

# Drying and Cooling

## Energy Savings in Tough Economic Times

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**VENTILEX USA Inc.**

2005 saw natural gas prices go from \$6.30 to almost \$16.00 per MM ft<sup>3</sup> or a “decatherm”. Over the last 8 months, #2 fuel oil prices have risen in similar fashion, tied to gasoline prices and the cost of oil per barrel. In the famous words of my father “*it’s not going to get any cheaper*”.

While at the time of this writing, prices have fallen back to the level they were in May 2005, I am sure everyone will agree that it probably won’t stay there. So what can you do to lessen the impact of rising fuel cost? The answer is: **Use less fuel.**

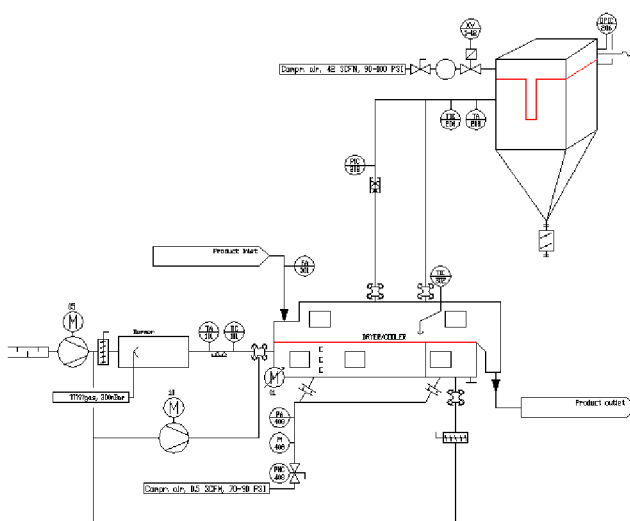
And that is where VENTILEX comes in. If you are using a rotary dryer, most likely you are throwing away 40 to 60% of your money up the stack. To know for certain, see what your exhaust temperature is. If it is above 160 F, you are “blowing away” your hard earned money.

VENTILEX has been manufacturing Fluid Bed Dryers and Coolers since 1964. With an installed base now of over 200 Fluid Bed Dryers and Coolers in the aggregate industry alone, we have learned a few things along the way about energy savings and energy management.

In a Fluid Bed Dryer, drying is accomplished in a cross-flow manner. This means that the air is rising and the material to be dried is moving horizontally. The air is heated ideally to the highest possible temperature that the equipment design will allow, and then the pressurized air is forced through holes in a perforated bedplate. The airspeed “lifts” the material to be dried, and in the case of aggregates, bubbles like boiling water. The transport of the material is accomplished in the VENTILEX system by a gentle cam motion, instead of using high frequency vibrations like other fluid bed dryers. This means that you do not have cracking of the equipment from vibration, compacted or falling off insulation, popped rivets, broken bolts, or large downtime for costly repairs.

### Controls

All the major competitors of VENTILEX utilize a simple cascading controller setup for management of the drying. Almost all depend on monitoring stack temperature to control the burner. And most over-dry the product. The reason is clear why the set points for the exhaust air temperatures are set high on Rotary and other Fluid Bed dryers – changes in incoming moistures cannot be accounted for, so the operators over dry “to be sure”. In reality, if the moistures were constant with the in feed material, then the “Stack temperature” method would work OK. But we all know that that is not the reality.

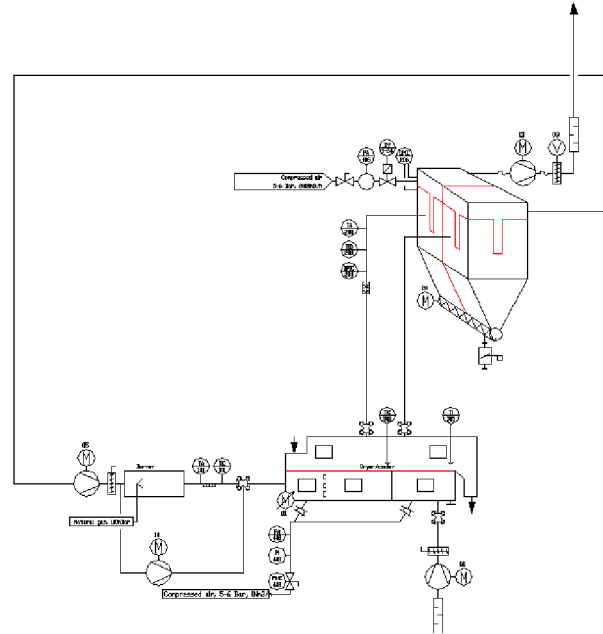


In the VENTILEX system, we utilize a sophisticated PLC, the Allen Bradley SL/C 5/05. Since all materials when they reach a desired moisture obtain a certain temperature, the VENTILEX method is to monitor the product temperature as it is drying, along with the exhaust temperature. Using an algorithm that has taken 10 years to perfect, we can “predict” the amount of gas or fuel oil that is needed at the burner, without over shooting. Changes in the feed moisture will be seen

immediately at the exhaust air temperature, however, monitoring the product temperature will allow us to adjust the burner more or less, in an accurate fashion, so as not to under dry or over dry the product, thus giving accurate discharged moisture. When compared to a rotary, this method typically saves about 27% of the energy and at least 8.5% over most other Fluid Bed Dryers.

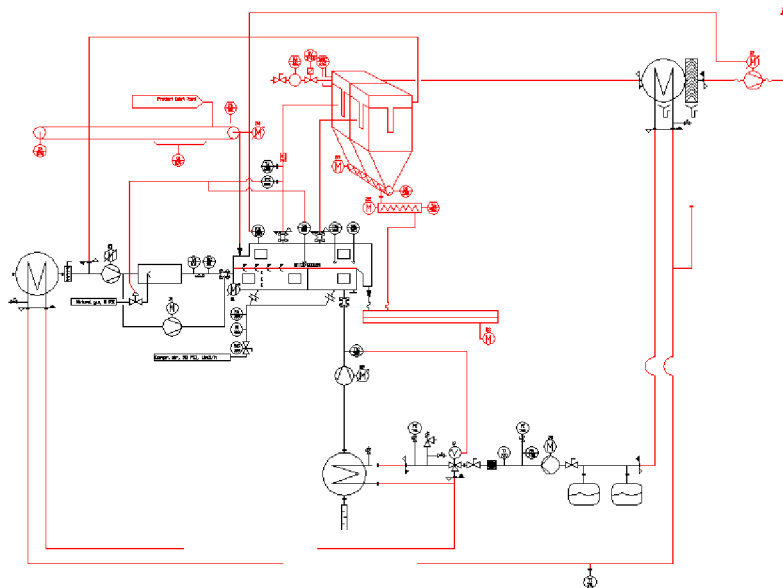
**Recirculation**

Further energy savings are then possible by cooling the product. For aggregates, condensation occurs when either placed in the silo or the bag above 140 F with ambient standard conditions. Things get worse with high humidity's and cool temperatures. So with a VENTILEX Fluid Bed, we now combine a Cooler section in the same equipment (unlike a rotary where it must be 2 different pieces of equipment). In a VENTILEX Fluid Bed Dryer/Cooler combination, we take the air from the cooler section in the hood, filter it in the baghouse separately from the heated air discharge, and then re-use this air as makeup air for the supply air/burner. This saves approximately 11% of the energy. But there is still more we can do....!



*Typical VENTILEX Dryer/Cooler with Recirculation*

**Evaporative Cooling**



6 years ago VENTILEX started a research project to adapt "Evaporative Cooling" to our control scheme. Evaporative cooling only works, and saves money, with a tightly controlled drying logic and an exact cooling air temperature. With evaporative cooling, the cooling air is slightly heated in order to raise the air's capacity to hold moisture. In this method, the aggregate is not dried to the final set point in the dryer section, but instead we leave about 0.5% additional moisture, or about 1% overall. This also

means that the product is not heated up so far – and logically you can understand that less heating means 2 things: less spent on gas/fuel oil and; easier to cool the product. For sand, evaporative cooling works quite well, with an additional savings of about 10% over a VENTILEX Fluid Bed Dryer/Cooler with re-circulation of the cooler air.

So in total, at least 42% can be saved over a “good” rotary and at least 21% over most typical Fluid Bed Dryers.

When comparing a VENTILEX Fluid Bed Dryer/Cooler to a rotary, the savings of a complete system are enormous. Take the following examples based on 6% moisture dried to 0.5%, and the therms used per ton:

Moisture in	Typical Rotary	Best Rotary	Other Fluid Bed Dryers	Standard VENTILEX	VENTILEX With Recirculation	VENTILEX with Evaporative Cooling
6%	3.10	2.84	2.25	2.06	1.84	1.67

As you can see, the savings are huge. In this example, you would save 46% over the “typical” rotary. How does that transfer to dollars? See below:

Below is based on 75 tph sand drying cost / hr

Cost/therm	Typical Rotary	Best Rotary we have found	Other Fluid Bed Dryers	Standard VENTILEX	VENTILEX With Recirculation	VENTILEX with Evaporative Cooling
\$ 0.60	\$139.50	\$127.80	\$101.25	\$92.70	\$82.80	\$ 75.15
\$ 0.80	\$186.00	\$170.40	\$135.00	\$123.60	\$110.40	\$100.20
\$ 1.00	\$232.50	\$213.00	\$168.75	\$154.50	\$138.00	\$125.25
\$ 1.20	\$279.00	\$255.60	\$202.50	\$185.40	\$165.60	\$150.30
\$ 1.40	\$325.50	\$298.20	\$236.25	\$216.30	\$193.20	\$175.35
\$ 1.60	\$372.00	\$340.80	\$270.00	\$247.20	\$220.80	\$200.40

In a typical mortar plant operating 4,000 hrs per year, and based on \$1.00 per therm, the savings over a rotary dryer with a VENTILEX System utilizing Evaporative Cooling and Predictive Drying would be: **\$429,000** – In one year alone! Imagine the savings on a 24/7 operation or if gas prices rise back to the fall of 2005 levels.

In most cases, the payback for the new equipment and installation is less than 2 years!

### [A System Approach](#)

At VENTILEX, we don’t just sell you a dryer/cooler and send you on your way for the Dust Collector, Controls, MCC, ductwork, insulation, and instruments. We take a system approach. All the parts must work together in order for the system to operate properly and to achieve the energy savings.

VENTILEX not only designs and builds the dryers, but we also design and manufacture the dust collector, ductwork, MCC and PLC/Controls, and we supply the finest direct drive fans (guaranteed noise levels under 80 dbA), and burners with the lowest emissions, - a complete system from end to end. VENTILEX will even incorporate, control, and supply feed and discharge conveyors, along with the installation of all the equipment if you like.

With a VENTILEX System, you won't be spending time on repairing the equipment. Your tons/hr throughputs will be maximized, your energy costs reduced dramatically, and you will have a reduction in the personnel required for the drying operation. A VENTILEX system really only needs 1 person to oversee the operation and that person can split their time between drying and other duties. The PLC computer carefully watches over all aspects and even notifies the operator when something is not correct, and tells them where the problem is!

Since VENTILEX designs and manufacturers the entire system, the installation takes about ½ the time of other dryer installations. Everything is modular, pre-fitted and marked. We use the CAD-CAM method of manufacturing. Insulation is installed at our factory, thus saving time and money.

If you would like a comprehensive quotation that not only explains our equipment in detail, but also shows typical installation footprint, please give us a call at 513.874.4451 or visit our website at [www.sanddryer.com](http://www.sanddryer.com)

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**Nugent Sand, Muskegon, MI**



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**Basalite - Dixon, CA**  
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