



LCI

Part of the Nederman Group

Thin Film Drying Technologies



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LCI Thin Film Drying

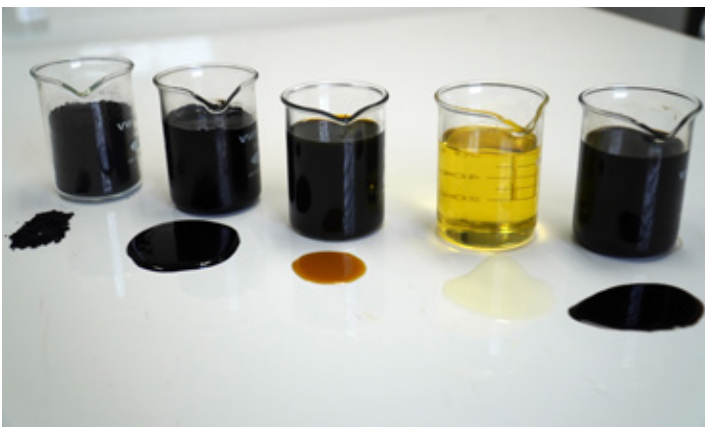
LCI Thin Film Contact Dryers are widely used throughout the chemical process industries to convert liquids, slurries, and pastes to free-flowing solids in continuous, single-pass operation.

There are two types of LCI Dryers, vertical and horizontal. Both are indirectly heated, either by steam or hot oil. Both can be operated either semi-batchwise or continuously, at atmospheric pressure or under vacuum.

Unlike direct heated dryers in common use, LCI Dryers require no sweep gas. By design and performance these contact dryers are particularly suitable for heat-sensitive products which must be carefully dried in a short time under vacuum.

Drying efficiencies for both the vertical and horizontal dryers are high, with approximately 1.15 pounds of steam required per pound of water evaporated.

Transform a Slurry to a Flowable Powder in One System



LCI Thin Film Dryers are able to dry oil sludge into flowable powder and recover valuable fuel products at the same time.



Vertical CP Dryer

LCI Vertical Thin Film Contact Dryers

LCI Vertical Thin Film Dryers are able to dry feed materials to free-flowing solids in a single pass.

Operation

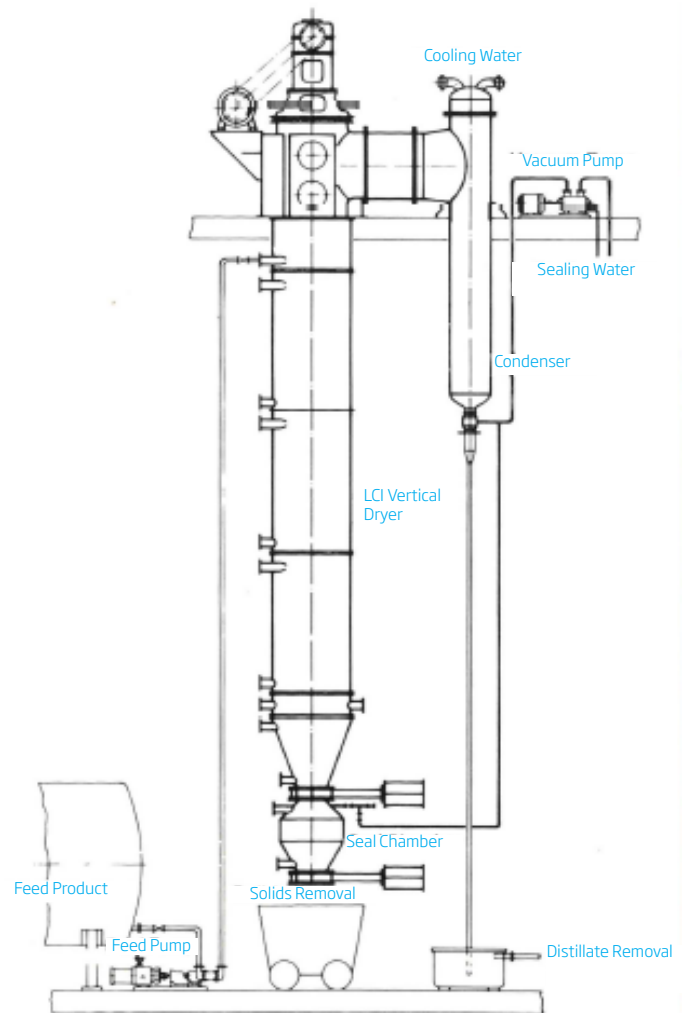
Product enters into the vertical dryer above the heated zones. The rotor spreads the product over the heated wall in a highly turbulent thin film. Evaporation proceeds rapidly, forming a slurry which moves down the heated wall and is further dried to solids. Solvent vapors leave the dryer at the top. In this example, the residue is a free-flowing powder which is removed through a vacuum air lock. Solvent vapors are condensed and removed from the system via a barometric leg (or a centrifugal pump).

Benefits

- Dilute feed materials dry to free-flowing solids in a single pass- a one-step operation that eliminates several process steps.
- Reduced energy requirements; less than 1.15 pound of steam per pound of water removed.
- Thermal degradation of heat sensitive or hazardous products minimized by low residence time "contact" drying.
- Fouling of the thermal surface eliminated by scraping action of pendulum blades.



Vertical CP
Dryer Rotor



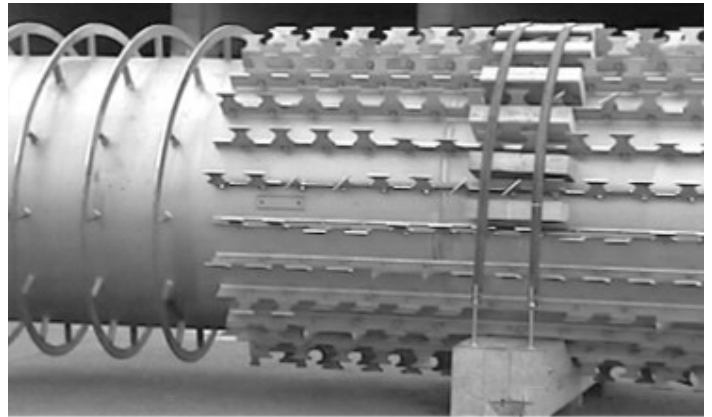


LCI Horizontal Thin Film Dryers

LCI Horizontal Dryers are used for drying slurries, filter cakes, and wet powders.

Operation

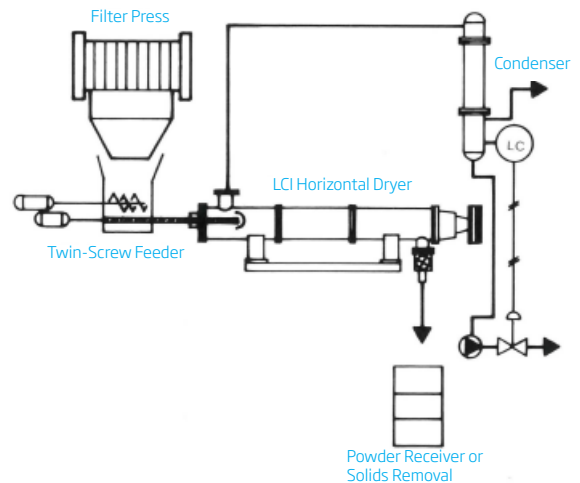
Feed materials enter the dryer and are forced into the heated zone by an augur feed blade. In the heated section, flat blades on the rotor spread the material over the thermal wall, preventing buildups and continuously exposing every particle of the product to the heated surface. The dried material passes through the discharge system (an air lock when operated under vacuum) into the powder receiver.



Rotor transport zone

Benefits

- Dryer may be operated as a contact dryer under vacuum and as an atmospheric, contact dryer without a sweep gas.
- Reduced energy requirements; less than 1.15 pound of steam per pound of water removed.
- Airborne dust eliminated because sweep gas not required; drying process conforms to EPA and OSHA requirements.
- One pass, "plug-flow" drying; product inventory is less than one pound of product per square foot of dryer surface.
- Rotor design prevents product sticking to thermal surface.

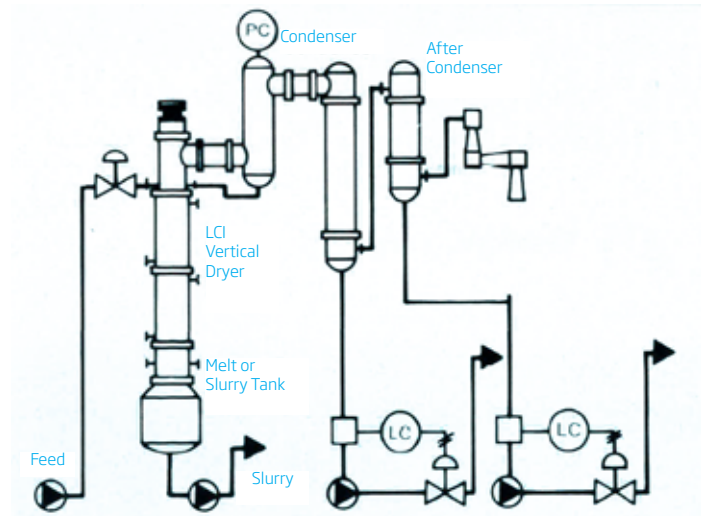




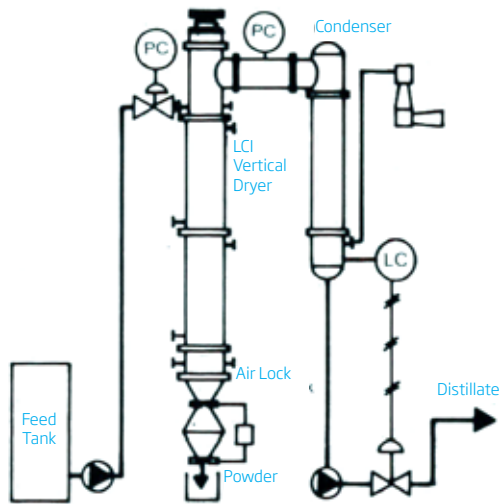
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Applications for Vertical Thin Film Dryers

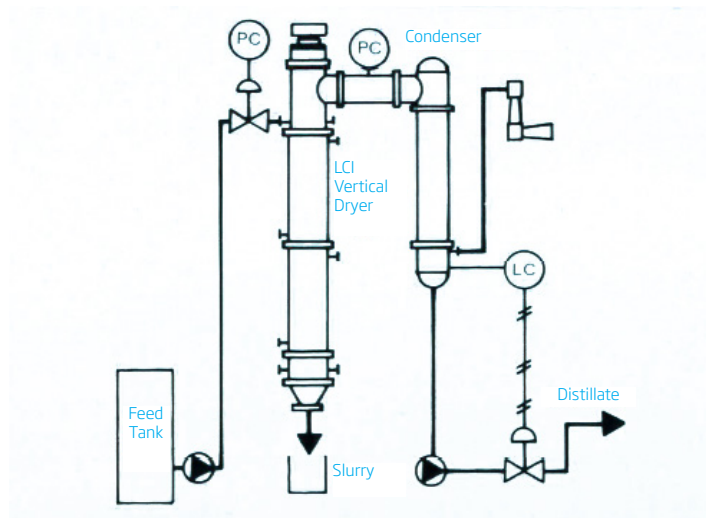
Feed Characteristics	Solutions & Slurries
Powder Characteristics	Free flowing, must be shear stable
Residence Time	Approximately 1 minute
Back Mixing	Virtually none
Special Features	Easy to control, high heat transfer, short heat history



For recovery of valuable products from feeds containing suspended or dissolved solids which need to be re-slurried or melted for easy discharge.



For drying dilute solutions and suspensions into flowable powders, inorganic pigments, sulfates, chlorides, bromides, xanthates, polymers, caffeine, and sodium gluconate. For recovery of valuable solvent from feed.



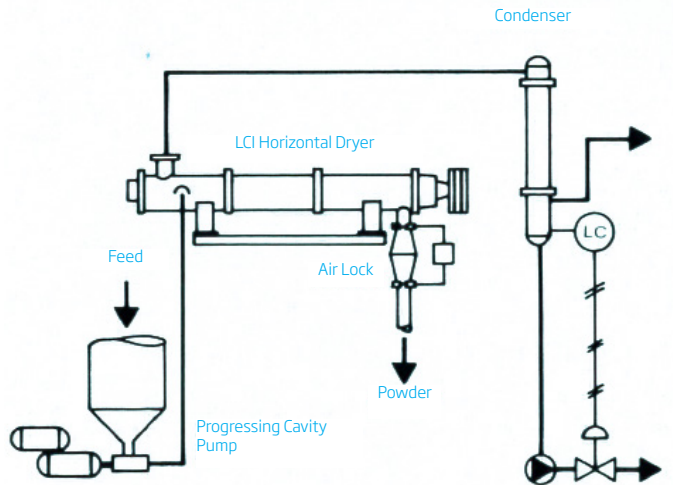
For concentrating solutions or suspensions of organic and inorganic crystalline products to a thick slurry.



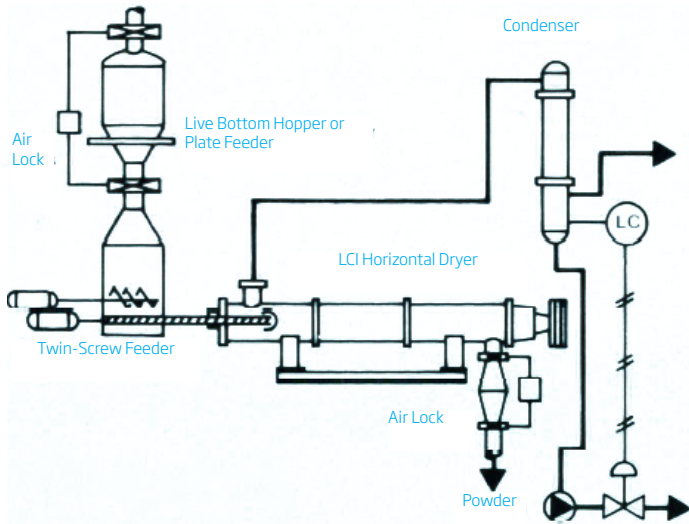
Vertical CP Dryer
Blade Rotor

Applications for Horizontal Thin Film Dryers

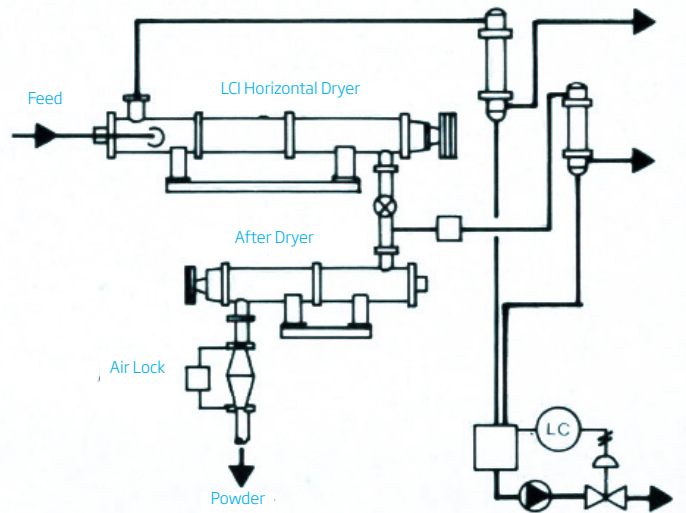
Feed Characteristics	Wet powders or cakes
Powder Characteristics	Free flowing, must be shear stable
Residence Time	Approximately 4 minutes
Back Mixing	Limited back mixing
Special Features	Heats and cools in one machine, configurable blade solutions



For continuous vacuum drying of pumpable presscakes, suspensions and solutions to dry product specifications.



For continuous drying (atmospheric or vacuum) of nonpumpable powders, presscakes and friable materials.



For two-stage drying or drying/reaction of dilute feed streams to a finished dry product.



*Horizontal
Dryer Rotor*

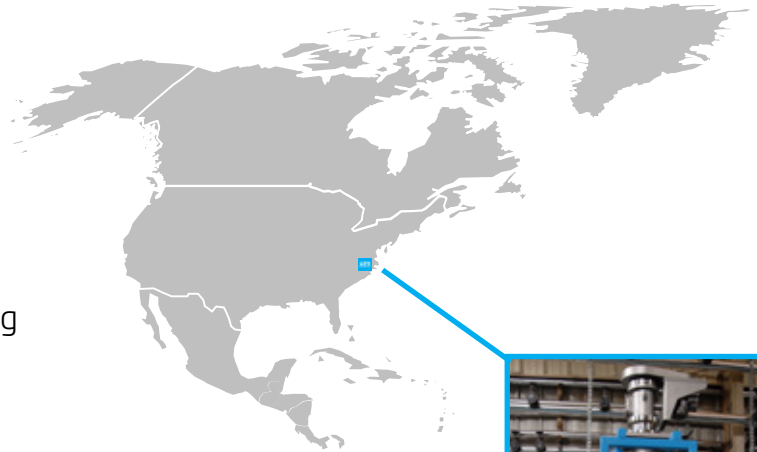
Thin Film Drying Testing at The LCI Test Center

The LCI Test Center is your customized resource for Thin Film Drying product development and scale up, and is the most comprehensive thin film development facility in the industry.

It is expertly staffed and equipped for process development work using LCI agitated thin film drying technology (evaporation, reaction, devolatilization, etc.).

Our team of evaporation experts provide testing, design, and feasibility samples for your challenging thermal separation process according to your stringent process requirements.

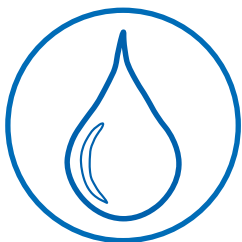
Find confidence in your processing solution at the LCI Test Center.



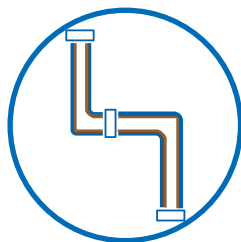
The LCI Test Center is located in Charlotte, NC



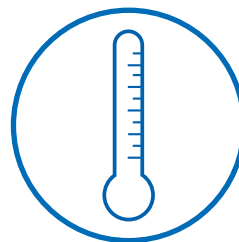
Thin Film Drying Solutions For Your Most Challenging Applications:



Viscous Products



Fouling Tendencies



Heat Sensitivity



Foaming

Sample Applications

Amines from organic solids
Aromatics from ferric salts
Glycol from salts
Sodium Lauryl Sulfate
Organic Pigments
Solvent Recovery
Pharmaceuticals
Fine chemicals
Temperature Sensitive Emulsions
Penicillin
Acetaminophen
Acetoacetanilide
Caffeine
Cyanuric Acid
Polypropylene
Thermoplastic resins
Herbicides
DMSO from salt residue
Cyanuric chloride from solvent
Glycerine from salts
Inorganic salts

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