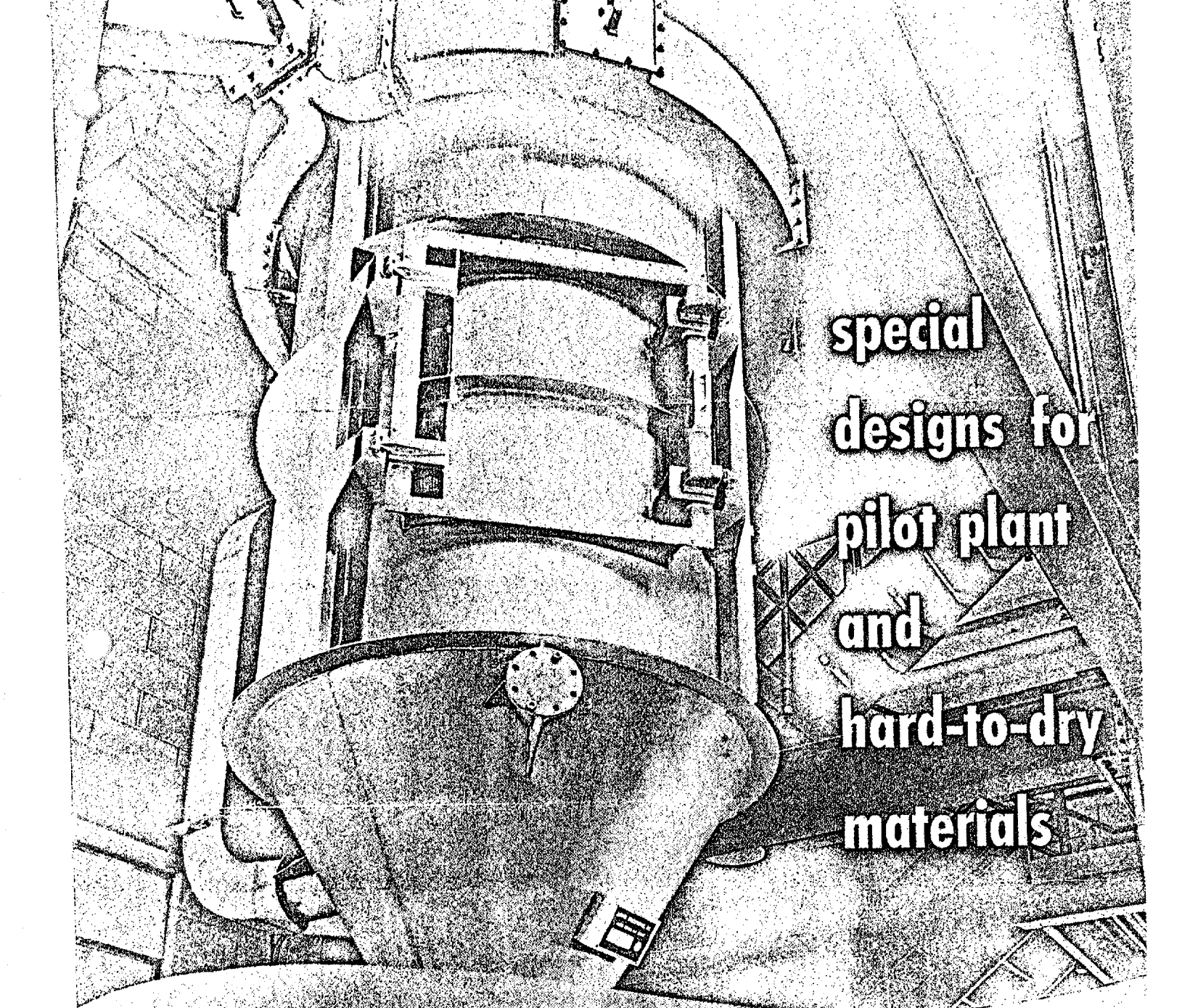
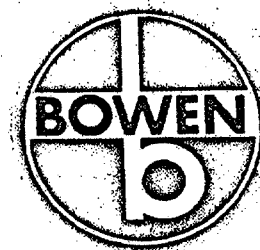




**special
designs for
pilot plant
and
hard-to-dry
materials**

**BOWEN SPRAY DRYERS
for PILOT PLANT and
MODERATE PRODUCTION**



N40630

standard sizes for moderate production— up to 20 tons/day

THE Bowen 7- and 10-ft.-diameter Spray Dryers (No. 2 and No. 4) were designed specifically to fill the need of the moderate producer whose production rate was too high for the Bowen laboratory model and too low for the high-tonnage custom spray dryer. They were also designed to meet the budget requirements of the moderate-sized company through standardization of basic components with customization only where necessary.

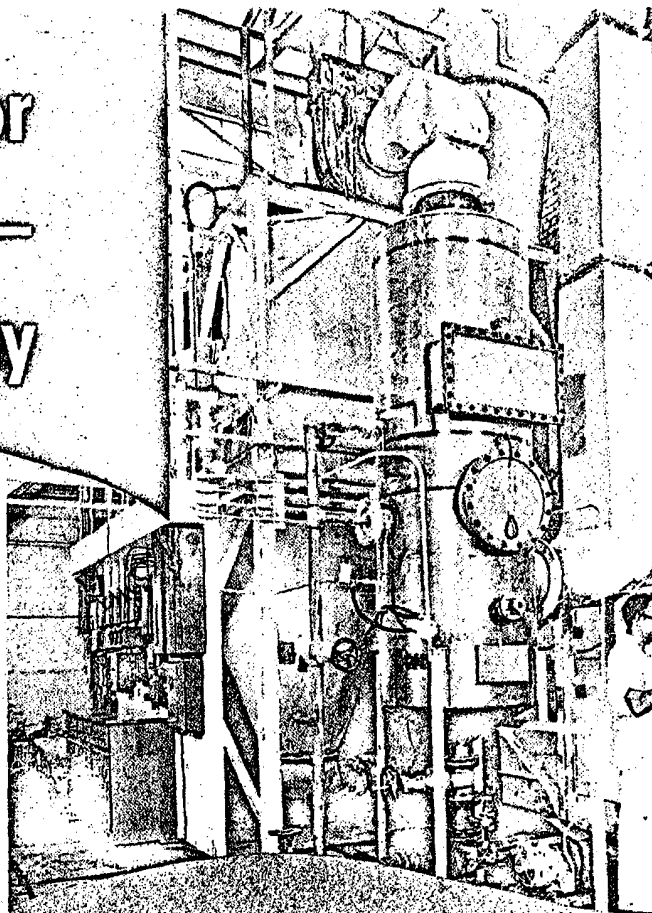
That was more than a decade ago. Since that time, the No. 2 and No. 4 Dryers have found wide acceptance, alongside the hundreds of other Bowen Spray Dryers, in the chemical, plastics, pharmaceutical, food and other industries throughout the world.

For some companies, such as producers of pharmaceuticals and other heat-sensitive products, these dryers are producing a superior end product with an important competitive advantage. For others, the high throughput, coupled with almost automatic 24-hr. operation and simple maintenance, delivers the benefits of lower operating and production costs.

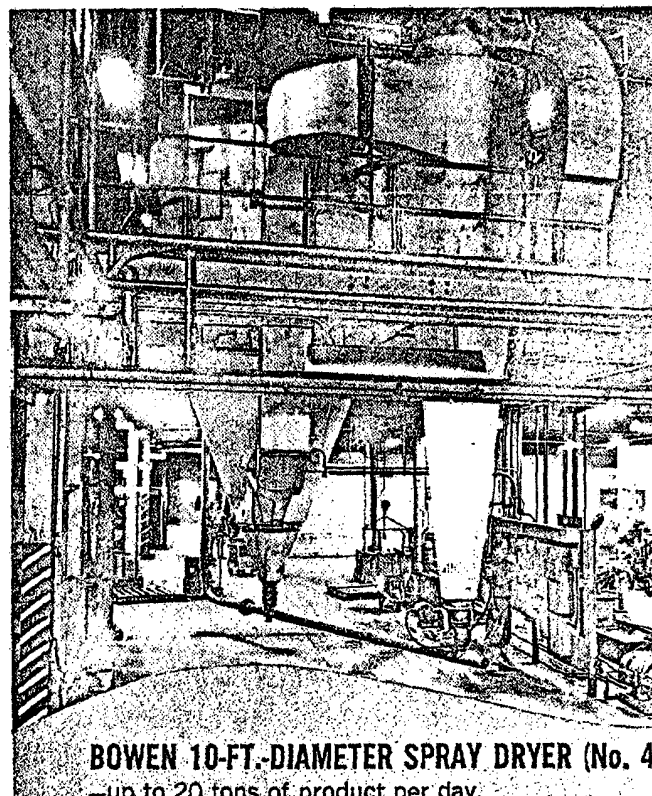
Both the No. 2 and No. 4 Dryers are especially well suited to the companies with aggressive new product development programs since pilot-plant and semi-commercial quantities of product may be produced for evaluation, market testing and development and similar purposes.

advantages

lower overall cost • simpler operation • easier maintenance • minimum erection costs • custom variations in design and construction to accommodate special drying or production requirements



BOWEN 7-FT.-DIAMETER SPRAY DRYER (No. 2)
for moderate production (up to 10 tons) and pilot pl



BOWEN 10-FT.-DIAMETER SPRAY DRYER (No. 4)
—up to 20 tons of product per day.

DUP050054437

EQUIPMENT SPECIFICATIONS: BOWEN NO. 2 AND NO. 4 SPRAY DRYERS

AIR HEATER: A choice of three types of air heaters is provided. 1. The direct gas or oil-fired unit is used wherever possible for its greater economy and particularly where high temperature of inlet gas up to 1000°F is advantageous. The Bowen direct oil-fired furnace is designed particularly to give soot-free combustion of #2 fuel oil. 2. Indirect gas or oil-fired units are available where products of combustion are undesirable. 3. Fincoil heaters are specified in certain instances and are available for either steam or a heat-transfer fluid.

CHAMBER: Both the No. 2 and the No. 4 Drying Chambers have a cylindrical upper portion and a steep-sided conical bottom. The upper portion of the No. 2 Dryer is 7 ft. in diameter; the No. 4, 10 ft.

Both spray dryers are available in mild steel, stainless steel, or other alloys for special cases.

The hot drying gas enters the top of the drying chamber at the center through an annular inlet surrounding the atomizer.

For materials relatively insensitive to high temperatures, the drying gas can also be admitted through four side inlets around the top periphery of the chamber to increase drying efficiency. The addition of cold air through angular slot inlets in the chamber wall enables instantaneous cooling of ultra-sensitive solids in the zone of lower temperature air, circulating adjacent to the chamber wall, before heat damage can occur.

The spray-dried products can leave the tip of the chamber cone bottom, airborne by the outlet air, or from the chamber bottom tip through a suitable product-discharge device. In this latter case the outlet air is removed by a "goose-neck" duct leading through the side of the cone and two-stage recovery of dry material is accomplished with resultant high yield.

Each chamber is provided with an operating platform on the top and with chamber light wells. A door is provided in the side wall for cleaning and inspection.

CENTRIFUGAL ATOMIZATION: Unique, yet simple in design, the Bowen Spray Machine is a compact, self-contained unit constructed for rugged, high-temperature operation. Its power is provided by a motor mounted directly on the driving shaft and protected by a water-jacketed housing. A corrosion-resistant feed pipe passes through the housing and delivers feed material to a rapidly-spinning atomizer wheel directly mounted on the motor drive shaft. High-frequency current for machine operation is furnished by a frequency converter set which can be remotely located out of hot, dusty and otherwise hazardous process areas. Frequencies can be precisely selected to provide any desired atomizer wheel speed between 6,000 and 20,000 rpm.

Bowen atomizers are of three main types, giving coarse, medium or fine atomization. Normally of stainless steel, they are frequently made of other special alloys.

A feature of the Bowen Spray Machine is the ease with which it may be lifted from the chamber for inspection, maintenance, or simply to "hang it up" when the dryer is not operating.

FREQUENCY CONVERTER: The high-frequency current for the spray machine is furnished by a frequency converter mounted on a common base with its drive motor. The drive is usually V-belt type, but may be variable for special cases. This unit delivers current at proper frequencies to run the atomizer at selected speeds between 6,000 and 20,000 rpm. Carefully-engineered starting switches are furnished for the frequency converter-spray machine motor circuit.

DUCTS: An inlet duct of special design conducts the hot drying gas to the point or points of entry to the chamber.

The outlet duct carries the air from the chamber to the product collector and then leads from the collection equipment to the main fan.

PRODUCT COLLECTION: The majority of cases employ a single Bowen high-efficiency cyclone collector fitted with a rotary dust lock, an aspirator or other means for product removal while maintaining a proper seal. In certain cases the value of the product will justify secondary collection which may be a second cyclone, multiclones or a bag collector.

The Bowen Venturi Washer is also available for wet recovery of fine solids passing the cyclone, or for fluid scrubbing of the air leaving the spray dryer to avoid a nuisance. Occasionally this may be used advantageously for concentration of thin liquors.

MAIN FAN: All of the air or gas for the spray drying unit is handled by a single main fan placed on the outlet side of the system to avoid attrition of the spray-dried solids and minimize risk of build-up on the fan itself. It has rugged ball bearing construction, clean-out door in the scroll, and V-belt drive to a ball bearing motor.

SPACE REQUIRED: The 7 ft. diameter (No. 2) Spray Dryer fits into a space 10 by 15 feet; the 10 ft. diameter (No. 4) Spray Dryer fits into a space 20 ft. square. Structural steel unit framing is standard equipment for either out-of-doors or indoors installation.

SPRAY MACHINE INSTRUMENTS: Instruments and accessories are conveniently assembled and located for the proper operation of the spray machine. They include voltmeter, ammeter, flow control switch, circuit lights and push-button starter for the electrical circuit. The jacket water system has pressure gauges, thermometers for ingoing and outlet water, proper lengths of non-ferrous flexible metal hose with quick-opening couplings, and manual shut-off valve. Bearing lubrication is by positive feed oilers. A manual valve and length of flexible stainless steel tubing with quick-opening couplings lead to the spray machine feed pipe.

operation.

CONTROL INSTRUMENTS: Standard specifications include a two-pen recorder controller for operation of the spray dryer. One pen records the inlet temperature and the other the outlet air temperature regulating the latter by control of the feed rate. An over-temperature control is also provided.

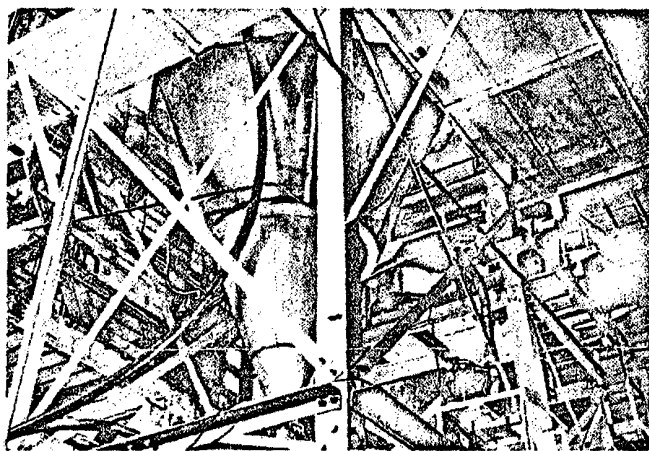
Manometers are supplied to indicate the pressure-drop at critical points in the spray drying system. This is helpful in maintaining proper drying conditions.

ASPIRATOR SYSTEM: This equipment, while not essential to the spray drying operation, is a useful adjunct which in many cases accomplishes a worthwhile over-all economy. It is occasionally the means of obtaining highly desirable final product characteristics. It consists of a Bowen Aspirator for removing material from the product collection system and redispersing it continuously in a duct carrying a secondary air stream. This secondary stream is selected to produce the characteristics desired and may be merely ambient air or cooled, heated or conditioned air or even a special gas.

CAPACITY: The capacity range for the Bowen No. 2 and No. 4 Spray Dryers is obviously wide, since they are designed for air inlet temperatures from less than 300°F to 1000°F and for feed solutions or slurries from thin, watery consistencies up to the limit of pumpability. A simple test or two in the Bowen Test Laboratory will establish optimum operating conditions for determining accurate capacity ratings on a given material. For estimating purposes, the twenty-four hour output of the No. 2 unit is two to ten tons; the No. 4 unit is five to twenty tons.

ERECTION: The entire dryer design in either No. 2 or No. 4 is developed with a view to reducing field erection work to a minimum. The chamber is shipped by rail or truck as an assembled unit. Component parts are match-marked for ready identification. Detailed instructions for assembly and a complete description of the apparatus and operating process are furnished together with layout drawings, foundation bolt arrangement and final assembly drawing. Although it is not usually requested, Bowen will undertake the erection of the equipment or will furnish an erection supervisor.

SPECIAL DESIGNS FOR PILOT PLANT AND HARD-TO-DRY MATERIALS



Dryer in use at Sheffield Chemicals Div., National Dairy Products Corp., Norwich, N. Y.

Materials which are hard to dry often require special equipment design. Bowen is prepared to develop design information to meet the needs of the drying problem, however difficult. Based on such design information, special equipment with unusual but required features can be provided. For example, compare the unit illustrated on the cover with the standard No. 2 and No. 4 Spray Dryers.

TEST SERVICE: Because no two spray drying situations are exactly alike, we are equipped at our North Branch, N. J. laboratories to test dry a sample of your product (as little as one gallon) under conditions closely approximating those of actual production in your plant.

Bowen's thirty-five years of experience in spray drying can be put to work to solve *your* drying problems.

Recognized leader in Spray Dryer Engineering Since 1926

BOWEN ENGINEERING, Inc.

NORTH BRANCH
NEW JERSEY

