

NEW PROCESSING TECHNOLOGY FOR EXTRACTION

Littleford Day Ploughshare® technology offers a highly efficient and an economical means of extracting superior quality extracts.

A considerable portion of ingredients and/or products in the Food, Pharmaceutical, Nutraceutical and Biotechnical Industries begins with the extraction of the desired product from a biomass using a suitable solvent.

To extract the product from the biomass five (5) steps are needed:

1. Diffusion of the solvent into the solid particle through the particle pore structure.
2. Dissolution of the solute from the solid into the solvent.
3. Diffusion of the dissolved product from within the particle to the particle surface.
4. Washing the product-rich solvent from the biomass surface into the bulk solid.
5. Separate solvent and product.

The three (3) factors, which affect the rate of extraction, are:

1. Solvent composition
2. Temperature.
3. Particle size.

Processors have been searching for an economical way to extract these products from a biomass, and recover the residual solvent in the biomass.

In the past, this required a costly and time-consuming process involving multiple pieces of equipment (extractor, steam stripper, dryer). Further these multiple step processes were quite labor intensive.

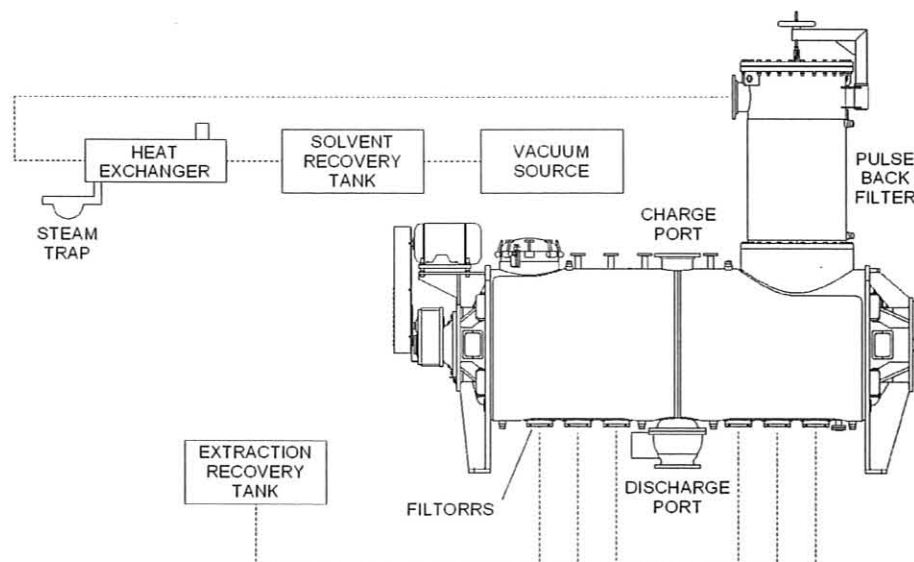
In addition, this type of processing led to an increased possibility of contamination and exposure of workers to the solvents.

Littleford Day has drawn upon its process technology, advanced Ploughshare® action and Patented Filtorr® to develop a vastly superior extraction

system. The Littleford Day system extracts and recovers the residual solvent in a single vessel.

Typically the Littleford Day extraction process follows these processing parameters.

1. Biomass is charged into the Littleford Day Ploughshare® Extractor. Because of the superior mix action in a Littleford Day Ploughshare® Extractor, much smaller particle size biomass can be used, thus shortening the extraction time.
2. The solvent is added. Hot oil or steam is initiated onto the jacketed chamber. Because the Littleford Day Ploughshare® Extractor can be operated at elevated pressures, a higher temperature may be used which lowers the extraction time. (In some applications a reflux condenser will be mounted on the unit.)
3. After the prescribed time, the Littleford Day Ploughshare® Extractor removes the extract via the Filtorr® assembly located on the bottom of the unit..
4. Steps 2 and 3 may be repeated with several batches of solvent until all of the desired product is extracted.
5. With heat still on the jacket, vacuum is initiated in the Extractor and the remaining solvent is removed. (In some applications, steam stripping is utilized as described in Littleford Day Technifax No. 123.)
6. The biomass solids that have been cooled partially via vacuum evaporation are then cooled further (via cooling water on the vessel jacket) to the appropriate temperature and subsequent processes are completed (i.e. other ingredients added, product granulated, product discharge, etc.).



The dynamic mix action developed by the Littleford Day Ploughshare® Extractor assures complete and rapid extraction of the product in minimal cycle times. This unique action is developed by rotating plow shaped mixing tools at a speed sufficient to cause the mix materials to become a pulsating mechanically fluidized bed. This aggressive, yet gentle mixing allows the solvent to be thoroughly dispersed onto the biomass.

The Littleford Day Ploughshare® Extractor is equipped with a highly efficient ASME Code heat transfer jacket. The Littleford Day Ploughshare® Extractor, specifically engineered to maximize heat transfer, generates heat transfer coefficients that are many times higher than those of traditional units.

Customers report this advanced Littleford Day Extraction Process provides:

1. Improved extraction efficiencies.
2. Controlled temperatures promote effective/optimum heat transfer.
3. Improved production rates.
4. Efficient single unit processing for the entire extraction process.
5. Technical and design capability necessary to handle various biomass particle sizes.
6. Efficient recovery of the residual solvent from the biomass (including steam stripping).
7. Capability of further processing the desolvated biomass.

The Littleford Day Ploughshare Extractor can be enhanced with an optional Littleford Day Pulse Back Filter to effectively handle the vapor stream created during drying. The Littleford Day Pulse Back Filter is used to filter the vapor stream coming off the extractor in order to prevent product carry-over into the condenser. The filter is heated slightly higher than the dew point of the vapor, thus preventing condensation. Filter bags of proper porosity are mounted over stainless steel cages and can easily be removed through the top section of the filter housing. A pneumatic pulse-jet system provides continuous automatic bag cleaning down through the bags. Since this pneumatic shock wave clears only one row of bags at a time, there is no interruption of vapor flow through the filter. This provides a smooth, continuously operating dust control system for the Vacuum dryer. The Littleford Day Pulse Back Filter can be equipped with an explosion relief door or rupture disc.

FKM Series Atmospheric/Vacuum Extractors

Littleford Day FKM Series Ploughshare® Atmospheric/Vacuum Extractors are designed to operate at levels down to 125mm of Hg absolute (245" Hg. reference vacuum). For increased levels of vacuum, pressure, or temperature, Littleford Day offers the VT and DVT Series Ploughshare® Extractors as described herein.

Littleford Day
Where Processing Ideas Become Reality

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VT Series Extractors

Littleford Day VT Series Ploughshare Vacuum Extractors operate on the same principles as the FKM Series Extractors, but are designed to meet more rigorous requirements of increased vacuum and higher temperatures. VT Series Extractors are designed to operate up to full vacuum and 50 p.s.i.g.

DVT Series Extractors

For applications with require pressure ratings greater than 50 p.s.i.g., Littleford Day offers the DVT Series Ploughshare® Extractor. Like other Littleford Extractors, the VT Series Extractor operates on the mechanically fluidized bed principle.

The Littleford Day Ploughshare Extractor is designed and constructed according to "GMP" and to meet or exceed FDA, 3A, and USDA compliance as specified by the customer.

This proven Littleford Day technology has been applied to numerous complex and difficult applications in the Food, Pharmaceutical, Nutraceutical and Biotechnical Industries. Littleford Day Ploughshare Extractors can be purchased in a variety of sizes from bench/pilot-scale up to larger units to meet most production requirements. Littleford Day can interface its system controls with existing equipment or supply fully automated process control systems.



For a free brochure or a detailed discussion, contact us at:

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