LOUISVILLE DRYER COMPANY
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Drying Distillers Grains (DDGS):
Steam Tube Dryer vs. Direct Heat Dryer

Consider a drying system to process 20 tons per hour of combined wet cake and syrup produced in an ethanol plant or distillery. At 66% combined feed moisture dried to 10% moisture content, the mass balance would be as follows:

	Feed Material	Discharge Material
Dry Solids	13,600 LB per Hour	13,600 LB per Hour
Moisture	26,400 LB per Hour	1,511 LB per Hour
Total	40,000 LB per Hour	15,111 LB per Hour
Evaporation	24,889 LB per Hour	

The heat requirement is for drying is approximately 27.2 MMBTU.

Direct Heat Dryer
Using a direct heat dryer system for the process above, the system schematic would be similar to the one shown in Figure 1. Note that the dry material recycle loop is not shown since it would be identical for either dryer.

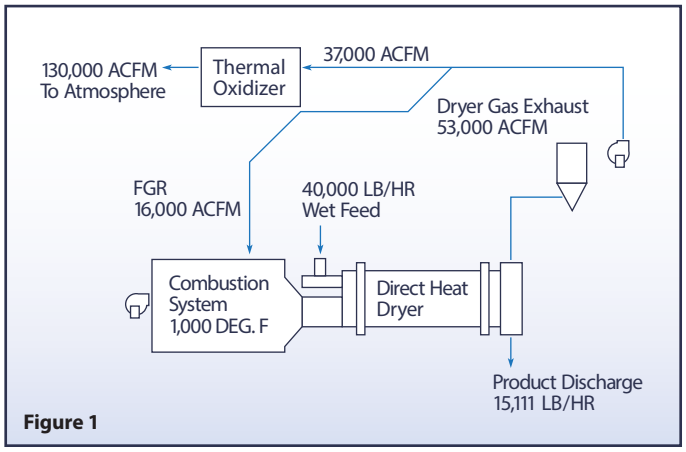

Figure 1

The direct heat dryer in the example is equipped with a combustion system having a dryer inlet gas temperature of 1,000 F. Based on this system, the dryer exhaust gas discharge volume would be 53,000 ACFM. The system is provided with a flue-gas recirculation system. This is included for two reasons:

1. Since the gas is laden with water vapor and combustion products (form having passed through the burner), it lowers the amount of oxygen present in the drum in order to prevent combustion from occurring inside the dryer.
2. It reduces the amount of gas having to go to the thermal oxidizer for destruction of VOC.

This operating cost of the system is not just the drying but also the cost to operate a thermal oxidizer. This type of system also requires two additional fans, which cause increased horsepower requirements and exponential complexity of controlling the process.

Steam Tube Dryer

Using a steam tube dryer system for the process above, the dryer system schematic would be similar to the one shown in Figure 2.

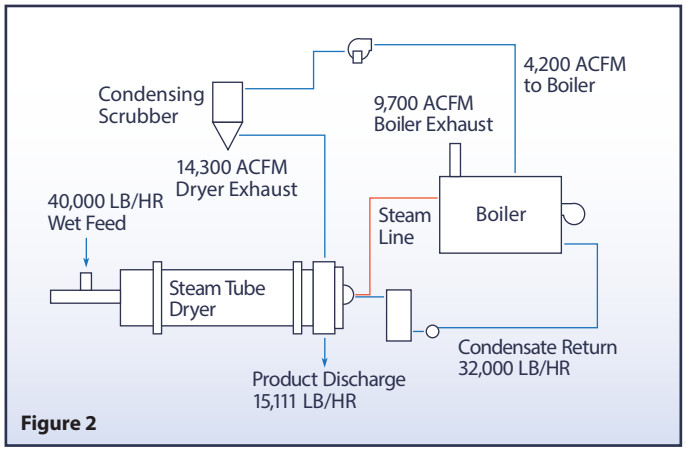

Figure 2

Because the steam tube dryer employs steam to do the work, very little air is required. Typically, the dryer is run under slight negative pressure and a small amount of air is vented into the dryer to offset dust form puffing out. Thus, the primary content in the exhaust stream is water vapor instead of air. Since water is condensable, the exhaust gas goes through a condensing scrubber, where a great deal of the water is collapsed back to liquid phase and removed. The remaining saturated air stream is taken back to the boiler and used as combustion air. The boiler acts as the VOC combustor potentially negating the need for an RTO.

Summary

Employing a steam tube dryer for processing DDGS may initially appear to be a more costly system (because the dryer itself is more expensive, and a boiler is required). Yet, for true comparison, the following factors of the overall system also need to be considered:

1. Steam tube dryers do not require heated air to operate.
2. Steam tube dryers do not require recycle gas stream for fire prevention.
3. Steam tube dryers are easily controlled by simple modulation of a steam valve.
4. Steam tube dryers do not require a thermal oxidizer system for most biomass systems.
   If an RTO is required, it is 75% smaller than with direct heat.
5. Steam tube dryers have an atmospheric environmental impact a fraction of direct heat dryers.
6. Considering the cost of an RTO verses a boiler, the steam tube dryer system may have a smaller initial cost.
7. Since the boiler for a steam tube dryer system may act as a thermal oxidizer, the operating cost is much less.

Contact our Application Engineers at 1-800-735-3163 or at louisvilledryer.com to discuss your operation's specific needs and how we can help you achieve **The Lowest Cost per Revolution**.