

### STEAM STRIPPING AND SOLVENT REMOVAL

The Littleford Day desolvation technology is an efficient and economic means of recovering solvents and making the remaining products more suitable for re-use or disposal after the extraction process of plant materials has taken place. A considerable portion of the ingredients for the Food, Pharmaceutical, Nutraceutical and Biotechnical Industries is manufactured from the extraction of plant materials using solvents. The extract is used either as an ingredient or may be sold directly to the consumer (i.e. vanilla, cola, paprika, etc.).

The extraction process typically utilizes a solvent such as alcohol, acetone, hexane, etc. to dissolve and remove a soluble resin from an insoluble solid. This process leaves the processor with waste in the form of an insoluble solid, which still has a fairly high level of solvent.

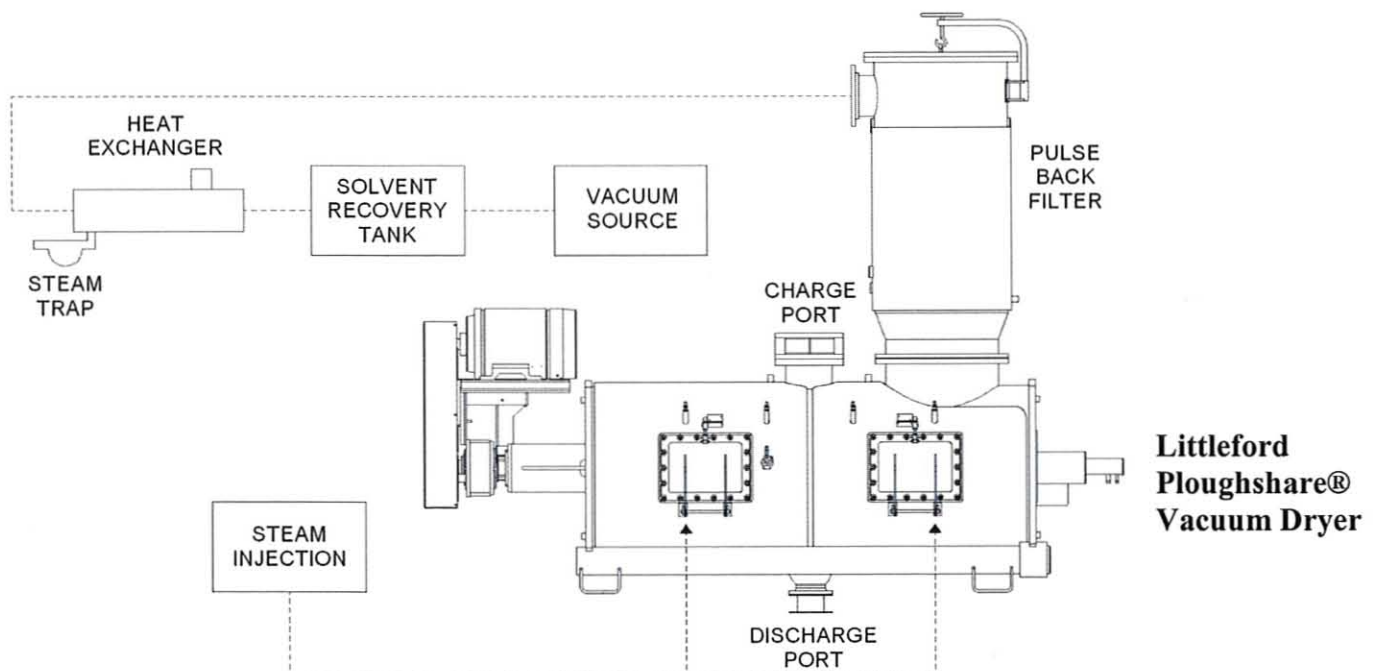
The only recourse for the processor was to dispose the waste in a landfill due to the high solvent levels. But, with higher and higher costs for landfilling items with solvents and the fact that these insoluble solids have value, processors have been searching for an economical way to remove the solvents.

Littleford Day has drawn upon its process technology and advanced Ploughshare® mix action to develop a system for solvent removal from these solids.

To facilitate the removal of solvent from these solids, the Littleford system steam strips, vacuum dries and cools the product, all in the same vessel which eliminates additional handling, thus decreasing the amount of labor hours required for this process. The Littleford system also avoids cross contamination of product.

**Typically the Littleford process follows these steps:**

1. The insoluble solids are placed in the Littleford Ploughshare® Vacuum Dryer. Agitation is initiated (plows and choppers), followed by direct steam injection into the Dryer to raise the temperature of the solids and to initiate the release of the solvent from the permeable solids.
2. After an appropriate period of time, the steam injection is completed. The vessel is pulled under vacuum, and the product is dried to remove the excess moisture and remaining solvent.
3. The insoluble solids that have been cooled somewhat 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 discharged, etc.).



The Littleford equipment used to accomplish this advanced process is the Littleford Ploughshare® Vacuum Dryer. The Littleford Ploughshare® Vacuum Dryer combines the operational features of steam injection, vacuum drying and effective heat transfer (heating or cooling) to desolvate in a single processing unit.

The Littleford Ploughshare® Vacuum Dryer operates according to the proven "fluidized bed" mixing principle, whereby the materials being processed are maintained by the plow shaped mixing elements in a mechanically fluidized "suspended" state. This permits the media (steam and solids) to achieve intimate, individualized, rapid contact with each other and the heat transfer surfaces. In addition, the Littleford Ploughshare Vacuum Dryer may be equipped with independently operated, high shear "chopper" devices to reduce the particle size of lumps or agglomerates thereby exposing undried (solvated) materials and ensuring thoroughly dried/desolvated particle interiors. Deagglomeration further shortens the drying/desolvation time required. The Littleford Ploughshare Vacuum Dryer has been specifically engineered to maximize heat transfer coefficients, which are many times higher than those of traditional dryers. This advanced heat transfer technology allows fast, single-unit desolvation.

The Littleford Ploughshare® Vacuum Dryer can be enhanced with an optional Littleford Pulse Back Filter to effectively handle the vapor stream created during steam stripping and drying. The Littleford Pulse Back

Filter is used to filter the vapor stream from the Dryer 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 through a venturi at the top of the bag. 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 smoothly operating dust control system for the Vacuum Dryer.

**We have found that the advanced Littleford process will result in:**

1. Controlled drying/desolvation through effective/optimum heat transfer.
2. Improved drying/desolvation rates.
3. Increased efficiencies of desolvation and drying.
4. Efficient single unit processing of the entire process.

The Littleford process enables the processor to have usable product with solvent levels well below the limits set by the FDA.

The Littleford Ploughshare® Vacuum Dryer is designed and constructed according to "GMP" and to meet or exceed FDA, 3A, 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 Ploughshare® Vacuum Dryers can be purchased in a variety of sizes 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:

Littleford Day, Inc.  
7451 Empire Drive, P.O. Box 128  
Florence KY 41022-0128  
Phone (800) 365-8555 or (859) 525-7600  
Fax (859) 525-1446

E-mail: [sales@littleford.com](mailto:sales@littleford.com)  
Website: [www.littleford.com](http://www.littleford.com)



**Littleford Day**  
*Where Processing Ideas Become Reality*

**Littleford Day, Inc.**

7451 Empire Drive (41042-2985), P.O. Box 128, Florence, KY 41022-0128  
859-525-7600 • Fax: 859-525-1446 • 1-800-365-8555  
Website: [www.littleford.com](http://www.littleford.com) • E-mail: [sales@littleford.com](mailto:sales@littleford.com)

**Technifax #123**