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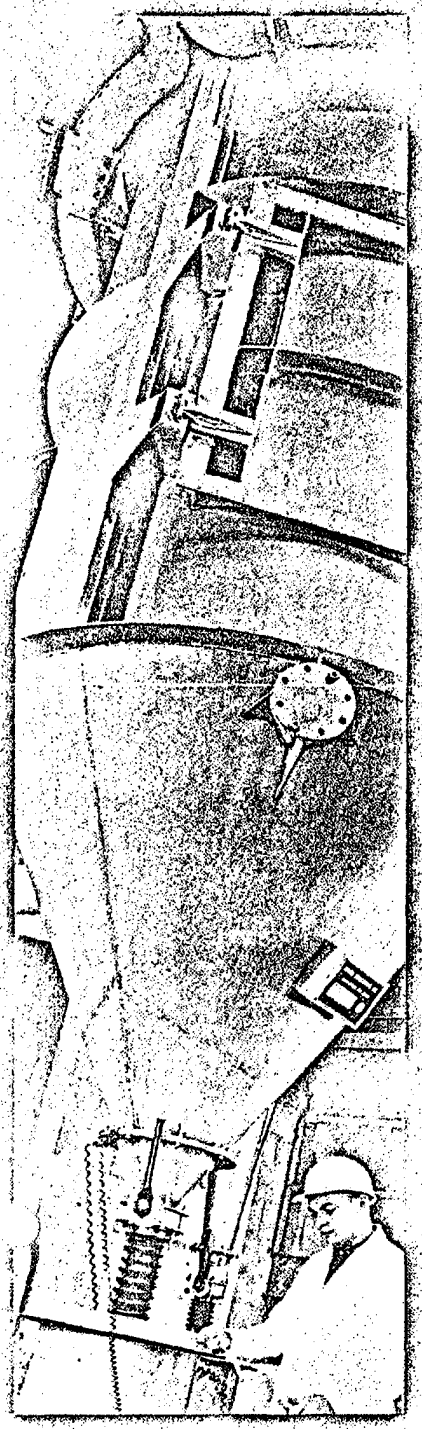
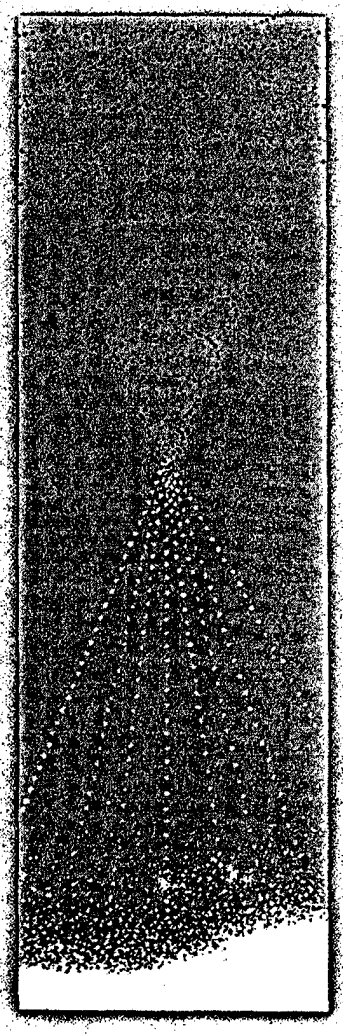


THINKING OF TURNING TO SPRAY DRYING?



Here are eight basic considerations to help you stretch your dollars

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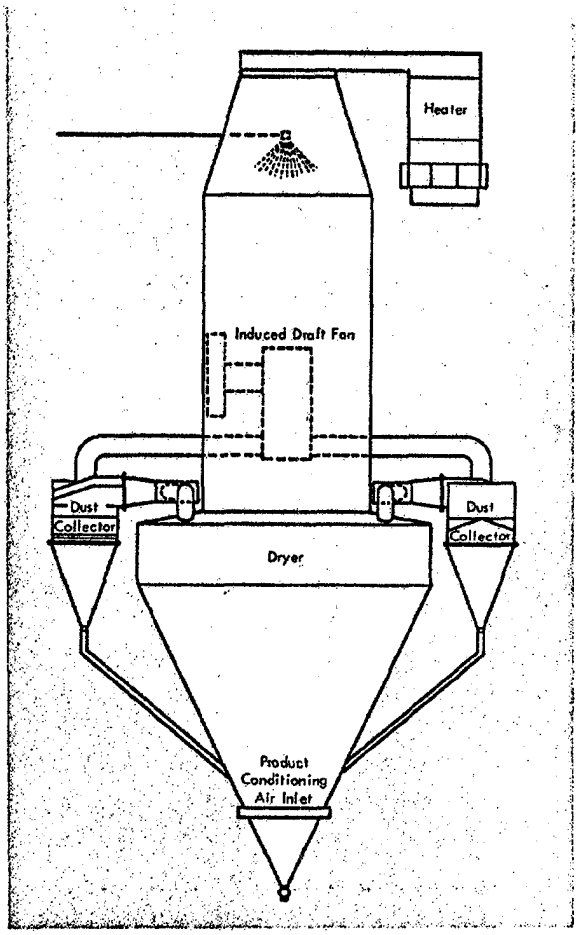
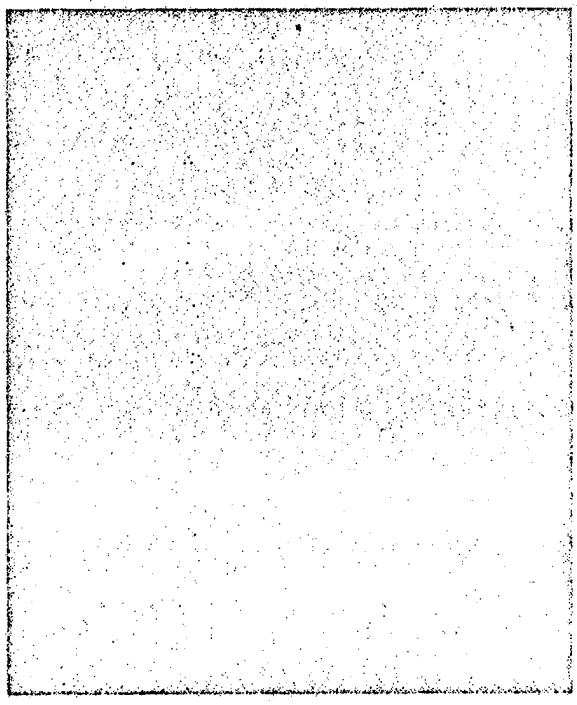


Thinking of incorporating spray drying into your plant? The purchase of such equipment involves much more than a dollars-and-cents expenditure. To aid you in planning, here are . . .

Eight things to consider when turning to spray drying



By **RALPH T. REEVE,** President
BOWEN ENGINEERING, INC.



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"THERE IS NO SUBSTITUTE for experience" . . . is a truism everywhere but seldom is it more appropriate than when designing and selecting a spray dryer for a given application. This is no job for a novice. Although the first spray drying patents were issued almost a century ago, experts are still at odds as to exactly what happens inside such equipment. The speed and complexity of the operation continues to defy all efforts to produce exact formulas which can be used directly to build spray dryers.

Today, most units are designed on the basis of actual tests conducted in experimental spray dryers *plus*.. the experience of the manufacturer. Although the initial cost of such equipment is relatively high, a spray dryer can quickly pay for itself. Used properly, a correctly designed unit may eliminate many time-consuming processing steps, slash operating and labor costs and improve product quality.

How can you be sure of getting the right spray dryer for your money? There are eight important factors that should be carefully evaluated.

To begin with, make certain that the firm you select to design and produce the equipment is competent and reliable. The concern must look at the task from a straight engineering viewpoint. The objective is the achievement of a suitable spray dryer design based on well-established facts (based on experience, coupled with special adaptation of the equipment for the specific requirements of the job.

It is never "safe" to start with a "frozen" design and expect the unit to do the task well. Too many variables are involved.

Preliminary testing

It is important to establish at the very start the optimum operating range of air temperature for spray drying the material on hand. How hot can the air be to evaporate the water from the feed stock without adverse heat effect on the dried solids? A higher permissible air temperature means that smaller equipment is needed for a required evaporation rate and that operating costs will be lower.

What is the best temperature for the air to be exhausted from the dryer to accomplish the desired degree of moisture, bulk density, solubility, particle size, potency or chemical composition of the spray dried solids? The only reliable way to answer such questions is by actual tests with the product.

The spray dryer engineering concern should start with laboratory-scale tests, working with small samples of the feed to keep cost, time and labor of this preliminary investigation at a minimum. Preferably, engineers of the client company should be present for the test runs. Results should be evaluated and samples analyzed by the client as well as the fabricator.

When the proper sample has been achieved, the engineering firm can calculate from the test data the general range of production-equipment size, its approximate price and probable operating cost.

When the project reaches the point where firm proposals are desired, a pilot-plant-scale spray drying test should be made. Laboratory test data are most valuable at this stage. Testing time and effort can now be devoted to pinning down precise points and data.

The client should, at this point, see his product in the form desired. Fundamental data to be used in the design of the spray dryer for his specific requirements should also be interpreted and made available.

Heat source important

Questions concerning the specific installation can now be considered. What is the most economical, convenient, and adaptable method of heating the air required for the spray drying? Is there a useable supply of waste heat near the proposed dryer site? What are comparative costs of existing heat sources versus a new installation serving only the spray dryer? Heating of the air used in the dryer is by far the major item of operating expense, so these points should be studied carefully.

Next comes the question of the drying chamber design. Shall it have a cone bottom or be cylindrical? Should it be located outdoors or in a building? Is it to be separately supported or tied into existing structure? What materials of construction are necessary? The spray drying engineer should have available standards, developed through experience with production spray

Spray drying check list

- ✔ Select competent engineering firm
- ✔ Determine best operating conditions
- ✔ Pick most suitable heating method
- ✔ Choose optimum chamber design
- ✔ Adapt sound atomization technique
- ✔ Find efficient product-collection system
- ✔ Obtain proper instrumentation
- ✔ Get startup assistance from manufacturer

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dryer design. This knowledge can result in lower engineering expense and sales price.

Three ways to atomize

Atomization of the feed stock must be considered. Is the feed a slurry or is it a true solution? Is the viscosity high or low? Should the dried solids have uniform particle size or should they be dispersed over a relatively wide range? What volume of feed is to be atomized per minute? These points have a direct bearing on which of the three common methods — centrifugal (spinning disk), nozzle or pneumatic atomization — is best.

Product collection

A most important part of the spray dryer equipment is the kind of product-collection system to use. This is a straightforward case of dollars and cents, but one which demands careful consideration. The engineering firm should work out with the customer the equipment which best fits the case.

The engineering concern must not be committed to any particular system or manufacturer. No spray dryer installations collect 100% of the spray dried solids, despite advertising claims to the contrary. The client's own experience with dust-collecting problems should be studied for possible assistance in the final selection.

Instrumentation

Correct instrumentation for the spray dryer is vital. Two categories of instruments are involved: one for safety, the other for operation.

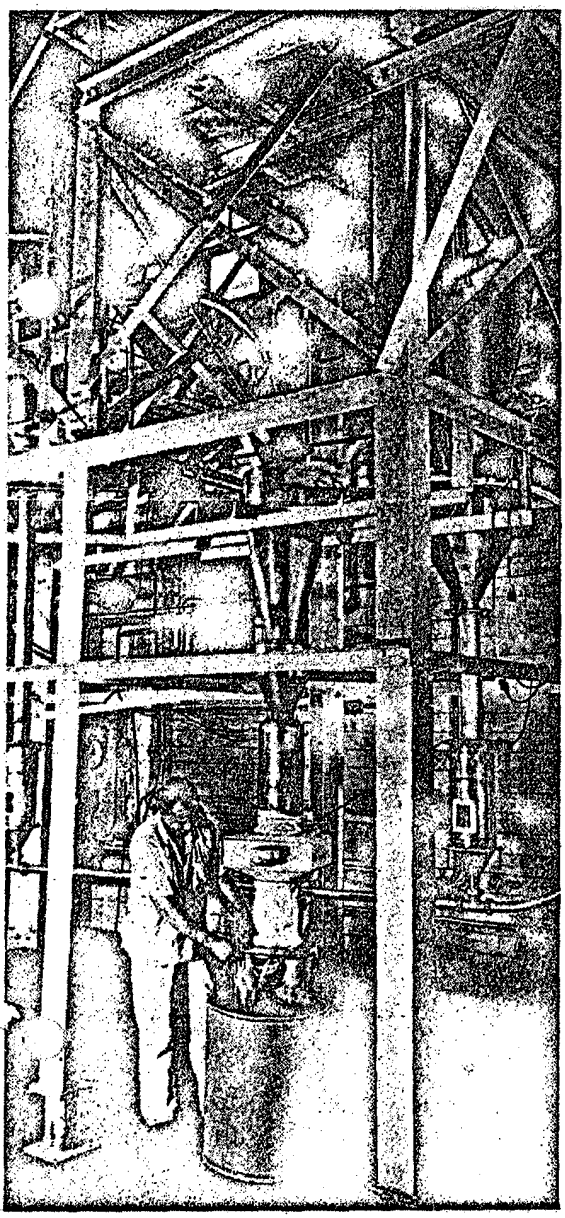
The engineering firm should provide for the air-heating furnaces all instruments required by state or national safety codes, or by engineering common sense. Adequate interlocking of safety and operating controls should always be included to shut down the dryer in case of accidental failure of the feed supply, flame in the furnace, cooling-water supply to the spray machine, power to any of the motors, belt breakage of the fan, etc.

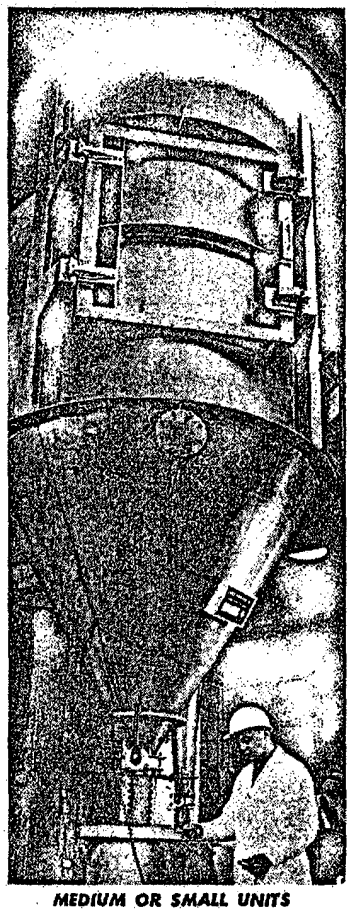
Instantaneous shutdown saves hours of cleanup and much valuable product so provision for it is essential. Operating controls should consist of those necessary to maintain a constant temperature of the hot air entering the drying chamber plus necessary instruments for regulating the feed rate. Latter are interlocked with the temperature controller for the outlet air leaving the drying chamber. Special instrumentation over and above these basic requirements should also be provided when necessary.

Once a spray dryer has been fabricated and erected, a field-service engineer should inspect the installation, make preliminary adjustment runs, instruct the client's regular operators and supervise initial operations. A complete engineering check of air-flow rates, pressure-drop readings and general operating conditions should be made to assure that performance conforms with original functional design.

The cost of this service for a limited period should be part of the purchase price. No reliable spray dryer manufacturer would shirk this responsibility, for without start-up assistance and operator training, even the best-engineered spray drying system can go awry.

After the unit has been in operation for some time, the field engineer should occasionally return for follow-up checks on engineering, production and operating personnel and practices. ■





***MEDIUM OR SMALL UNITS** can be located indoors, make clean-cut installations*

***". . . A MOST IMPORTANT PART** of the spray dryer is the kind of product-collection system to use."*

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