ECU SUSTAINABLE ENERGY AND ENVIRONMENTAL ENGINEERING

# Details for follow-up activities: Air Heat Exchanger for Dryer Recommendation

**Installation and Labour**

Some companies will request a flat rate charge while others determine payment by the hour. Approximately 5 to 8 hours is needed to replace a heat exchanger. An assumption of $35/hr base pay with 2 technicians was selected. Therefore, installation and labour costs can range from $350-$560 USD.

**Implementation Schedule**

Aforementioned, approximately 5-8 hours is needed to replace a heat exchanger. With this information, it is recommended to conduct installations outside of normal industry hours. This is so the normal workflow and production rate is not disrupted.

**Maintenance cost**

Maintenance costs includes checking for corrosion, scaling, and fouling of heat exchanger materials. The build-up of these defects may lead to higher future maintenance costs and decreased productivity.

Dew point corrosion occurs for a variety of reasons. The type of fuel used, its sulphur content and moisture content are contributing factors. However, by far the most significant cause of dew point corrosion is the metal temperature of the tubes. If the metal temperature within the tubes drops below the acid saturation temperature, usually at between 190°F (88°C) and 230°F (110°C), but sometimes at temperatures as high as 260°F (127°C), then the risk of dew point corrosion damage becomes considerable.

Checking the air heater twice annually is ideal. A routine check can consume up to 2 hours for testing. An HVAC or MEP consultant may cost $25 - $45 per hour. The estimated cost per visit is $90, totalling in $180 per year.

**Energy Saving Cost**

Natural gas used yearly for dryers = 105,230 MMBTU

Natural gas saved by preheating the dryer air:

$$105{,}230\ \text{MMBTU} * 10\% = 10{,}523\text{MMBTU}$$

Annual savings from preheating the dryer air :

$$12{,}627\ \text{MMBTU} * \$4.20\ \text{per MMBTU} = \$\mathbf{44{,}120}$$

**Dept of Energy Recommendation** [1]

Many processes produce dirty or corrosive exhaust gases that will plug or attack heat exchangers. Some exchangers are more resistant to these conditions than others, so if the process is not a clean one, do not give up without investigating all the options. When discussing it with potential vendors, be sure to have a detailed analysis of the troublesome materials in the exhaust gas stream.

A heat exchanger, placed in the exhaust stack or ductwork, can extract a large portion of the thermal energy in the flue gases and transfer it to the incoming combustion air. Recycling heat this way will reduce the amount of the purchased fuel needed by the furnace.

Payback Period = (Cost of combustion air preheating system, obtained from the supplier or contractor) ÷ (Reduction in fuel usage, Million Btu/hr x Number of operating hours per year x Cost of fuel per Million Btu)

Using current or projected energy costs, estimate preheated air savings with this example or the Process Heating Assessment and Survey Tool (PHAST) available from the Department of Energy's Industrial Technologies Program.

**Success Stories**

For fuel-fired industrial heating processes, the Department of Energy states one of the most potent ways to improve efficiency and productivity is to preheat the combustion air going to the burners [1]. They experimented with various temperatures and reported the savings in the table below.

| Furnace Exhaust Temperature (deg F) | Pre-heated Air Temperatures (deg F) | Percentage of gas savings |
|---|---|---|
| 2400 | 1600 | 51% |
| 1800 | 1400 | 37% |
| 1600 | 1200 | 30% |
| 1400 | 1000 | 24% |

Processes operating above 1,600° F are generally good candidates, while preheated air is difficult to justify on processes operating below 1,000° F. Those in the 1,000˚ to 1,600° F range may still be good candidates but must be evaluated on a case-by-case basis.

**Suppliers**

| Brand | Price | Contact | Website |
|---|---|---|---|
| Heseco | Model Specific | (920) 749-1960 | Here |
| Chester Jensen | $7,500 | 1-844-201-9609 | Here |
| Honeywell | Model Specific | Here | Here |
| Standard Xchange | $4,813.53 | 1-866-321-6321 | Here |
| Emergent Coils | Model Specific | 855-334-3158 | Here |

**Technicians**

| Company | Location | Phone | Website |
|---|---|---|---|
| Sam Pollard and Son | Greenville, NC | (252)-752-3661 | Here |
| Central Heating and Air Conditioning | Kinston, NC | (252)-527-6676 | Here |

**References**

[1] U.S. Department of Energy, "Energy Tips - Process Heating," 2007.