Albion Mixing Devices are used to disperse dry powdered materials, such as “Hercules” cellulose gum, starch, or flour, into a liquid, without creating agglomerates, or lumps. They are designed to assure mixing, by wetting the powder as it is passed through a high velocity jet of liquid. Each of the three models consist of a jet pump assembly and a funnel to hold the powder.

AVAILABLE MODELS

MODEL 128-G02 is our original “Standard” Mixing Device for food and dairy products. It is made of 304 stainless steel, is designed for the processed food and dairy industry, and is easily identified by measuring the ½” diameter mixture outlet size.

MODEL 296-G01 is our improved “High Flow” Mixing Device. Also made from 304 Stainless and finished for use in the food processing & dairy industry, this unit looks very much like it’s predecessor. However, the mixture outlet is flared and measures 1¾” in diameter. Also the outlet is made to attach to a sanitary pipe fitting.

MODEL 296-G02 is our “Commercial Quality” Mixing Device. It is identical to 296-G01. However, it does not have a sanitary quality polished finish.

NOMENCLATURE

Bulletin No. 215
MIXING DEVICE PRODUCTS

GENERAL

Albion Mixing Devices were originally developed to mix “Hercules” Cellulose Gum with a liquid in order to prepare smooth, clear solutions. They have since been used to mix starch, flour, and other dry powdered materials which also tend to clump together, creating agglomerates, or “lumps”.

They consist of a water jet pump, manufactured in the shape of a Tee, tilted on its edge. A funnel, to hold the dry powder is mounted on top and feeds straight down. Liquid feeds in from the side. The mixture discharges from the bottom. At the base of the funnel, or hopper, are two air bleed holes. It holds about a ½ cubic foot of powder.

MODEL 128-G02 is our original “Standard” Mixing Device for food and dairy products. It is made of 304 stainless steel, is designed for the processed food and dairy industry, and is easily identified by measuring the ½" diameter mixture outlet size.

MODEL 296-G01 is our improved “High Flow” Mixing Device. Also made from 304 Stainless and finished for use in the food and dairy industry, this unit looks very much like its predecessor. However, the mixture outlet is flared and measures 1 3/8" in diameter. Also the outlet is made to attach to a sanitary pipe fitting.

MODEL 296-G02 is our “Commercial Quality” Mixing Device. It is identical to 296-G01. However, it does not have a sanitary quality polished finish.

OPERATION PRINCIPLES

Makeup water enters the Mixing Device from the side inlet port. From there it enters the throat at a very high velocity through the annulus opening and is directed downward into the receiving vessel. The powder flows from the hopper funnel under a slight suction, and is wetted in the throat of the mixer. Extreme turbulence caused by high water velocity in the throat assures intimate contact between the liquid and individual powder grains. The liquid is absorbed in the powder which is dispersed by the time the mixture is discharged.

The Mixing Device is equipped with air bleed holes. These permit air to be drawn into the dry powder stream, aiding in its proper dispersion in the water stream. Also, closing one hole will increase the suction on the powder feed and increase the feed rate. At least one hold should remain open for the best operation.
OPERATING VARIABLES

Variations arise from differences in powder characteristics, powder feed rate required, and available liquid pressure. Therefore each installation needs to be adjusted to provide optimum performance. Once the proper conditions have been established, no further adjustments should be necessary.

The POWDER FEED RATE can be regulated by:
1. Changing the liquid flow rate.
2. Regulation of the air bleed holes.
3. Changing the size of the opening at the discharge end of the hopper funnel.

The WATER FLOW RATE can be regulated by:
1. Regulating water pressure.
2. Changing the size of the annulus opening.

The size of the annulus opening can be changed by using shims under the lip of the insert or by changing the thickness of the O-ring. However, if the annulus is too large the resulting velocity drop through the unit will result in poor operation.

The liquid velocity through the throat of the mixer should always be high enough to assure a high degree of turbulence and a positive downward flow without splashing up into the upper insert section of the mixer. This is controlled by a combination of adequate line pressure and annulus size. Only when the fluid pressure is too high, say over 75 PSIG, does the annulus distance need to be changed, as there is a tendency for liquid to splash into the throat of the upper insert, wetting the powder before it is dispersed.

OPERATING AND INSTALLATION RECOMMENDATIONS

Always make certain the funnel and upper insert are dry and that the entire unit is free of any obstruction. Clean the air bleed holes with a thin wire. Use extreme care when cleaning the upper and lower inserts. Small nicks or bends in the knife edge of the annulus opening cause water to curl around the inside of the upper insert and prematurely wet the powder, thereby plugging the Mixing Device.

The Mixing Device should discharge directly into a receiving vessel. Additional piping on the discharge tends to create back pressure. This causes poor performance in most cases. However, the addition of a 12" long tail pipe has been used as a technique for increasing the solids content of a solution by as much as 4%.
The receiving vessel should be agitated to insure good mixing between the effluent and whatever liquid is initially present. In order to prevent the build-up of solids around the discharge area, it should be located at least one foot inside the edge of the tank.

The liquid level in the receiving vessel should always be below the outlet from the device during operation to avoid creating back pressure.

If the liquid in the tank is heated, vapors can backflow into the Mixing Device and wet the upper insert, which can then result in plugging. A quick opening, full-throat valve can be installed on the discharge to prevent this from happening.

If a temporary setup is used, the Mixing Device must not be inverted after use or the liquid will run back into the device and clog the upper section with effluent.

There may be a tendency for dry powder to bridge in the bottom of the hopper. Bridging can usually be overcome by jarring the assembly. It may be desirable to install a vibrator on the funnel to ensure smooth and continuous operation. Two vibrators that have been found suitable are:

- Martin Engineering Co., Model 1 BD-19, Air driven Vibrator
- Syntron Div., FMC Corp., Model V-4 Electric Vibrator

A recommended sequence of operation is:

1. Fill the receiving vessel with the maximum amount of liquid, leaving only enough room for the added mixture.
2. Turn on the tank agitator.
3. Be sure liquid is flowing through the Mixing Device.
4. Add powder into the Hopper.

CAPACITY OF MIXING DEVICE

The following test data has been reported by Hercules Inc. for mixing their CMC-7H at various water pressures. CMC-7H is a fine free-flowing powder with a bulk density of about 0.7 g/ml and a screen analysis of 1% maximum on a U.S. 30 screen and a 10% maximum on a U.S. 40 screen.
<table>
<thead>
<tr>
<th>Number of Air Bleed Holes Open</th>
<th>Water Flow gal/min</th>
<th>Model 128-G02</th>
<th>Models 296-G01 and G02</th>
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