine with about 630,000 tons of ground corn in the annual production of alcohol products. But that process leaves behind a by-product of whole stillage -- a soup of grain solids and solubles for which the only remaining value lies in recycling as feed additives for cattle, hogs and chickens. The stillage is centrifuged to 33-35% solids while the liquid plus dissolved solids and fiber spun out -- termed thin stillage -- is reduced by evaporators into "syrup" of about 35-40%

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solids. Both components are reunited and mixed with enough dry finished product to achieve a 65% solids blend, and passed through a rotary drum dryer to finally emerge as distillers dried grain with solubles (DDGS), in a steady stream totaling around 225,000 tpy.

Sold under the brand name Midsol, guaranteed for at least 26% crude protein and 8% crude fat but no more than 8% crude fiber, most of Pekin's DDGS is shipped by barge to gulf-port terminals for export, with the remainder moving by rail and truck to feedlots and feed manufacturers across the U.S.

--- Drying Biggest Problem ---

According to Plant Production Manager Joe Werth, the most troublesome part of the process had been the drying. "Our earlier system wasn't meeting its EPA limits, and was costing too much in both energy and maintenance," he summarizes. That system comprised two rotary drum dryers each designed for 50,000 lbs/hr of evaporation driven by 70MM BTU of natural gas heat. Although the furnace flue gas emerging from the dryers passed through primary and secondary scrubbers to remove particulate, and about 40% of it was recycled back through the furnace, there was no provision for eliminating VOC's, CO, or NOx from the vented 60%. Solving that problem

Pipelines and chute (upper right) deliver centifuged solids, evaporated syrup and dry finished product to Swiss Combi mixer.

Mixer feeds prepared 65% solids material into rotary drum dryer, below larger duct bringing in process steam.

by adding an "end-of-pipe" RTO (regenerative thermal oxidizer) was not thought worthwhile because that would only add another layer of maintenance and fuel cost to an aging and already-inefficient system.

"Right from the start, those dryers had lots of plugging problems," he explains. "These were traced to inadequate air flow resulting from a significant pressure drop across the system, which in turn prompted unnecessarily high temperatures upstream in the dryers."

"Maintenance of both dryers was costing around $100,000 per year," he adds. "Some examples include problems with the trunnion and chain drive system rotating the dryer drum, overheating due to refractory failures, internal structural breakage resulting from corrosion and cracking, and the constant need for lubrication and alignment attention. Of course, along with maintenance cost came excessive downtime and production loss."

--- Eurotechnology Offers Hope ---

"In the process of looking for a replacement," Werth says, "the drying systems we investigated looked quite similar to what we had, required about the same amount of fuel, and would still need an RTO to comply with EPA. Then in early 2001, one of our engineers in Atchison came across a new drying technology being used in a European municipal sludge drying application." That system was developed by W. Kunz dryTec A.G., of Switzerland, also known as Swiss Combi, which is represented in the U.S. by Dedert Corporation, a developer of custom-engineered evaporation and drying systems headquartered in Olympia Fields, IL, near Chicago.

Called ecoDry, the Swiss Combi concept confines the product drying process within a closed steam loop kept isolated from the furnace flue gas, and uses process-integrated thermal oxidation to prevent VOC's and pollutants released in the dryer from venting to atmosphere. It not only eliminates need for any post-treatment of stack exhaust gas, but also uses the energy content of dryer-generated VOC's as an additional fuel source, and makes the heat of the closed steam loop available to drive other systems such as Pekin's thin-stillage evaporator.

Intrigued after initial meetings with Dedert Corp. and Swiss Combi, Werth and MGPI VP/Corporate Director of Engineering Randy Schrick traveled to Europe to study two sites using the Swiss Combi technology, one of which was a corn and wheat starch facility. "After seeing the clear stack discharge and waste-heat evaporator configuration used there," Werth says, "we knew Pekin had to become Swiss Combi's first U.S. installation."

Pekin Plant Production Manager Joe Werth checks product quality at sampling port.

--- System Consumes Own Pollutants ---

In ecoDry operation, flue gas from the system's natural-gas furnace passes through a specially designed heat exchanger, charging the closed-loop steam temperature to 850°F. That steam is introduced to a rotating drum dryer along with the syrup and grain solids mixture. Turning on four independently driven variable-speed trunnion rollers, drum rotation is easily adjusted to optimize product moisture and throughput. Also helping to control throughput is a new dosing bin, installed as part of the Swiss Combi system, which receives and monitors centrifuge output by weight and automatically optimizes its flow to the dryer.

The material is advanced via mechanical and pneumatic means, discharging at the opposite end of the drum as DDGS, onto a tightly enclosed output conveyor. The process steam vents to a pair of cyclones that remove entrained particulate, which is dropped back into the DDGS conveyor. Approximately 25% of that steam is bled off by an automatic control system that responds to internal dryer conditions, while the remainder returns to the furnace-fired heat exchanger for recharging.

Swiss Combi dryer "back end": DDGS emerges from rotating drum onto tightly enclosed conveyor while ducts take process steam up to cyclones and back to the heat exchanger intake. Stack framed against blue sky attests to exhaust clarity.

The bleed-off steam routes to the thin-stillage evaporator's first effect at 250°F (approximately 201°F wet bulb), and upon emerging at 172°F (wet bulb), returns to the furnace air intake where its entrained pollutants are incinerated in combustion with the natural gas fuel. Vapors released by final evaporation of thin-stillage syrup in the first effect flow to the second effect to serve as the heat source driving the initial stage of thin-stillage evaporation.

"During construction and erection of the new drying plant," Werth continues, "we also replaced the old first-effect thin-stillage evaporator with a Dedert unit designed to operate on the process steam available from the Swiss Combi dryer. This new first effect has performed extremely well, giving us an 80% increase in evaporation rate, with low gas side fouling due to Dedert's continuous-flow washdown system."

The DDGS leaving the dryer is contained within the enclosed output conveyor and transported to a

Most of Pekin's DDGS loads into barges on Illinois River bordering plant property, bound for Gulf export terminals.

Process Oprator Kieth Clark keeps watch over distilling and DDGS production via graphic systems displays.

counter-flow cooling system utilizing outside air for cooling. As the cooled DDGS drops out, the heated exhaust air is routed back to the furnace air intake as combustion air, which additionally incinerates its entrained pollutants along with the stillage evaporator's outflow gas.

--- Fuel Cut Exceeds 20% ---

"Our ecoDry system provides evaporation of 55,000 lbs per hour driven by less than 62MM BTU of natural gas," Werth points out. "That's an evaporation rate of no more than 1125 BTU per pound of water evaporated, compared to the 1400 BTU rate in our earlier system, which indicates a fuel savings of about 20%. Total savings are actually bigger, considering that the old system would have needed an RTO to meet current U.S. and Illinois EPA standards for dryer emissions, requiring additional fuel, while the ecoDry system's integral oxidation provides that benefit inherently without extra fuel. Here, in fact, the burned pollutants actually help to lower ecoDry's fuel requirement by adding their energy to the heat."

Newest emission limits on DDGS dryers for Pekin as part of the Peoria, IL attainment area, based on BACT (best available control technology), stipulate PM (particulate matter) limits of 0.01 gr/dscf (dry standard cubic ft.); CO (carbon monoxide) at 100 ppm or 90% DE (destruction efficiency); VOC as total C at 10 ppm or 95% DE; and NOx (Nitrous Oxide) at 0.08 lbs/million BTU. "Our new ecoDry system was starting up around the time these BACT limits were raised," he notes, "but it performed comfortably within the new limits right from the start."

"Like the system they showed us in Europe, our ecoDry continually impresses us with the clear air above the stack," Werth continues. "It's a striking contrast from the haze that our previous system produced. Due to its clarity, we're considering recirculating some of that stack exhaust back through the dryer's furnace as makeup air, replacing that portion of bled-off gas which has been condensed in the evaporator. By recycling some of its 270°F exhaust heat, we should gain even better fuel efficiency."

As another alternative for reducing natural gas demand, Werth also eyes the methane generated by the plant's wastewater treatment plant digesters, which until now has simply been flared off as typically done with many methane sources but could easily be routed to the ecoDry furnace.

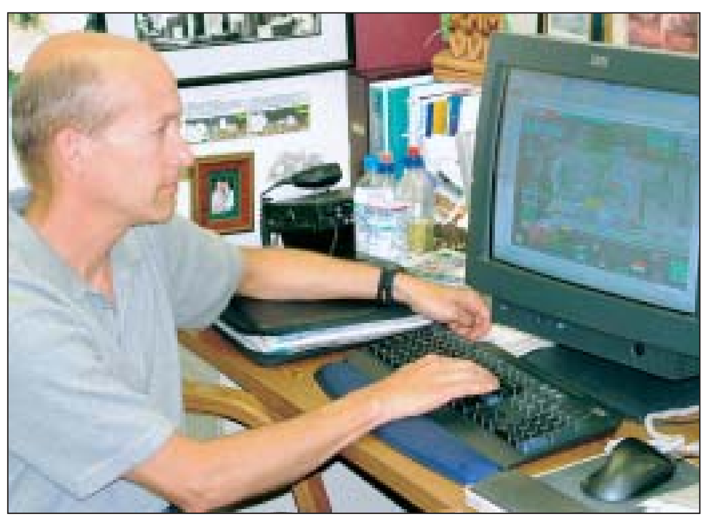
--- Reliability Boosts Uptime ---

"Mechanical reliability has been outstanding," he says. "Monthly records for the past year show an average uptime of 95.7%, contrasting with about 80% for our earlier dryer."

"A common problem with DDGS drying systems is the accumulation of oil residue within the interconnecting ductwork," he adds. "The Swiss Combi design effectively counteracts this with relatively short ductwork sections and sufficient insulation, nevertheless, we installed manway entrances at strategic locations to allow easy access for cleanout if needed."

"One of MGPI's key requirements was easy interfacing with the plant's existing Delta V control system", Werth explains. "Our ecoDry does that, with very good auto-start and shutdown sequencing. It comes up to capacity a bit slower than conventional systems, but once at capacity, regulates itself with very little operator intervention needed. It is also equipped with extensive high-temperature and fire protection, with thermal sensors at various critical points, which either call operator attention to abnormal conditions or begin auto shutdown while adding water at strategic locations to cool the system. No system is absolutely failsafe, but Swiss Combi has the most extensive and effective protection I've seen on this type of dryer."

"With more than two years of operation now proving ecoDry's effectiveness," Werth concludes, "we've already ordered a second system to bring these same improvements to our sister distillery in Atchison, and we've recently filed an EPA permit for a third system to replace the other old dryer still running here."



Pekin Plant Production Manager Joe Werth looks in on system operation on office PC.

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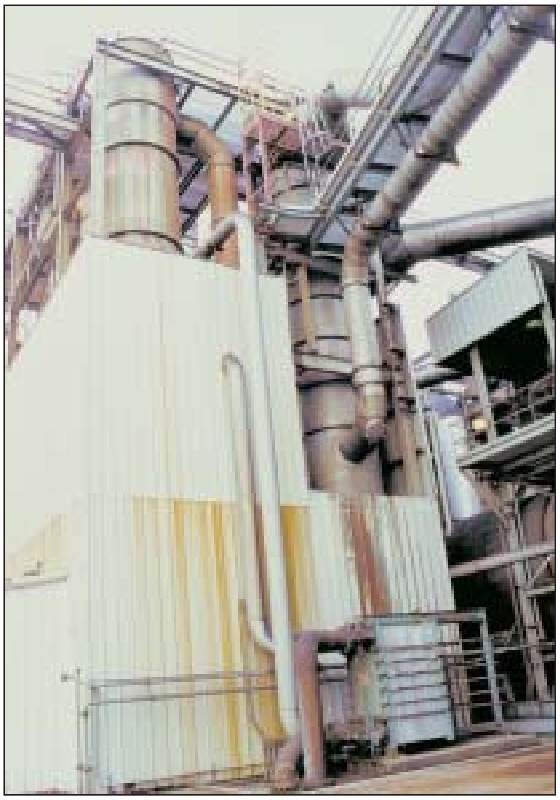
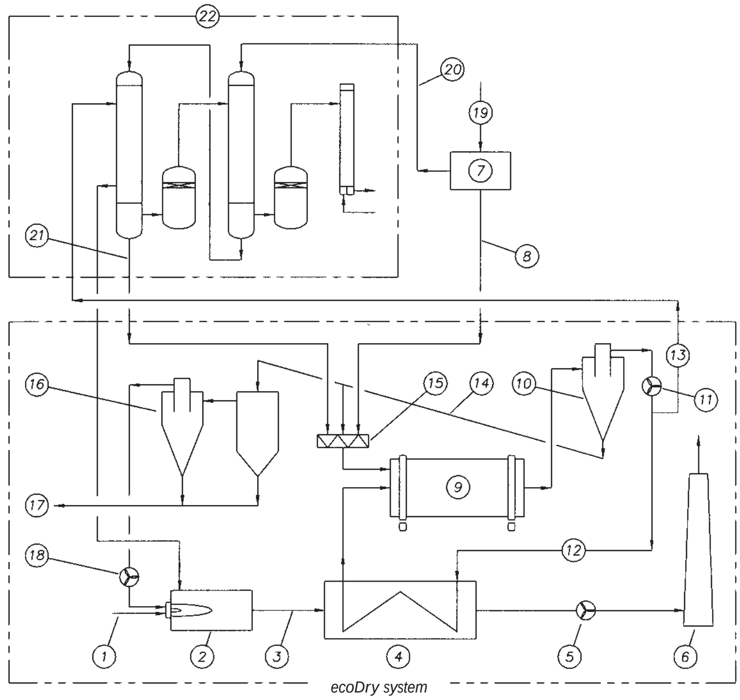


Thin-stillage evaporator refitted with new Dedert first effect brought 80% improvement.



1. Burner Fuel (Gas, Oil, etc.)
2. Furnace
3. Flue Gases
4. Heat Exchangers
5. Flue Gas Fan
6. Exhaust Stack
7. Centrifuge
8. Wet Feed
9. Rotary Drum Dryer
10. Cyclone
11. Main Fan
12. Closed Steam Loop
13. Bleed-off Steam
14. Hot Dry Product
15. Mixer
16. Product Cooler / Cyclone
17. Final Product
18. Combustion Air Fan
19. Whole Stillage
20. Thin Stillage
21. Syrup
22. Gas Heated Evaporator

Centrifuges receive whole stillage and separate grain solids from "thin stillage".

Centrifuged solids drop into ecoDry dosing bin, mounted on weight sensors to automatically optimize flow into mixer and dryer.

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