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INTERNATIONAL

TECH BITS

Which Gas Fired Reactivation?

Reactivation systems play a critical role in desiccant dehumidification by regenerating the desiccant material, enabling it to absorb moisture effectively from the air. The heating method used for reactivation significantly impacts system performance, efficiency, and long-term reliability. Selecting the correct heating

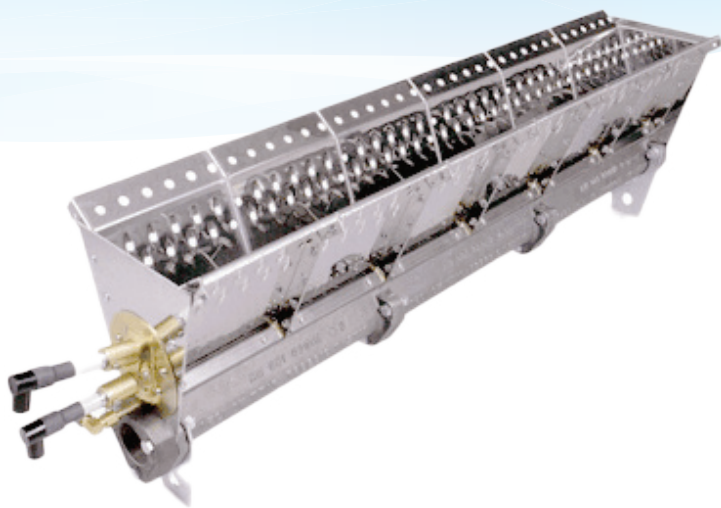
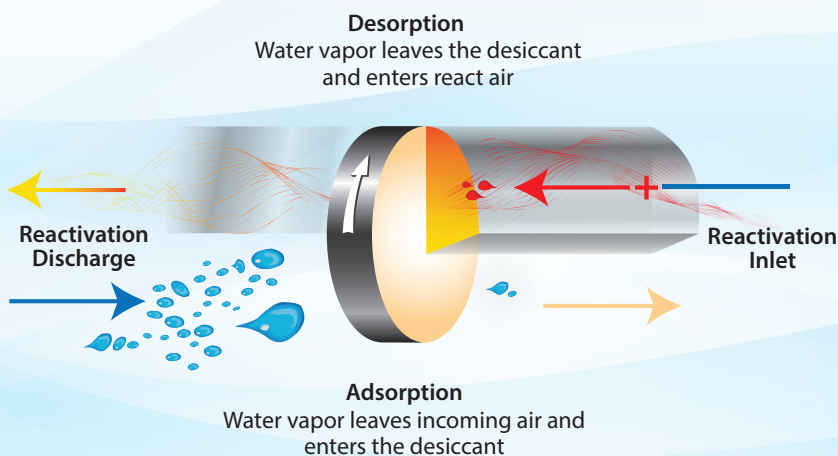
method—direct-fired (DF) or indirect-fired (IDF) gas—ensures that the system meets specific application requirements while optimizing energy use, maintenance needs, and operational flexibility. Understanding the differences between these methods is essential for making informed decisions tailored to project demands.

Definitions

Reactivation Process

The reactivation process involves the reactivation fan drawing air through the following stages:

- **Reactivation Inlet:** this is typically fresh air.
- **Pre-Filter:** protects the rotor from contaminants.
- **Heater:** the heat source that heats the reactivation air.
- **Desiccant Wheel:** moisture is desorbed from the rotor as the air passes through.
- **Reactivation Fan:** the fan that draws air through the reactivation process.
- **Reactivation Discharge:** the moisture-laden air is then discharged to atmosphere.



Direct Fired (DF) Gas Reactivation

Direct-Fired (DF) Gas Reactivation

- A direct fired gas heater has an open flame in the reactivation air stream.
- The gas is fed directly to the burner where it combusts with the oxygen in the reactivation air stream and directly heats the air.
- Products of combustion travel through the reactivation airstream and are discharged.

Indirect Fired (IDF) Gas Reactivation

Indirect-Fired (IDF) Gas Reactivation

- An indirect fired gas heater has a flame that is encased within a metallic heat exchanger over which the reactivation air stream flows across.
- The gas is fed to a series of small burners that fire within the tube of the heat exchanger where combustion air is introduced through a separate air stream.
- The combustion process occurs within the heat exchanger tube, heating the tube and indirectly heating the reactivation air stream.
- Products of combustion are drawn through the tube via a separate exhaust fan and need a separate duct to discharge outside of the building.



DF and IDF Reactivation

Primary Advantages

- A direct fired (DF) gas reactivation system is more efficient, more compact in size, easier to service, less costly, more adjustable in the field, and provides better turn-down control.
- An indirect fired (IDF) gas reactivation system provides combustion-free air that does not contain the products of combustion.

Item	Direct-Fired (DF) Gas	Indirect-Fired (IDF) Gas
Efficiency	Near 100% thermal efficiency.	Approximately 75-80% efficiency; decreases at higher inlet air temperatures.
Equipment Size	Compact design with smaller footprint.	Larger footprint due to additional components. Requires multiple heaters in series.
Maintenance	Simpler with fewer components; ground-level access enhances safety.	More complex; rooftop access required, posing safety concerns.
Serviceability	Easier with fewer failure points.	Increased complexity and material stress at high temperatures.
Initial Cost	Lower initial costs due to simplicity of heater assembly.	Higher initial costs due complexity of heater assembly and installation due to exhaust flue venting requirement.
Field Adjustability	High flexibility for in-field adjustments to meet changing conditions.	Limited options for capacity or temperature adjustments post-installation.
Operational Cost	Lower operational costs due to higher efficiency.	Higher operational costs due to lower efficiency, which requires higher gas consumption.
Air Quality	Reactivation air contains combustion by-products.	Reactivation air does not contain combustion by-productions.

Conclusion

Climate by Design International (CDI) has the capability, and has done, indirect-gas fired reactivation. However, given the facts above, CDI recommends and uses direct-fired gas reactivation for a majority of the desiccant dehumidification systems that we manufacture; including applications such as: Ice Arenas, Archival Storage, Lithium Battery Production, and many other Critical Processes.