Flexible Foam Solutions,
Molenlaan 77,
2181 GS HILLEGOM,
the Netherlands

Tel.: +31 252 532 192
Fax: +31 252 532 231
Email: johanstoute
@compuserve.com
website: www.ffs-holland.com

PRE-MIXER

APPLICATION : Pre Mixer for mixing nucleating air and polyol into a froth for improved nucleation and elimination of air- or pin-holes on low- as well as high-pressure foaming machines. Can be used for standard foams as well as for optimising the cell structure of HR grades.

FEATURES : Suitable for Maxfoam, Varimax, other trough processes, as well as conventional lay-down machines.

PRE MIXER

AIR- OR PIN- HOLES.

Pinholes (up to 4-mm dia) and air holes (over 4-mm dia) can be a reason for rejects in critical applications of flexible foam.
The cause for such holes can be in two areas on any foaming process, whether it is Low- or High Pressure metering, or conventional Liquid Lay-Down or a Trough Machine, such as Maxfoam, Varimax or Vertifoam;

a) ***Tankfarm***; tanks, pumps and pipework, as well as wrong operating procedures can be the cause of excess of air in one or more of the components.

b) ***Mixinghead***; mixer and manifold design, injection of nucleating air, running parameters, cleanliness etc. can be another source for the occurrence of excess of air in the foam.

The advantage of Liquid Lay Down machines (Conventional) is that the majority of the air caused in the areas a) and b), has the chance to escape before the mixture starts to cream. Some of the smaller air bubbles will still be causing pinholing.

A third area, which will always be a cause for pinholes, is the Trough on Maxfoam, Varimax and Vertifoam machines;

c) ***Trough***; volume, design, inlets, insufficient cleanliness can be a source for pin- and air holes.

Obviously, on a Trough Machine, almost all air- or pin- holes generated by any of these three areas, will finally end up inside the block of foam.

Taking proper care of the various critical points in the areas a) and b) can virtually eliminate pinholes on Conventional machines.

Pinholes on Trough Machines can be greatly reduced, but never completely eliminated (the disturbing factor will always be the trough itself) by carefully eliminating all the sources from problem areas a), b) and c).

NUCLEATION

Nucleating Air or Nitrogen (1b) on low pressure metering machines is usually introduced in the polyol stream at the manifold via a hypodermic needle or in some cases via a sintered metal disk into the TDI stream. The standard agitator is then supposed to break the relatively large air bubbles into microscopic fine bubbles, which will form the nucleation sites for the CO_2 released from the TDI-Water reaction. In general the standard mixer is not much more than a simple agitator with some pegs or strips running a high speed in a barrel with some static pins. The mixing of the chemicals is in general no problem at all; a couple of hundred RPM will be sufficient for a proper mix. However breaking up the injected nucleating air, or N_2 in sufficiently small nucleation sites requires a little more than just high speed.

PRE-MIXER

The Pre-Mixer completely eliminates the chance of pinholes being caused by poor mixing of nucleating air. The nucleating air is premixed with polyol and silicone surfactant into a stable froth, before entering the standard foam mix head and being mixed with the rest of the

components.
The extremely high shear forces, which take place in the Pre-Mixer at a low RPM produce a creamy micro-cellular froth in which the injected air is distributed very finely. A potlife of more than 12 hours can be obtained at the optimum ratio between air, polyol and surfactant!

RESULTS

The most important condition for good results is that all other factors, causing air holes, are also taken care off. It is obvious that the effect of premixing of nucleating air can be nullified by cavitation of a polyol pump or a leak on manifold or mixing head.

Counting numerous samples during the development stage of the premixing process showed a reduction of 80% in the number of pinholes on foams in the density range 25 to 30 kg/m^3. Further optimisation led to a total reduction of better than 90% in a later stage.

An additional benefit of the Pre-Mixer is that (part) of the surfactant is mixed in much better than before. This results in the same phenomena, which has been noticed by foamers who have High Pressure metering for silicone; the level of surfactant can be reduced by about 10% because of the more efficient mixing. Another (more theoretical) benefit is that the surfactant, by being mixed in sooner then normal, assists also in an improved mixing of the other activators in the mixhead.

HR FOAMS

The initial development work was concentrated at the improvement of standard (conventional) foam types.
In a second stage the Pre-Mixer was also introduced in the production of HR type of foams. When producing HR foam, an excess of nucleating air is required to obtain an irregular cell structure, which facilitates the opening of the cells at the point of Full Rise (blow off). A too regular cell structure on HR foam may result in poor blow off and subsequent shrinkage. However, when metering an excess of nucleating air into the HR foam system, one will easily overshoot, and the result in general is that the HR foams show a large number of cheese holes.
The major advantage of the use of the Pre-Mixer in HR foam production is the elimination of these cheese holes.
It is not possible to use one Pre-Mixer for both conventional and HR foam, because of the incompatibility of the surfactants for these two foaming systems.

EQUIPMENT

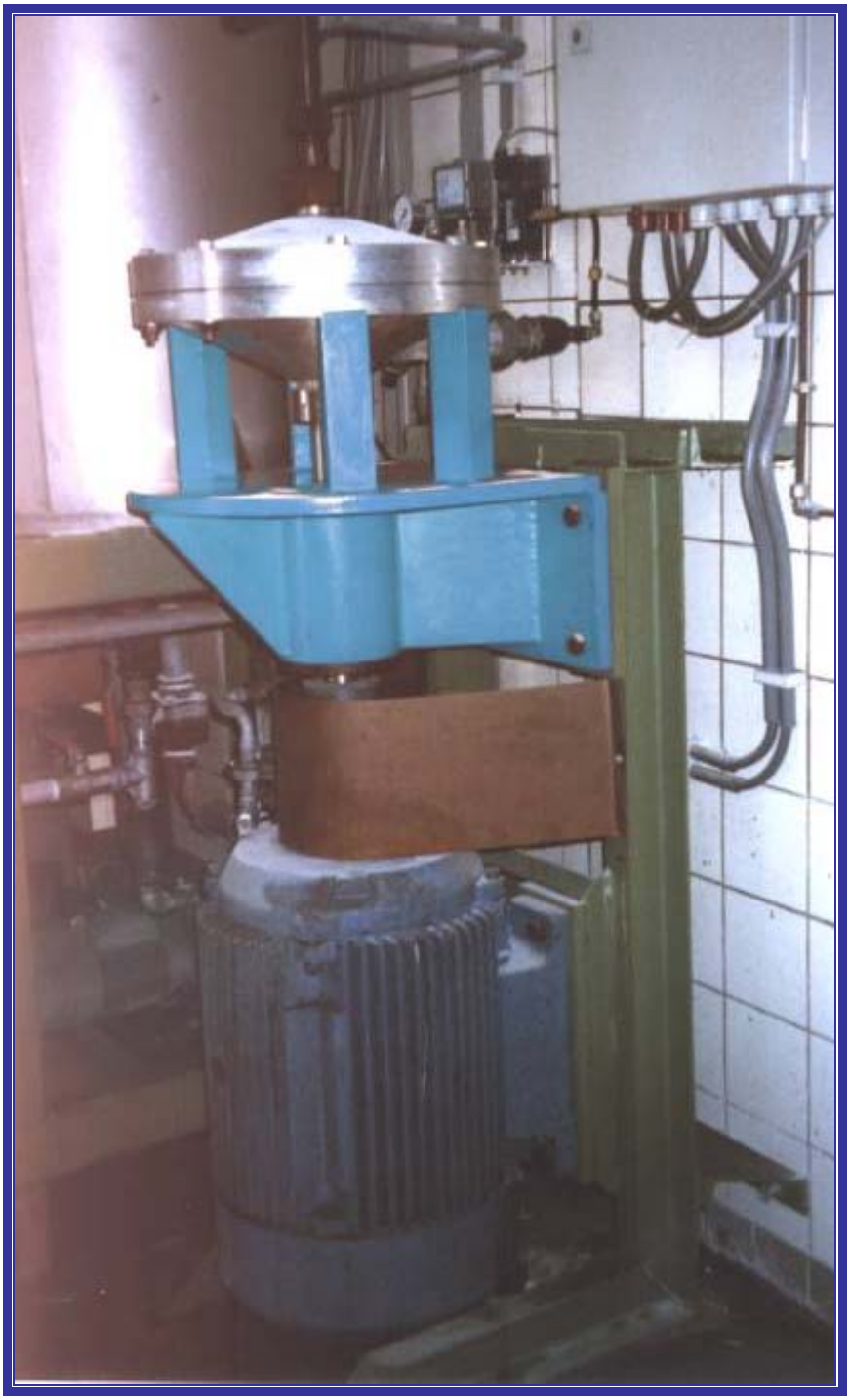
The Pre-mixer can be supplied in two ways;

a) Pre-Mixer only with bearing house and drive shaft.

b) Pre-Mixer, bearing house, drive shaft, framework and single speed drive motor.

At present some 6 Pre-Mixers are in use on a daily basis, of which at least 2 specifically on HR production.

The oldest Pre-Mixer has been in service, on a daily basis, since 1983.



For further information, please contact:

Johan Stoute

Flexible Foam Solutions
Molenlaan 77
2181 GS HILLEGOM
The Netherlands

Tel.: +31 252 532 192
Fax: +31 252 532 231
Email: johanstoute@compuserve.com
Website: www.ffs-holland.com