

## **“THE LIQUID APPLICATION SYSTEM FOR ULTIMATE QUALITY” 11/99**

A twin shaft mixer that has high randomized particle movement, all particles moving and no shear makes an ideal coater because it will coat all surfaces by having a fully randomized presentation under the spray for the full dwell time. The particle movement of one meter per second gives wiping action until the liquid is absorbed. Typical dwell times (time to add liquid) are from 15 to 45 seconds with weight range of application in one machine up to 32%. Whether it is seeds or feeds, complete coating has advantages. In the case of seeds, it means protection on the entire surface. In the case of feeds, it means getting more on; and in the case of aquatic feeds, better control of sinking if required.

Several methods of applying liquid can be incorporated in one machine and are often necessary. When designing the system, it is assumed that agglomeration is not desirable. It is useful to apply judgement using the definition of an agglomeration: two or more particles bonded together by a bridge, which in this case would be liquid, where the strength of the bridge exceeds the weight of the particles and all other forces in the mixer.

When particles are heavy and the liquid low or medium viscosity, it is fast and practical to slug load the liquid and let the mixer wipe it from particle to particle. With cold pellets, for example, whether it is pet or aquatic feed, generally you can slug load down to 5%. Hot pellets is somewhat higher, typically 8%. Slug loading has another advantage in that filters or screens are not required to prevent plugging.

When the liquid level is too low using the slug loading method, the liquid gets coated or absorbed by some of the pellets and leaves some dry, which is commonly called “salt and pepper” effect. To eliminate “salt and pepper” it is necessary to slow down the entry of the liquid and use spray nozzles. If the product is agglomerating, this is also how to weaken the bridge. The principle here is to randomly present all the particles under the nozzles so all are equally coated. One or more sets or combinations of spray nozzles can be used and selected with the formulation. This allows maximum utility of the coater.

Defining the volume of liquid required to coat the entire surface of pellets has to be determined through testing. Absorbency is a major factor. If you have enough liquid to paint a rock of equivalent weight, we will try to do it. If complete coating is not required and you want an even distribution of some on each pellet such as an enzyme, in the average coater size the smallest amount is .15 USG or 570 ml. (about .1%). If the volume is smaller than that, consider dilution.

**A & J Mixing International Inc.**

**Good People To Mix With!**

*World Famous for Quality, Care & Commitment*

Call US/Can **1-800-668-3470** or **1-905-827-7288**, Fax: **1-905-827-5045**

Web site: [www.ajmixing.com](http://www.ajmixing.com)

## “THE LIQUID APPLICATION SYSTEM FOR ULTIMATE QUALITY” 11/99 (CONT'D)

Opposite of “salt and pepper” is having more liquid than will reasonably stay on. This is a variable. An example would be in aquatics where 15% added on is about the maximum and this would give a 20 to 22% fat feed. When you get above this, it is necessary to use vacuum and have control of variables such as moisture, pellet structure, temperature of the oil. Elevation also has to be considered. What vacuum does is remove the air from the capillary structure of the pellet, and at sea level removing the vacuum gives 920 millibars or 13.5 psi to drive the oil in. Practical commercial vacuum is limited to -920 millibars or 27” mercury at sea level. It is possible to increase the pressure. The process is referred to as “liquid infusion”.

Breakage is always a concern in a mixer/coater. Dusting from internal friction of the material, that is, the resistance of the particles to pass each other, is very difficult to reduce other than running only when necessary. Other forms of breakage can be overcome through proper design, manufacturing procedure and quality control, and in some cases the process sequence. An important feature is a discharge that can be adjusted so leading edges are not protruding.

A fast cycling batch system using weighing is the most accurate and positive way to add liquids. Weighing liquids accurately is easy, and having a tank at the mixer pressurized with air is the best way to have the right pressure for the job to be done. When the liquid has left the scale you know it is in the mixer.

In a typical installation the volume of pellets is fixed by the machine capacity. For each product there is a fill weight. The liquid additives are selected by percentage up to 32%, set the number of batches required and the PLC does the rest.

The PLC will fill the pellets into a mixer on load cells, preferably from a bin over top using a good quality roller gate valve with dribble feed. Liquids will be weighed individually on a separate scale. The PLC selects one of several pilot valves with built-in pressure regulator to pressurize each tank. There will probably be a pressure for each spraying device in the mixer. The flow rate (dwell time) is determined by nozzle or distribution pipe sizing. The result is the right pressure and flow rate at the mixer. This solves the pumping complexity associated with flow meters and is flexible, fast and accurate.

The result is the right quantity of pellets and oil together for the time required to get the coating done which could average from 15 to 45 seconds. The software is event driven and monitored so you know the liquid is on every batch. Software or Doppler systems cannot overcome the limited presentation of the pellet surface to the spray inherent in most coating systems.

For methods of adding liquids to powder please contact our office.

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