Des Champs: Energy Recovery Products

Applications for Process Heat Recovery, High-Temperature Heat Exchangers, and Process Dehumidification

Munters

Introduction

Des Champs has led the industry in the design and manufacture of industrial heat exchangers and heat recovery packages since 1974.

With over 400,000 square feet of manufacturing space and large engineering staff, Des Champs has the support to meet the challenges of today's most demanding heat recovery applications. Continuous development and testing of innovative heat recovery products, and over 100,000 successful installations, give us the leading edge over the competition.

Des Champs understands its customers needs and offers engineered solutions to meet specific requirements. Custom designs may include multiple airflow configurations, variable plate spacing, and attaining desired heat exchanger effectiveness and pressure differentials while maintaining specific size.

Following are ten examples that demonstrate our capabilities. They represent a small sampling of applications for our products. We would like the opportunity to discuss your specific industrial requirements. Contact us or visit our website for information on gas-to-gas heat exchangers, integrated heat recovery packages, or complete turnkey solutions.

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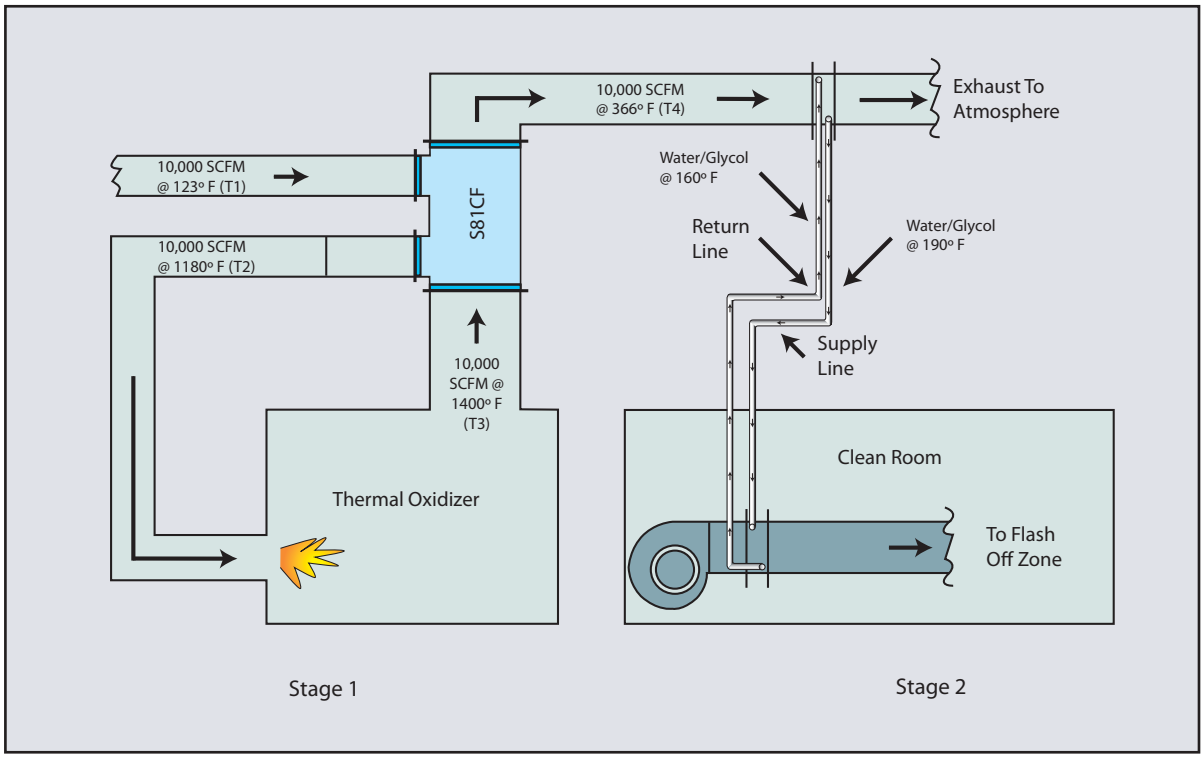
Capturing Waste Heat With Ultra-High Efficiency

Crawford Equipment & Engineering Company of Orlando, Florida offers a complete line of services related to industrial process heating equipment, including design, fabrication, and sales. With their diverse capabilities, they regularly find uses for Des Champs air-to-air heat exchangers in their designs. The company recently installed a unique two-stage system for a well-known automotive parts manufacturer at a plant in Mexico that fabricates headlight lenses.

One of the processes in the plant involves applying a chrome coating to the lenses. A thermal oxidizer incinerates isopropyl alcohol and the butyl acetate fumes that result. A Des Champs model S81CF Thermo-Z heat exchanger recovers heat from the incinerator's exhaust at 1400°F, so it can be used to preheat inlet effluent air from 123°F to 1180°F. In doing this, the heat exchanger operates at an almost-unheard-of efficiency of 83%.

In the second stage, also supplied by Des Champs, a water coil in the exhaust stream uses 365°F air coming out of the heat exchanger to heat a water-glycol mix from 160°F to 190°F. The water then flows to a cleanroom in the plant, where a forced air fan blows ambient air across a second coil, heating the air from 70°F to 180°F. This hot air goes to a flash-off zone, where it cures a sprayed-on clear coat and solvent applied to the lenses. Using waste heat from the thermal oxidizer to heat water in this fashion eliminates the need for a boiler.



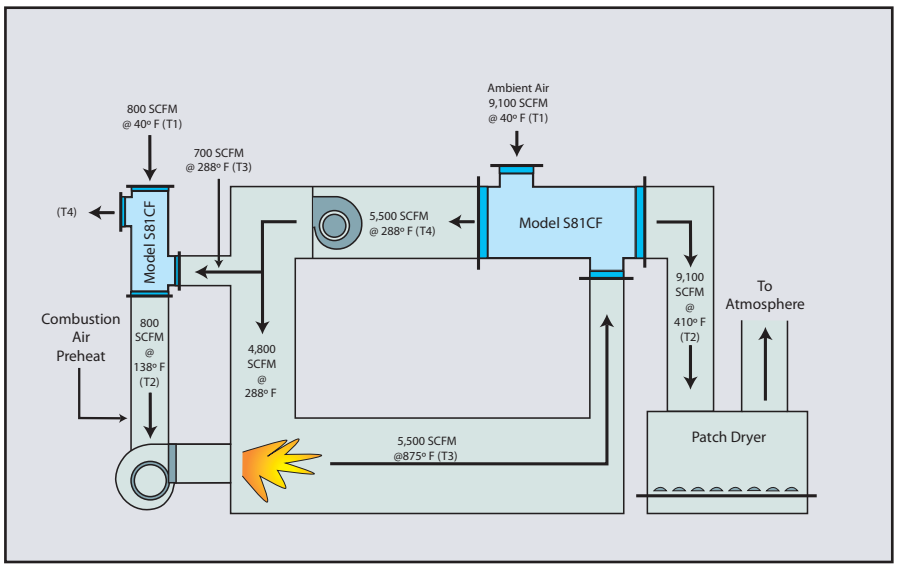
A Recirculating Heater Yields Clean Process Heat

Following a national trend, a southeastern pharmaceutical manufacturer produces transdermal patches in a big way. The self-adhesive patches apply directly to the skin for time-release of medicine. To meet consumer demand for them, the company recently added a second production line at a plant it recently built.

In the manufacturing process, a coating machine applies medication to the patch in layers, and then hot air cures the medicine. Needing a system to supply heat for curing, the company turned to Plymouth, Michigan-based Durr Environmental, a manufacturer of air pollution control systems that had previously supplied equipment for the facility. Des Champs supplied the VariMax™ system, an indirect-fired recirculating gas heater. A burner in the combustion chamber generates heat, and the combustion products recirculate by means of a fan, rather than flowing straight up a stack.

Indirect firing involves transferring heat from one airstream to another while keeping them separate. As Yves Pszenica, project manager at Durr Environmental, explains, "The customer didn't want combustion byproducts in their process air." Because an air-to-air plate heat exchanger provides an ideal means of heat transfer, Durr specified two Des Champs Thermo-Z models. A larger primary heat exchanger in the recirculating box uses exhaust air at 875ºF to heat outside air from 40ºF to 410ºF for the curing process. And a secondary heat exchanger uses bleed air from the exhaust to preheat inlet combustion air, saving fuel.

In the past, indirect heaters have suffered from low efficiency and high fuel consumption when compared to direct-fired burners. But combining the Des Champs heat exchangers with the recirculating burner yielded an efficiency of over 90%, nearly equaling that of direct-fired heaters.

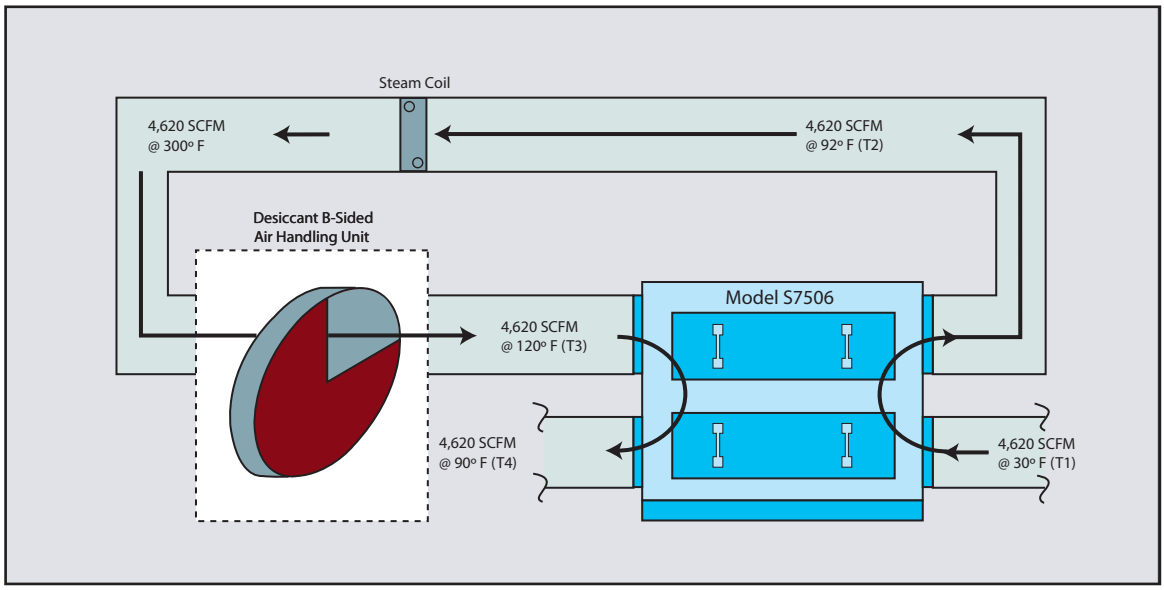


Recovering Heat From a Dehumidification Process

A major international pharmaceutical company manufactures prescription medications and specializes in cancer care products. Their production process is sensitive to moisture because in several phases, the drugs are in hydroscopic form, meaning they absorb moisture. This can lead to problems such as difficulty in forming drugs into tablets.

To maintain proper humidity levels in its manufacturing environment, the company installed an air handling unit several years ago with a desiccant wheel for dehumidification. When the desiccant becomes saturated with moisture, they run hot air through it to regenerate the medium.

To save energy, they placed a Des Champs model S7506 Z-Duct air-to-air heat exchanger downstream of the desiccant wheel to recover heat from the discharge during the regeneration cycle. The captured heat is then used to heat outside air coming into the air handler. This reduces the amount of steam required for heating space in winter and the fuel needed at the plant's gas-fired boiler. As a result, the heat exchanger paid for itself shortly after the air handling unit went into operation.

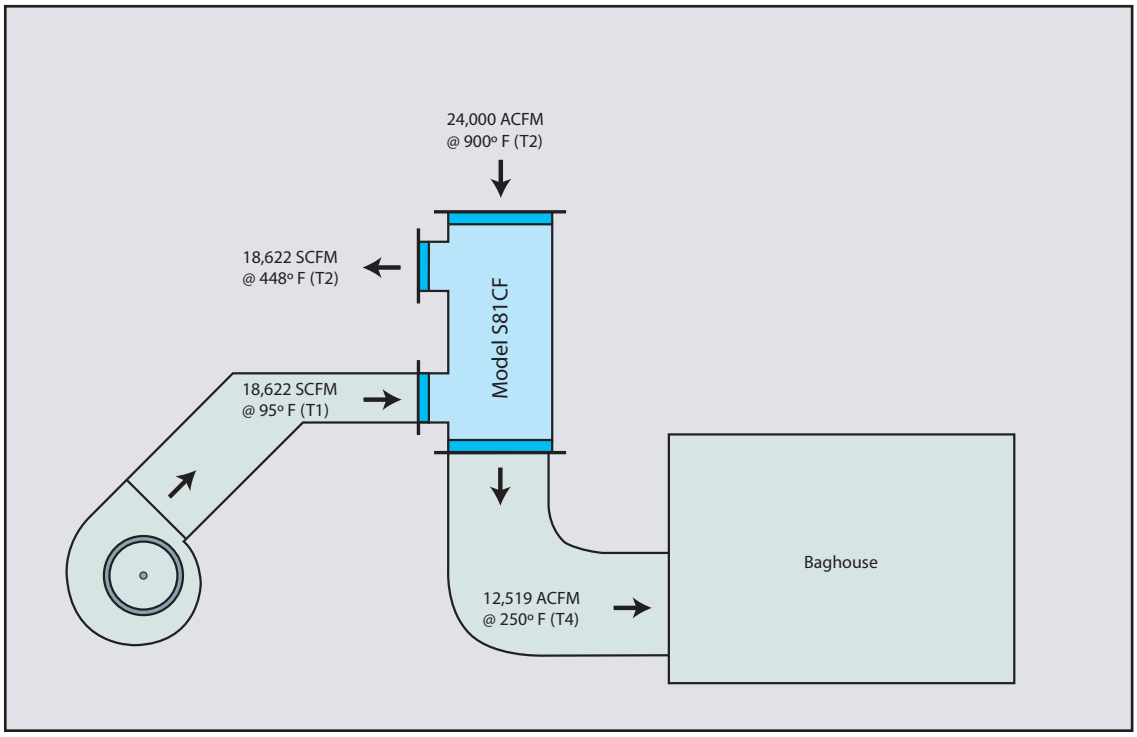


Reducing Production Equipment Size

When engineers at a large manufacturing company designed a second production line for a plant that produces micron-sized glass beads, they found that the baghouse used in the process could not handle air flow from the new line. Des Champs solved the problem by supplying an air-to-air heat exchanger in the gas stream prior to the baghouse.

Like a huge vacuum cleaner, the baghouse filters contaminated air with a series of bags that trap dirt as the air flows through them. The problem is, air comes from the process at 900ºF – hot enough to burn the bags – and it must be cooled to 250ºF. Previously, with the existing line, outside air was mixed with the hot air to cool it. A second line doing this would have resulted in exceeding the baghouse capacity.

Instead, the company installed a Des Champs model S81CF Thermo-Z heat exchanger to indirectly cool the gas from both production lines before it enters the baghouse. Having outside air and process air flow through opposite sides of the heat exchanger cools the process air, and because the airstreams don't mix, no volume is added to it. Removing the outside air component from the flow allows the baghouse to serve both lines.

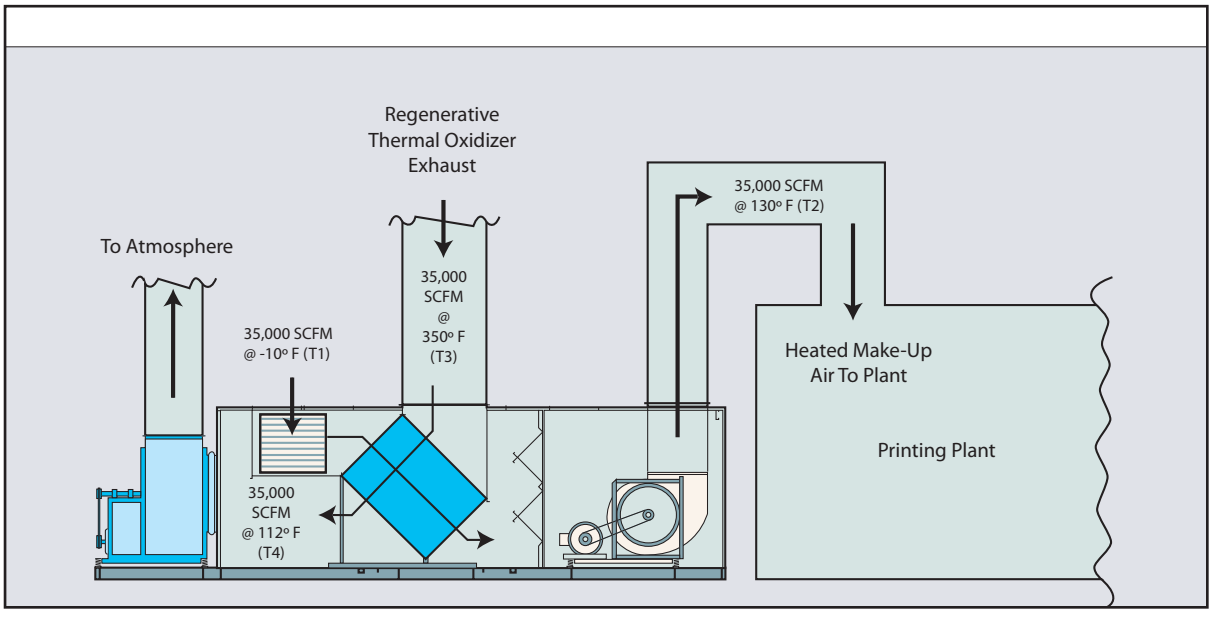


Free Heat From an Incinerator

At a large midwestern printing plant, solvents used in ink from presses generate harmful vapors. Two regenerative thermal oxidizers, with a combined 70,000 CFM exhaust, incinerate the VOCs. But rather than let all that heat go to waste up a stack, the company wisely uses it to heat its facility.

Two Des Champs Series 81 Thermo-Z air-to-air heat exchangers, one on each incinerator, capture exhaust heat and use it to heat outside air for plant makeup air in winter. Each heat exchanger is actually part of a complete packaged heat recovery system that also includes supply and exhaust fans, dampers, and filters.

Under design conditions, the systems heat air from -10°F to 130°F using 250°F exhaust from one incinerator and 350°F exhaust from the other. Combined, they can transfer over 10,400,000 BTUs per hour. In the package heat recovery system manufactured by Des Champs, the temperature to the space is controlled to a consistent 130°F by modulating the hot gas flow through the heat exchanger.



Increasing Turbine Horsepower in a Harsh Environment

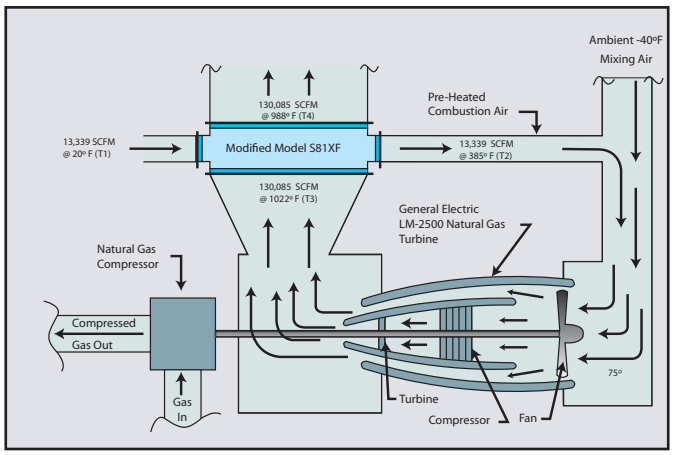
TransCanada Pipelines pumps natural gas through underground pipelines from production facilities in western Canada to consumers in eastern Canada and midwestern U.S. states. Gas generators (themselves powered by natural gas) drive power turbines, which in turn drive compressors that compress natural gas to transmit it across the country.

Pipeline engineers learned long ago that these gas generators run more efficiently with their inlet air above 70ºF. "Once you hit cold weather, you lose efficiency," says Marie Standing, senior mechanical engineer with TransCanada. To remedy this, they installed an air-to-air heat exchanger on a turbine exhaust at the Compressor Station in Saskatchewan. The heat exchanger recovered heat from the turbine exhaust and used it to preheat a portion of the inlet air to 385ºF. This in turn mixed with the remaining cold inlet air to bring the entire inlet airstream up to 75ºF, allowing the turbine to gain hundreds of horsepower.

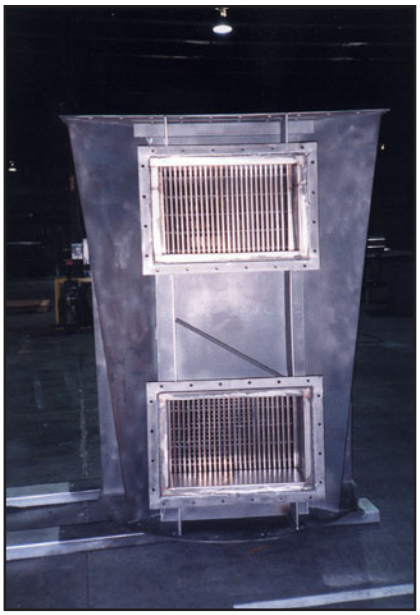
However, TransCanada also learned that because the turbines ramp up quickly to an operating temperature of over 1000ºF, turbine operation created a severe environment for heat exchangers. They originally used a heat exchanger from another manufacturer, but it failed after only three months of operation.

Standing says the quick ramp-up is inherent in turbine operation and hard to control, and in addition, TransCanada couldn't reduce the startup rate because it would have held back operations on each startup. In response, Des Champs designed a special heat exchanger, actually a modified model S81XF Thermo-Z, that accommodates rapid thermal expansion. A heat exchanger that can withstand such severe conditions is uncommon in the industry.

TransCanada now uses the heat exchanger for three to five months out of the year, and as Standing says, "It may not sound like much, but when you add up the number of days, it's quite a bit." With the success of this trial, the company plans to add a heat exchanger to other compressor station turbines.



Giving Customers Greater Efficiency

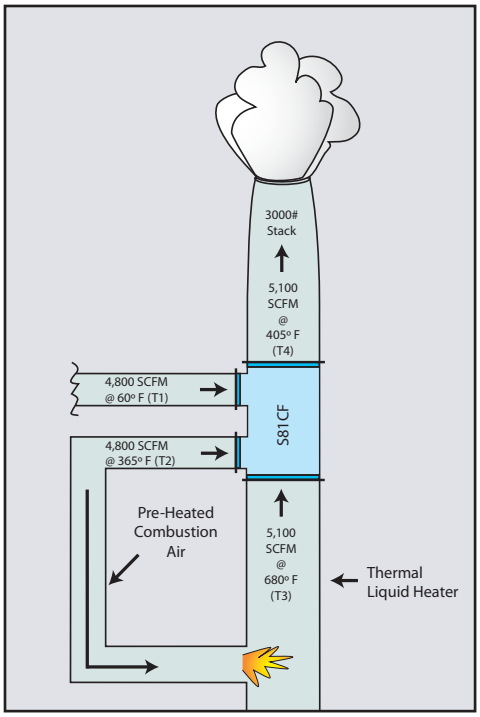


Few companies know as much about efficiency as American Hydrotherm Corporation of Bay Shore, New York. The company designs and fabricates high-temperature thermal liquid systems and heaters that use thermal oil as a process heating medium rather than steam to achieve higher temperatures. The units see extensive use in the chemical industry for processes such as production of plastics.

As evidence of its efficiency awareness, American Hydrotherm has specified Des Champs air-to-air heat exchangers in its liquid heaters since the early 1980s. According to Tony Ledic, vice president of American Hydrotherm, "We specify a heat exchanger whenever the customer requests increased efficiency."

In a recent application, a specialty chemical manufacturer installed one of American Hydrotherm's dual gas-fired thermal liquid heaters equipped with a Des Champs model S81CF Thermo-Z heat exchanger in a chemical reactor process. With the Thermo-Z, they capture heat from the flue gases coming out of the liquid heater's exhaust at 680°F and use it to preheat combustion air going into the heater at 365°F. The heat exchanger increases the efficiency of the heater by 10%, saving the customer an equivalent amount in fuel.

This application was unique in that Des Champs designed the heat exchanger as an integral part of the exhaust structure so it would support a 3000-pound stack. A round flange on the outlet of the heat exchanger allows for a convenient bolt-on connection with the stack.



Cleaning up a Dirty Environment

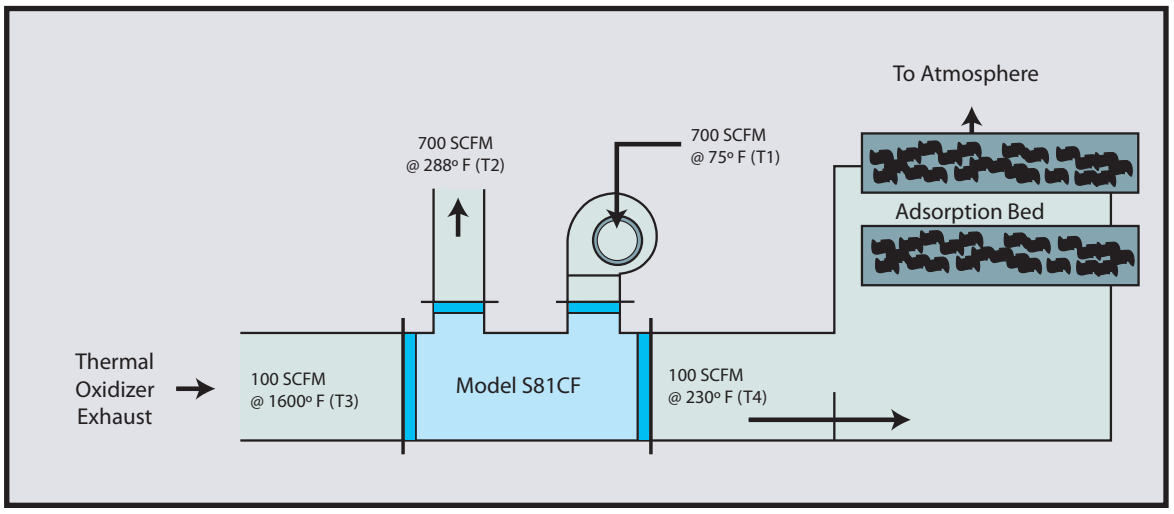
Treating contaminated soil poses a tremendous challenge for environmental specialists, but TerraTherm, an environmental services company in The Woodlands, Texas, has risen to the occasion by introducing a system that takes advantage of a Des Champs air-to-air heat exchanger.

TerraTherm is an affiliate of Shell Technology Ventures, which develops commercial applications for concepts resulting from Shell Oil Company's research. Shell developed a portable soil abatement system mounted on a trailer, and Terra Therm markets it. Employing so-called In Situ Thermal Desorption (ISTD) technology, the system remediates a broad range of organic compounds such as PCBs, pesticides, petroleum wastes, and chlorinated solvents, all without excavating the soil.

At the heart of the process lies a heat source consisting of thermal blankets placed on the ground for surface soil remediation and thermal wells bored for zones extending up to several hundred feet deep. Heating elements in the blankets or wells heat the soil, causing the contaminants to vaporize. A vacuum system then draws the vapors from the ground.

The heat in the soil destroys most of the contaminants, and the rest go to a vapor treatment system. In this, a thermal oxidizer incinerates 90% of the volatile organic compounds (VOCs), and the remaining 10% pass through an activated carbon adsorption process. To work effectively, adsorption requires lower temperatures than the 1600ºF in the incinerator exhaust gas. A Des Champs model S81CF Thermo-Z heat exchanger indirectly cools the exhaust to 230ºF using outside air.

With tens of thousands of contaminated sites in the U.S., TerraTherm sees a significant potential for the ISTD system and has begun limited production to meet the demand. Eventually, the company envisions several dozen units operating around the country.



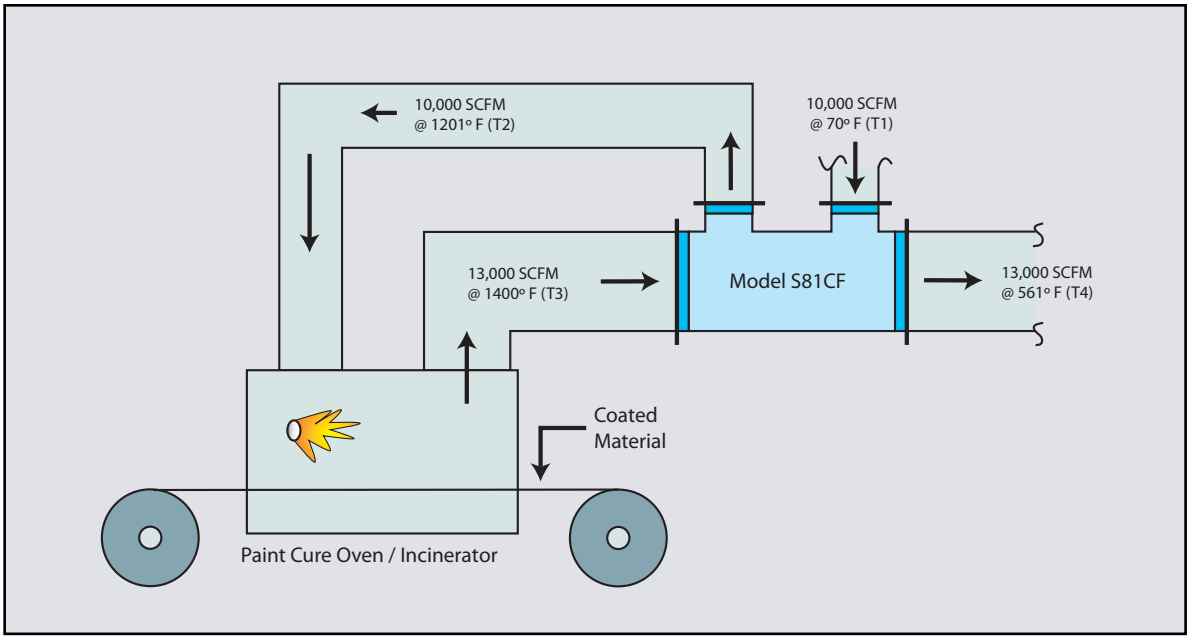
Increased Control for a Paint Curing Oven

Gasmac Incorporated of Ontario, Canada manufactures painting systems used in industrial plants, and the company specifies Des Champs air-to-air heat exchangers as a regular feature on its lines.

In a recent application demonstrating the effectiveness of the heat exchangers, Gasmac built and installed a new paint line for a steel processing plant in Slovakia to coat one side of steel sheeting with a decorative finish. The coating requires curing in an oven, and because the process uses solvent-based paint, the plant needed to incinerate fumes emanating during curing.

Gasmac devised a system that uses a natural-gas-powered burner both to heat the oven and incinerate fumes coming out of it. A Des Champs model S81CF Thermo-Z heat exchanger captures exhaust heat at 1400°F to preheat ambient air to 1200°F at the inlet for combustion.

Using this arrangement allowed Gasmac to specify a smaller burner than would otherwise have been required, reducing fuel consumption by 85%. The system also allows more control of the oven temperature and, most importantly, saves fuel for the steel company.



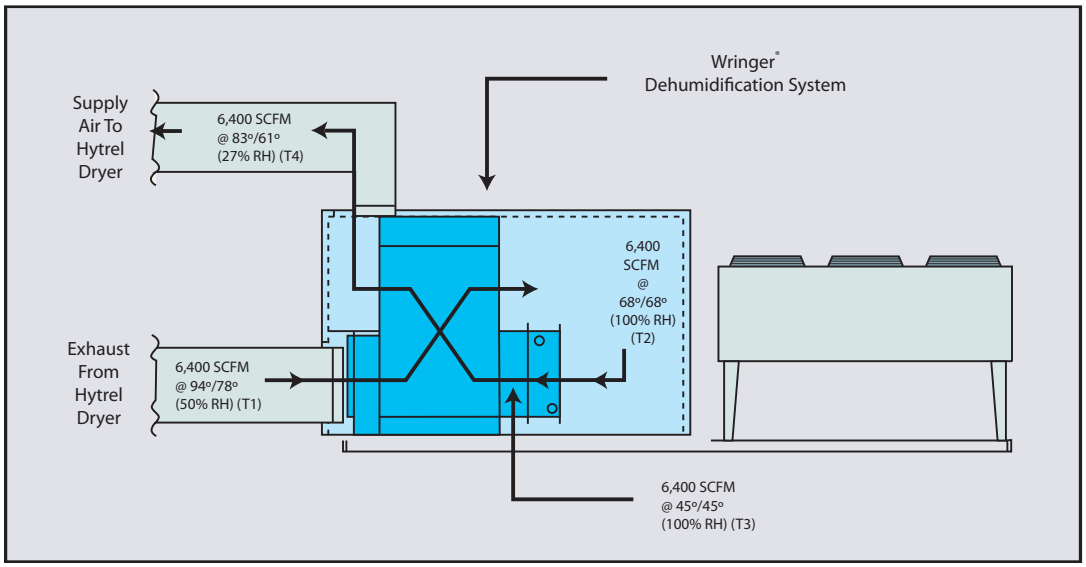
Drying a Popular Plastic

DuPont has found many applications for its high-performance Hytrel polymer and has had to expand its production capacity to keep up with increasing demand. At its Cooper River plant in Charleston, South Carolina, the global chemical and plastics giant recently built a Hytrel production facility that uses a Des Champs Wringer® dehumidification system for drying.

DuPont sells Hytrel in the form of pellets as a raw material to OEMs, who then fabricate it into a multitude of consumer products. Mostly for the automotive industry, these range from constant-velocity joint boots to covers for air bags. Hytrel works well for parts like this because of its superior cold-weather properties.

In its production process, DuPont goes to great lengths to dry the pellets to achieve the highest quality. To do this, they run fresh, hot air through them, and to dry the air, they use a roof-mounted Wringer dehumidification system made by Des Champs.

The Wringer condenses moisture out of the air by cooling it with mechanical refrigeration to a dew point of 45°F. And beyond that, outside air and cool air from the refrigeration coil pass through opposite sides of a counter-flow air-to-air heat exchanger. Heat recovery takes place to precool the warm air coming in (94°F is used as the summer design condition) to 67°F, and it reheats the cool air back up to 83°F for drying. This reduces the tonnage of the equipment required for cooling and dehumidification, and it saves energy as well.



Des Champs Energy Recovery Products

Rotary Heat Exchangers
Des Champs rotary heat exchangers offer both total energy and sensible energy recovery rotary air-to-air heat exchangers. At the heart of these extremely effective heat exchangers is a rotating honeycomb matrix. For total energy recovery, a highly selective molecular sieve desiccant is permanently bonded to an aluminum substrate. The total energy recovery rotor typically recovers 75% to 85% of both the temperature and moisture contained in the exhaust air. This recovered energy is transferred to pre-cool and pre-dehumidify outdoor air in the winter, thus reducing air conditioning loads in the summer and heating and humidification loads in the winter.

Heat Pipe Heat Exchangers
Des Champs' standard individually charged, all aluminum, integral fin and 1-inch I.D. large diameter tube heat pipe heat exchangers provide sensible energy recovery, or serve as a wrap around precooler/reheater to a cooling coil for augmented dehumidification. In typical counterflow energy recovery applications, the heat pipe assembly recovers 60% to 70% of the temperature contained in the exhaust air. This recovered energy is transferred to pre-cool outdoor air in the summer and to pre-heat air in the winter.

High Temperature Heat Exchangers
Des Champs leads the industry in the application, design and manufacture of industrial heat exchangers. Our product line includes the Thermo-Z® plate heat exchanger and the Thermo-T™ shell and tube heat exchanger. They recover up to 85% waste heat from energy consuming processes in applications up to 1600°F. They are fully welded units and guaranteed to have a maximum leakage rate of .01%. All units are custom designed to meet the specific requirements for the application. Design flexibility includes multiple airflow configurations, special materials of construction, variable tube size/spacing, and variable plate thickness/spacing. Options include insulation, expansion joints, access doors, waterwash system, or integration into a complete skid mounted system including filters, fans motors, controls, etc.

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