

Komline-Sanderson Paddle Dryer

**Drying technology for
biosolids, sludges
and by-products**



Komline-Sanderson

Why dry?

There are economic and environmental benefits to drying biosolids, sludges and by-products. In municipal and industrial facilities, the K-S Paddle Dryer is reducing disposal cost and converting waste into marketable by-products. The K-S Paddle Dryer provides a reliable and efficient method for drying filter cakes and centrifuge concentrates. For remediation, it is used to remove hazardous volatile organics.



- **Reduce disposal cost through**

- reduced weight
- reduced volume
- reduced landfill fees
- removal of hazardous volatile organics

- **Produce stable and marketable products through**

- production of Class A exceptional quality biosolids (EPA recognized as a PFRP)
- conversion to beneficial products
- reclaiming residuals

- **Increase fuel value through**

- production of an autogenous material
- generation of alternate fuel sources

Drying applications:

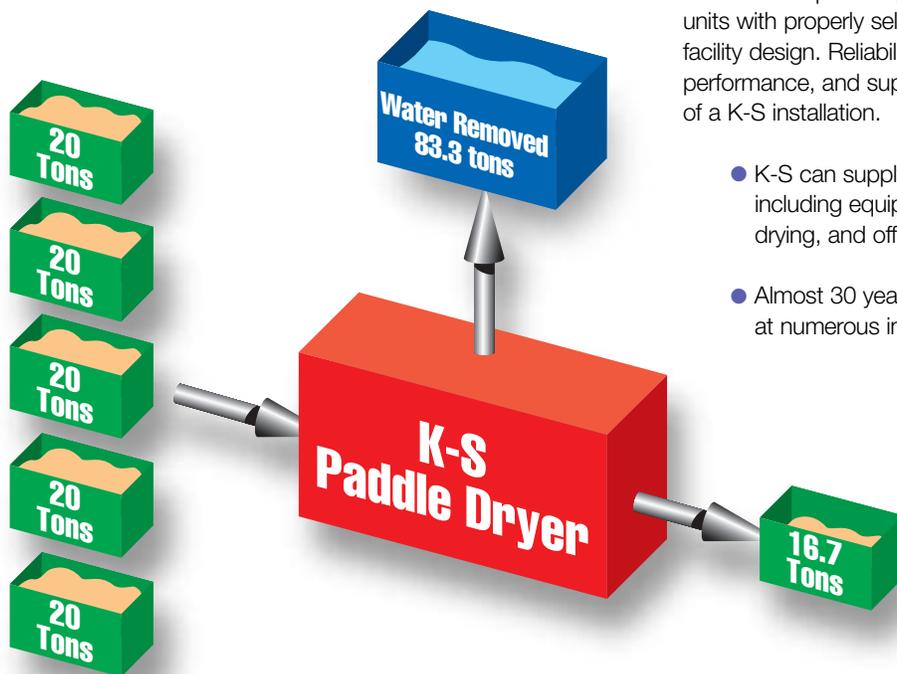
The chemical, petrochemical, pharmaceutical, food, metal working, mineral processing, and pulp & paper industries, as well as municipalities, are using the K-S Paddle Dryer to dry:

- Biosolids**
- Food Waste**
- Hydroxides**
- Dredgings & Soil**
- Fibers & Fillers**
- Oily Waste**
- Metal Oxides**
- Process Residuals**

Demonstrated capabilities

A successful plant depends on the integration of the key process units with properly selected ancillary equipment and the right facility design. Reliability, ease of operation, rugged construction, performance, and superior customer service are all trademarks of a K-S installation.

- K-S can supply an entire sludge processing plant, including equipment for pumping, thickening, dewatering, drying, and off-gas processing.
- Almost 30 years of successful sludge drying experience at numerous installations, worldwide.



83% weight reduction is achieved when drying from 15% dry solids to 90% dry solids

Indirect drying

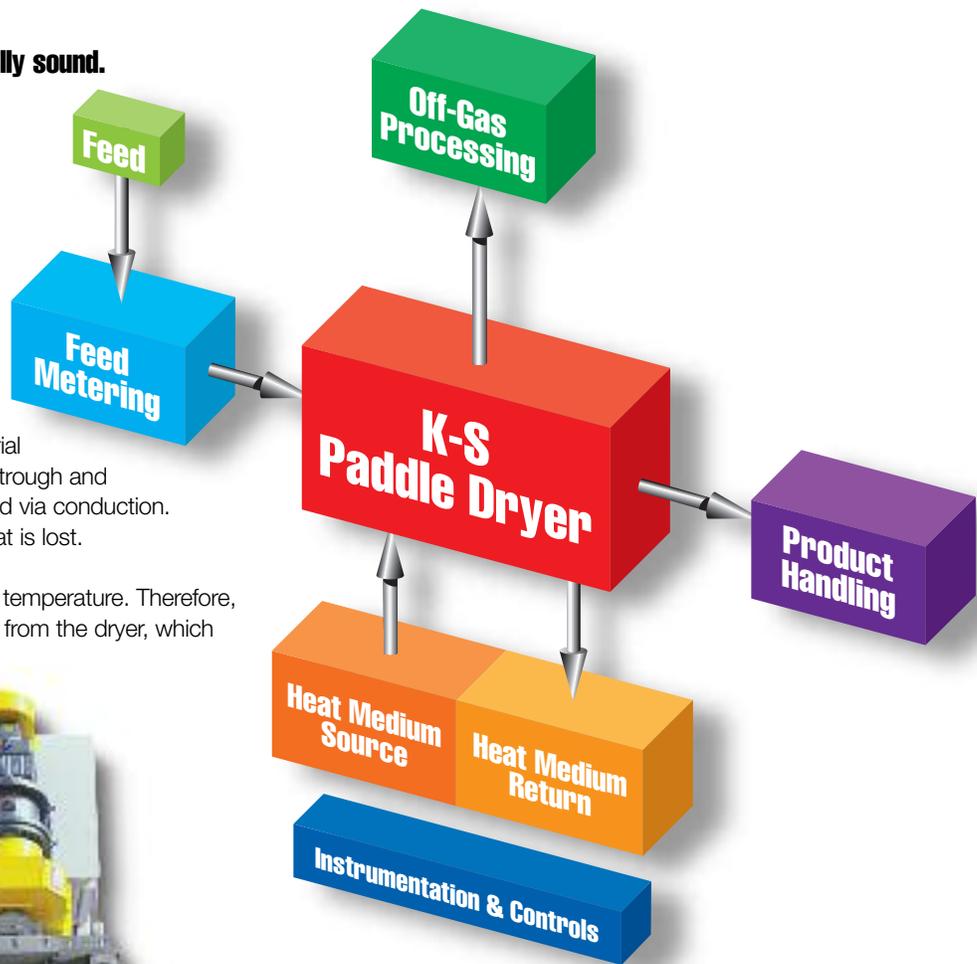
Cost-effective and environmentally sound.

- High thermal efficiency
- Minimal off-gas volume
- Low off-gas temperature

Indirect dryers have a metal wall which separates the process mass from the heat source (steam, water, or oil). High thermal efficiency is obtained because the heat from the thermal medium goes directly into the process mass. As the material comes into contact with the heated trough and agitators, the process mass is heated via conduction. With an insulated dryer, very little heat is lost.

Exhaust gas is minimal and at a low temperature. Therefore, the volume of non-condensable gas from the dryer, which might require treatment, is minimal.

Dual counter rotating shafts with intermeshing wedge-shaped paddles produce intimate mixing and optimize heat transfer.



High heat transfer rates

The K-S Paddle Dryer is an indirect heat transfer device which utilizes a high degree of mechanical agitation to enhance contact with the product being dried. Evaporation rates per square foot of heat transfer surface are maximized through self-cleaning paddles and the mixing effect.

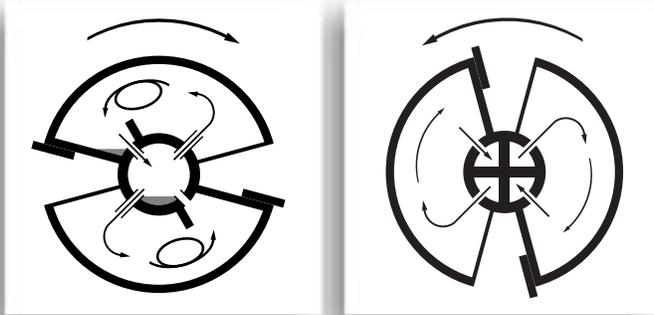
Movement of the process material between the slanting surfaces of the revolving wedge-shaped paddles generates shearing forces, which clean the paddle surfaces and maximize conductivity. Counter rotating shafts move the material away from the walls, cleaning the walls by means of the tab on each paddle. This results in higher heat transfer rates than disc or single shaft designs.

The wedge-shaped paddles, and the intermeshing of the dual agitators, create a localized mixing effect around the paddle. This allows more individual particles in the bed to be exposed directly to the heat transfer surface, thereby increasing the heat transfer rate, allowing the use of smaller equipment.

Model 8W - 390 square feet of heat transfer area.

K-S Paddle Dryer

Dual counter-rotating shafts with unique intermeshing hollow wedge-shaped paddles produce intimate mixing, optimize heat transfer, and provide a self-cleaning feature. A large heat transfer area to volume ratio is achieved by the use of hollow paddles and a jacketed vessel, through which the heating medium flows. The result is an efficient, compact machine with less space requirements and lower installation cost.



Steam

Steam enters the hollow shaft through a rotary joint and is evenly distributed to all paddles. Steam enters the paddles, regardless of their orientation. Condensate is removed with each revolution.

Thermal fluid

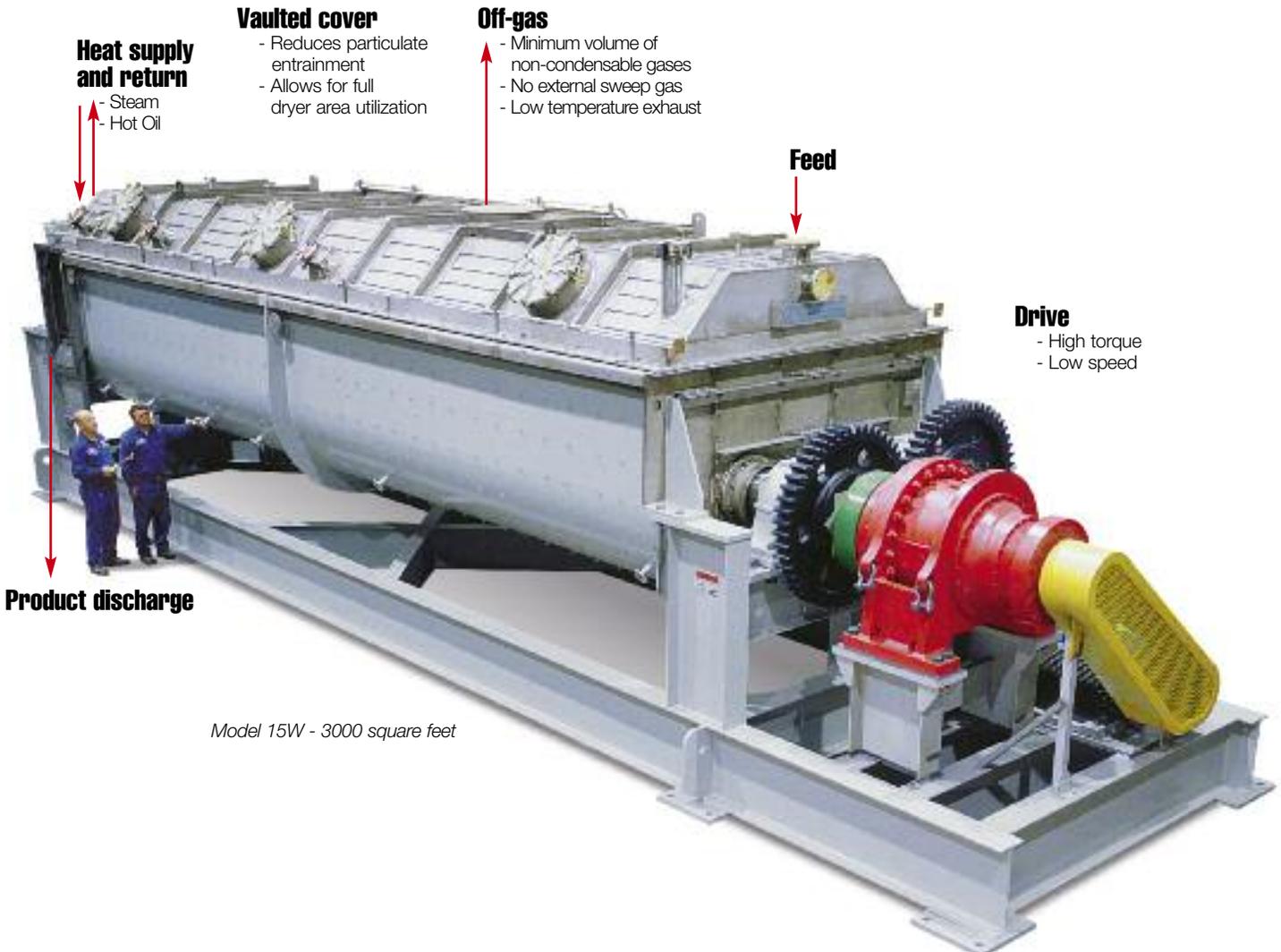
Hot oil (thermal fluid) enters and exits the hollow shaft through a rotary joint. Pressure from the supply pump forces liquid through the hollow paddles, regardless of orientation.

Process design

K-S process and project engineers provide assistance at all phases of the project. Depending on your specific requirements, K-S can provide you with a dryer, or a complete system.

K-S can provide pilot testing at our laboratory or at your plant.

- Indirectly heated with steam or hot oil
 - Steam from 30 to 200 psig (or higher)
 - Hot Oil up to 750° F
- Products having different dryness levels or high discharge temperatures
 - Dry to 99+% dry solids
 - Partially dry to achieve autogenous conditions
 - Produce a product of any intermediate dryness
 - Product can approach the temperature of the heating medium
- Continuous operation
 - Continuous process on a once-through basis
- Accepts a wide variety of feeds
 - Slurries, pastes, cakes, granules, or powders
- Enclosed process
 - No fugitive emissions
 - Atmospheric, vacuum, or pressure designs
 - Purged systems with solvent recovery



Heat supply and return

- Steam
- Hot Oil

Vaulted cover

- Reduces particulate entrainment
- Allows for full dryer area utilization

Off-gas

- Minimum volume of non-condensable gases
- No external sweep gas
- Low temperature exhaust

Feed

Drive

- High torque
- Low speed

Product discharge

Model 15W - 3000 square feet

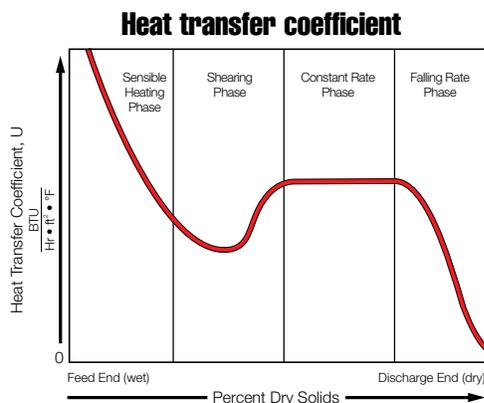
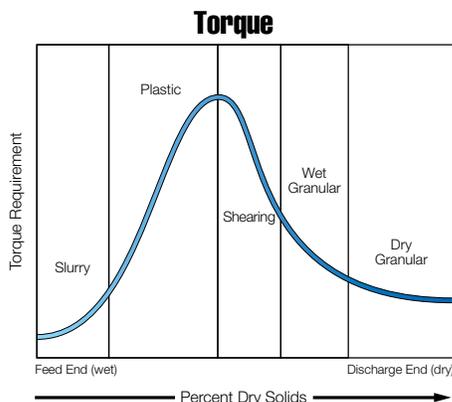
K-S can handle the sticky stuff.

The K-S Paddle Dryer transports material, regardless of its handling characteristics. Pre-conditioning the feed by mixing with recycled dried product, to make it conveyable, is not required. This results in lower capital, operating, and maintenance cost.

As sludges dry, they go through a number of transitions in handling characteristics. These changes are directly related to the solids content. For example, extremely wet sludges and extremely dry sludges require substantially less torque than sludges in the plastic – or *sticky* – phase, when high torque is required. The K-S Paddle Dryer is designed with high torque capabilities to increase its process flexibility. Extra torque keeps you on-line, even if upset conditions develop.

Material is typically conveyed through the K-S Paddle Dryer by displacement. As material is added to the dryer, it is assimilated into the bed by the mixing action of the agitators. Hydraulic head pressure, combined with the action of the wedge-shaped paddles, pushes material around and through the paddles. While there is a high degree of agitation and some back mixing, the overall flow pattern can be described as a plug flow movement down the dryer.

For fast drying material, where very high volumes need to be conveyed, the paddles can be pitched and the dryers inclined to increase the conveyance rate.



Low cost operation

- Easy to operate
 - Requires minimal attention
 - Simple instruments monitor the process
 - High efficiency
 - Low off-gas volume

Low maintenance cost

- Designed for high torque and low operating speed
- Simple durable design for easy and low maintenance
- No internal parts to adjust or maintain
- No metal to metal contact
- Shafts, pillow block bearings, and drive components are designed for long life under adverse conditions, insuring long term mechanical integrity
- Robust frame supports split pillow block bearings
- Grease-purged stuffing boxes. Alternate seal designs are available

Low installation cost

- Compact
- Small off-gas system
- Vertical shaft removal reduces building size requirements

Features

- Designed, constructed, and stamped per ASME Code or PED
- Heat transfer areas from 30 to 3300 square feet
- Carbon steel, stainless steel, or alloy construction
- Abrasion-resistant hard-surface coatings are available

Komline-Sanderson technology and equipment

Wastewater treatment and sludge management



Clarify
Thicken
Dewater
Dry
Pump



K-S Paddle Dryer/Cooler



Dry
Heat
Cool
React
Crystallize
Sterilize

Komline-Sanderson ...

Reliability, ease of operation, rugged design, proven performance and excellent customer service are hallmarks of Komline-Sanderson installations.

Vacuum and pressure filtration



Filter
Dewater
Clarify
Extract
Cake Washing
Product Recovery

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