

The Effect of Air

IN HOMOGENIZERS AND PUMPS

A major and persistent share of operating problems (with both equipment and product quality) is associated with improper feed conditions. This bulletin will help you define problems which can occur, identify some of the potential sources and suggest steps required for solution.

As long as pressure is not applied to the homogenizing valve, no damage will occur due to air in the feed. However, if pressure is applied to the homogenizer, extremely high shock loadings (as high as 50,000 psi) can occur in the cylinder. Repeated shock loadings will result in cracked cylinders and costly repair.

A plunger bore, which contains a combination of liquid and air, will behave in the following manner. On the pressure stroke the plunger will rapidly accelerate and compress the air with a minimum amount of backpressure. Then, when the air is fully compressed and the piston "hits" the liquid, extremely high, instantaneous pressures are developed.

There are several potential sources for the inclusion of air or vapor. The ones you are most likely to encounter are as follows.

1. Air can be entrained into the homogenizer, because of the type of agitation being used in pre-mixing.
2. Air can be incorporated when dumping a powdered or granular material into a pre-mix tank, as there is often a great deal of trapped air between the particles.
3. Any loose fittings or leaks within the feed piping, especially around feed pumps, will be hard-to-find sources of air incorporation.
4. If inadequate feed pressure is supplied to the homogenizer, there can be flashing or volatilizing of the solvent. This will have the same effect as incorporating the air with the feed.

5. If the diameter of the feed line is inadequate, the material cannot flow rapidly enough through the inlet manifold and up through the inlet valves to the plunger.

Air will be sucked through the plunger packing or other packing areas to fill the bore.

Large amounts of air can usually be detected easily, because of a knocking sound in the homogenizer. This will often occur at the end of a batch, if precautions are not taken to shut the homogenizer down or at least relieve the pressure on the homogenizing valve assembly. In some cases, excessive amounts of air will cause the homogenizing pressure gauge to fluctuate as much as 500 psi.

Several steps are usually required to ensure that all of the air sources are properly eliminated, and we recommend the following be checked:

1. Make sure that there is proper feed pressure. This can best be done by installing a pressure gauge in the feed line just prior to the homogenizer or on the far end of the inlet manifold by drilling and tapping the manifold cap. The minimum pressure required will vary, depending on the product. Please consult the Factory should any question arise.
2. Be sure that the feed pipe sizes are adequate (see the operation and maintenance manual for your machine).
3. Check all of the inlet feed lines for leaks, especially around pumps. Do not assume that lack of product leaking from the line means that air cannot be sucked in.
4. Check the degree of agitation in the pre-mix tank and be sure to shut off the agitator whenever the liquid level drops to the blades.

5. Check the condition of the plunger packing and packing rings, as well as cap gaskets, etc. The 027 plunger packing ring may be worn, increasing the probability of air being sucked between the packing and the plunger.

The importance of proper feed conditions cannot be over-emphasized. Poor feed conditions directly influence both product quality and life of the homogenizer. As soon as shock loading first occurs, fatigue begins and will continue in the cylinder block with each over-pressure, until cracking occurs. There is no way of determining the length or severity of shock loading required before failure. However, proper attention to the above points will certainly alleviate the likely conditions.



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