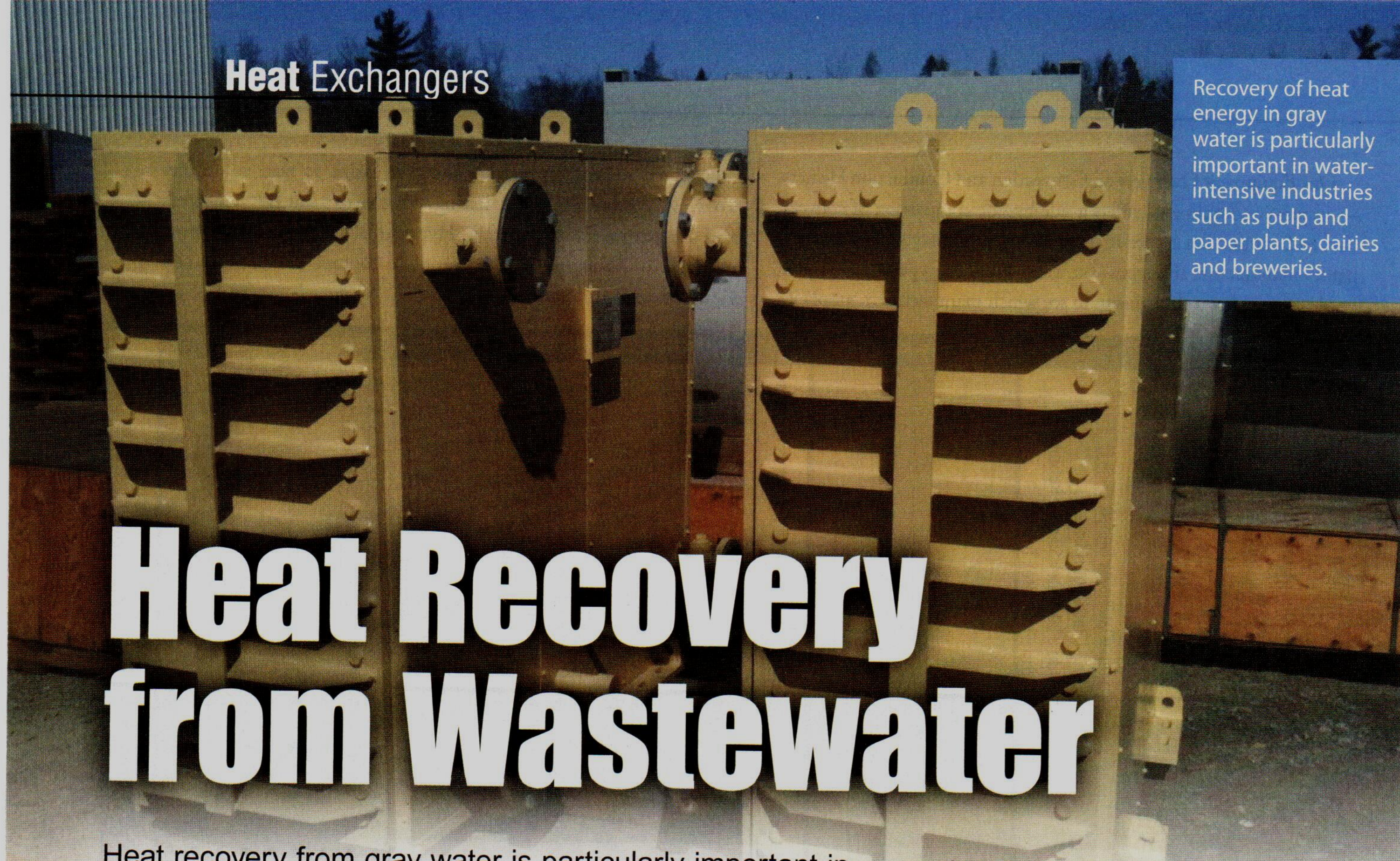

Heat Recovery from Wastewater

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Heat recovery from gray water is particularly important in water-intensive industries such as pulp and paper plants, dairies and breweries. Rather than flushing used water down the drain, consider whether a heat exchanging system can help you put that energy to work in your process again.

By Erwin Schwartz,
DDI Heat Exchangers

Most plant operators are aware of the need to save money and reduce the environmental impact of their plant through better water management. Typically, this line of thinking results in the development of ways to reduce water consumption.

Meanwhile, facility operators also are aware of the need to reduce energy costs. Here, too, the changes often have focused on the development and installation of cost-management measures. But saving energy has environmental benefits as well such as reducing greenhouse gas emissions. Focusing on the cost-cutting aspects alone may result in opportunities — in the form of heat energy readily available in the facility's wastewater — flowing away.

Also called gray water, a facility's wastewater may have been heated through hot-water tanks, industrial processes or simply from passing through the heated building. The heat in this water is a potentially valuable resource. Unfortunately, rather than being used, it often has been wasted when the water is discharged from the facility.

Developments in Heat Recovery Systems

Several trends are forcing plant operators to take a closer look at wastewater heat as a resource. First, there is the need to protect the organization's financial interests from sudden energy cost increases by using alternative sources of energy such as heat that would otherwise be wasted. Second, there is the need to manage greenhouse gas emissions through the reduced use of fossil fuels.

Recovery of heat energy in gray water is particularly important in water-intensive industries such as pulp and paper plants, dairies and breweries. Heat recovery also is important in sectors that process sludges. Many industrial processes produce sludges that may contain considerable heat, which is a valuable resource that should not be wasted.

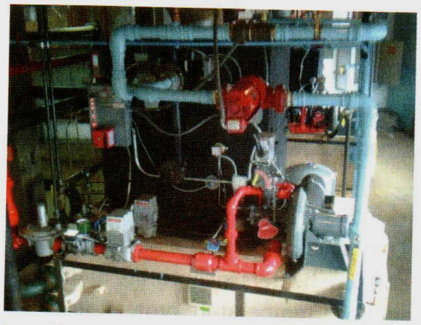
3 Approaches to System Design

Several system improvements can help plant operators recover heat from the wastewater produced in the facility. Some of these improvements rely upon:

- A smaller physical footprint, with less need for large spaces for changing out tubes after they become fouled.
- Greater reliability for more trouble-free operation.
- Better information systems that can quantify the savings gained through wastewater heat recovery.

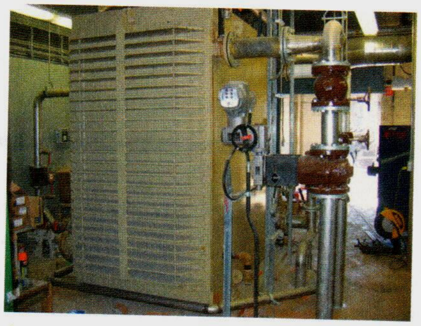
The three primary configurations for heat exchanger systems for wastewater heat recovery are tube-in-tube, spiral design and rectangular.

Tube-in-Tube Heat Exchangers. As the name implies, this technology includes one tube inserted inside another, with the hot liquid, or sludge, in the inner tube. Heat gets transferred to the cooler incoming liquid in the outer tube.


Installed with a boiler from Los Angeles-based Parker Boiler, rectangular heat exchangers in Pontiac, Mich., are used in a heat recovery application.

Due to the low heat transfer when compared to other technologies, this design is relatively inefficient. Also, in some jurisdictions, double-walled tubing is required for the inner tube to reduce the danger of cross contamination. The air space between the two walls inhibits heat transfer.

Spiral Heat Exchangers. In this technology, the hot liquid runs through a series of narrow spirals. This design requires small gaps of about ~0.75" (2 cm) for the tubes. This limits the amount of solids and sludges that can be pumped through to avoid plugging.


A rectangular heat exchanger is used in a sludge-to-sludge heat recovery application to capture and reuse energy that would otherwise be lost.

Rectangular Heat Exchangers. This design uses rectangular channels, placed in direct contact with each other, with hot and cold channels alternating. There is no space between the hot and cold channels to maximize heat transfer. It allows for double walls in the channels for the gray water market, minimizing the risk that corrosion or erosion will cause leaks that could contaminate one flow with the other. The rectangular technology provides a large gap to help avoid plugging, and the controlled width of the channel provides for a fast flow.

It is important to choose a system that can reliably manage any risk of contaminating the incoming flow with the outgoing flow. Specify a system that fits into the geographic footprint available. Some systems require an open space that is longer than the pipes in the recovery unit, so the pipes can be changed if they leak, corrode or become fouled.

Systems should be low maintenance and — particularly in the case of sludges — designed to avoid plugging or baking that can reduce efficiencies and require shutdown until repairs can be made. **PH**

Erwin Schwartz is president of DDI Heat Exchangers Inc., Montreal, a manufacturer of rectangular heat exchangers. For more information from DDI, call (514) 696-7961 or visit www.ddi-heatexchangers.com.