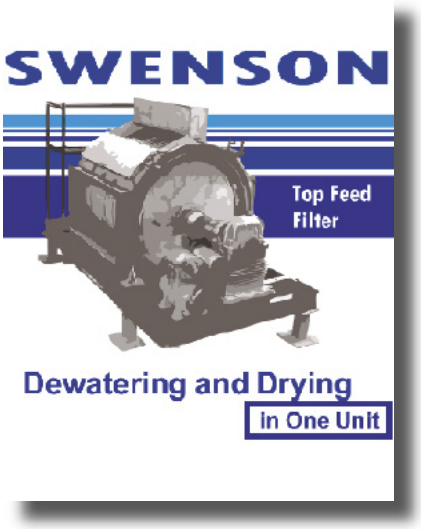
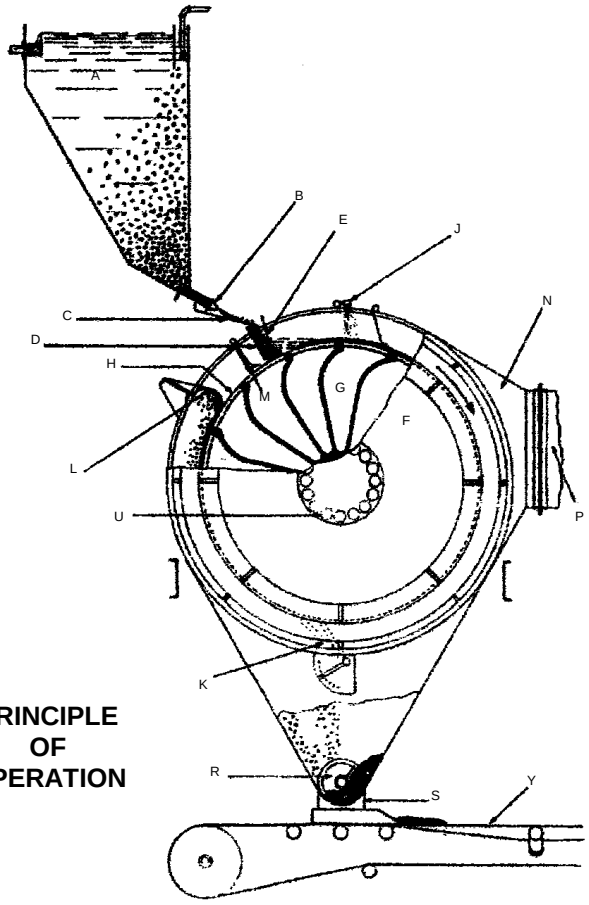
Whiting Equipment Canada Inc.
Swenson Top Feed Filter



CRYSTALLINE MATERIALS

Can be Dewatered and Dried



PRINCIPLE OF OPERATION

The feed, at low density, is pumped into feed hopper A, where suspended solids settle to bottom while excess liquor overflows and returns to process. Solids are carried through nozzles B by injecting saturated liquor, generally filtrate. The magma, formed of solids and liquor, strikes spreader apron C and flows over feed dam D. Baffle E focuses feed stream onto point on surface of drum F. As drum F rotates, the liquor enters section G, being sucked through filter medium H, on which the solids are continuously deposited as a uniform, porous cake.

The cake passes under wash J, where the impure mother liquor is replaced by water, then into the heat zone, where much of this water is removed mechanically, the remainder being heated to the boiling point. Drying now takes place, followed by removal of the outer dry crust by intermediate scraper K, allowing the thinner, partly dried cake to travel through final part of drying cycle. Cake is then completely removed by final scraper L. Spray M cleans filter medium, and the cycle it repeated.

Hot air is forced into filter hood N through duct P by booster fan, thereby preventing inleakage of cold air. Dried product drops to bottom of hood and is picked up by screw conveyor R and discharged through pipe S onto conveyor T.

G through ports U into receiver, where separation takes place. Air goes to exhauster to be removed to atmosphere. Liquor enters, seal tank and is pumped back to the process. Liquor and air pass from sections

<u>On the Swenson Top-Feed Filter</u>

Advantages:

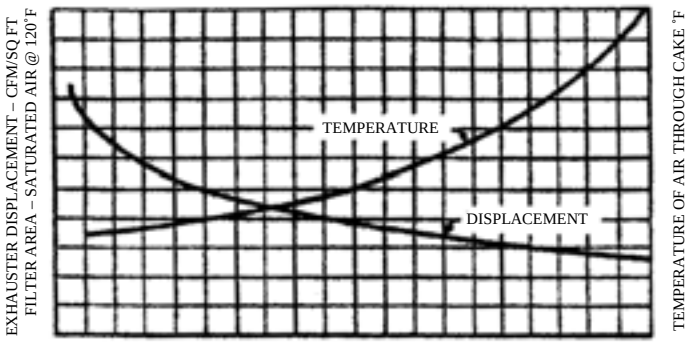
Two units in One (Filter and Dryer) - Reduces initial cost of equipment and installation.
Bone-Dry Product - Thoroughly dried by hot air under closely controlled conditions.
High Capacity - Hot air comes in intimate contact with each grain, resulting in quick drying.
High Thermal Efficiency - Mechanical removal of much of the liquor reduces heat consumption per unit output
No Dust - As hot air is filtered through the cake, floating particles attach themselves to coarse particles and are finally removed from the system.
Low Operating Coat - Automatic control reduces amount of attention required. Cost is further decreased by high capacity and high thermal efficiency.
Long Service Life - All parts move at low speed and are built of high-grade materials.
Clean Filter Stations - Operates under vacuum and under controlled conditions, minimizing spillage and waste.
Flexible - Can dry salts which normally form hydrated crystals to the anhydrous phase without special method of operation.

APPLICATION - The process of separating solids from liquids embraces a wide variety of problems and materials, from colloidal suspensions to magmas containing coarse crystals which settle so rapidly that it becomes difficult to maintain a uniform suspension of the solids by means of mechanical agitation.

In general, any suspension in which the solids settle readily can be filtered on top-feed filters and, hence, they are limited to the coarse, rapid-settling crystalline solids - especially where the solids are to be dried on the filter and where washing is not especially important. Tap-feed filters should not be used if a turbid filtrate is objectionable.

FILTER MEDIUM - Wire cloth or perforated plate is usually used as the filter medium with top-feed filters. The metal should be selected with a view to avoiding erosion and corrosion. The size of openings in the filter medium depends to some extent on the size of particles in the magma.

If the magma is fed to the filter at a higher density, these openings can be considerably larger than the largest particles in the magma, even though very small particles are present in a graded mixture.

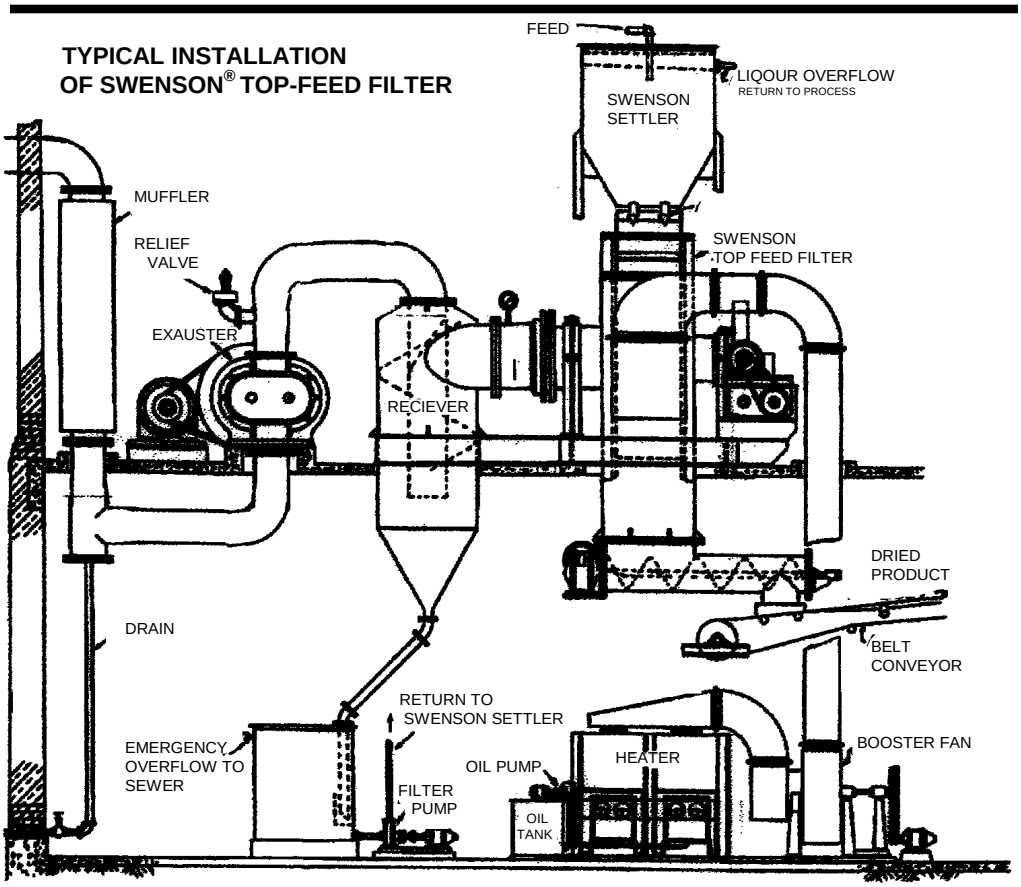


DRYING - Coarse crystalline solids form an exceedingly porous filter cake through which large volumes of air can be drawn, still maintaining a comparatively low vacuum in the system. Vacuums of 2 to 2½ in. of mercury, with exhauster capacities of 150 c.f.m. of air at 70°F. per sq. ft. of filter area, are not uncommon. By preheating such large volumes of air, the material can be discharged in a completely dry state. For any given material, the temperature of the air to the filter varies with volume per square foot of filter area.

The vacuum depends on the size and characteristics of the crystals and increases as the porosity of the cake decreases. The curve chart shows the general relationship for exhauster displacement and air temperature for cakes of various porosities as indicated by the vacuum. It will be seen that as the vacuum increases, the temperature of the air increases and the displacement decreases. Therefore, each problem must be considered from several angles before the optimum operating conditions can be determined.

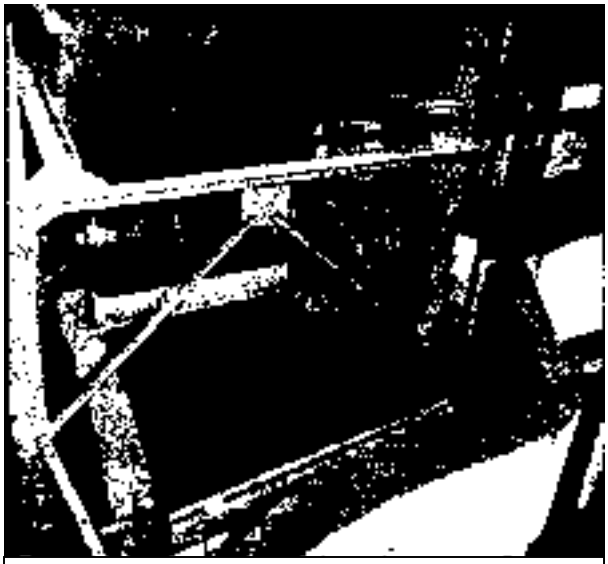
SOURCE HEAT - If the air to the filter is heated directly with gas or oil, the products of combustion will be mixed with the air. However, clean air can be delivered to the filter by using indirect heaters. Also, steam coils can be used if comparatively low-temperature air will accomplish the drying. Direct fired heaters are about 95% efficient, while indirect heaters have a thermal efficiency of only about 70%.

CAPACITY - The capacity of the top-feed filter depends on operating conditions and on the characteristics of the materials handled. Cake thicknesses range from ½ to 1½ in. and normal drum speeds from ½ to 2½ mpr. In general, when a bone-dry cake is to be delivered, capacities range between 100 and 900 lb. per sq. ft. of filter area per hour. Higher capacities are possible if only partial or no drying is required.



EFFICIENCY - The overall thermal efficiency of the top-feed filter depends upon the uniformity of the aggregate ii the cake, uniformity of cake formation on the filter, temperature of the air used for drying and rate at which the hot air used for drying, and rate at which the hot air is drawn through the cake. All these factors are controlled in any well-engineered installation. A high thermal efficiency is obtained in the top-feed filter because much of the liquor is removed from the cake mechanically during the heating period.

FEED - The uniformity of the aggregate and of the cake itself and the tendency toward cloth blinding all are related to the feed density. Swenson top-feed filters definitely control the feed density by starting with a magma of maximum density and providing only sufficient dilution to cause the magma to flow.



Top of Swenson® Top-feef filter, showing feed arrangement and dewatering zone. Note uniform cake formation.

CAKE WASHING - Where wash water is used, it must not be applied against the surface of the drum below a point approximately 450 from the vertical, or the water is apt to run down into the finished product and defeat the purpose of the filter. The top-feed filter has a limited space, after the cake has been formed, where wash water can safely be applied. Generally this is sufficient, provided thorough washing is not required.

CRUST REMOVAL - The liquor in the cake, during heating with hot air, becomes more highly saturated with the salt. As this liquor evaporates, the crystals on the surface of the cake tend to become cemented into a crust which is removed by an intermediate scraper to expose a fresh semi-dried surface to the hot gases and also leaves a thinner cake, thereby allowing a faster flow of hot air through the cake during the final drying part of the cycle.

CLOTH BLINDING - The highly concentrated liquor produced by the heating of the cake finds its way into the meshes of the filter medium, on which a hard crust is formed by the evaporation of this liquor. In some cases, this crust can be broken up with a spray of filtrate or brine under pressure, but generally a light spray of water is necessary. Water so used finds its way into the system and must be taken into account in subsequent operations.

STANDARD SIZES

The Swenson top-feed filter is available in the following standard sizes:

Drum Diameter	Drum length	Area of filter surface
4ft.	1ft.	12½ sq. ft.
4ft.	2ft.	25 sq. ft.
6ft.	2ft.	37½ sq. ft.
6ft.	3ft.	56¼ sq. ft.
6ft.	4ft.	75 sq. ft.
6ft.	5ft.	93¾ sq. ft.
6ft.	6ft.	112½ sq. ft.
6ft.	7ft.	131¼ sq. ft.
6ft.	8ft.	150 sq. ft.

SWENSON FILTERS CAN BE ADAPTED TO YOUR INDIVIDUAL PROBLEM

Since every filtration problem requires special treatment, the success of any installation depends largely upon the skill and experience of the equipment builder. In some cases, a thorough knowledge of the interlocking operation will enable him to recommend equipment and process changes that entail substantial economies.

The extensive experience of Swenson Technology Inc. in the design, construction and operation of top-feed filters (as well as evaporators, crystallizers, and dryers which are often used in conjunction with filtration) makes this company especially well qualified to help solve your individual needs.

SWENSON®

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