

# Plunger Packing Problems

Undoubtedly, all homogenizer and reciprocating pump users will experience packing problems at one time or another in the lifetime of their equipment. The variables involved in problem-solving can be intimidating and, at the very least, nerve-wracking. Hopefully, we can unwrap some of the mysteries involved.

Some of the primary causes of premature packing failure are extrusion, excessive friction, product or chemical attack and abrasion.

Some of the secondary causes are improper installation, defective packing and repeated, prolonged cavitation of the homogenizer or pump.

The purpose of this bulletin is to help you identify the causes associated with premature packing failure. You should be aware that the focus is on premature failure of packing, only; since all packings will ultimately fail at some point.

Also, since Gaulin homogenizers use chevron or V-ring-type packings in most applications, this bulletin will focus only on that style. Bear in mind that there is no such thing as "leakless packing". However, under certain conditions the leakage may be so low that it is not detected. Let us consider the primary causes of failure.

## **Extrusion**

This type of wear will almost always occur as a result of excessive clearances between the plunger and the packing adjusting ring or follower (which is usually constructed of bronze or nylon) . When new, these parts have a very close tolerance, somewhere between .005 and .007 of an inch. Once these tolerances are lost, the pressure can drive the inner lip of the seal towards the low pressure side and compromise the sealing action of the packing, allowing for leakage to occur. To avoid this, check clearances between these parts on a regular basis.

### Identifying Signs of Extrusion:

- An irregular shape to the i.d. of the packing upon removal
- Appearance of the i.d. rolling towards the low pressure side
- Failure path through the packing in a "V" shape, leading to the low pressure side

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#### **Excessive Friction**

Heat developed within the packing set is normal and is proportional to the product of friction and surface speed. Temperature can be held down by means of heat dissipation; i.e., lubrication, water jackets, etc. Most Gaulin homogenizers utilize a spray-type water cooling/lubrication system. Normally, one to two gallons per minute will provide enough heat dissipation. The spray tube nozzles should direct the cooling medium into the backside of the packing assembly, not down onto the plungers, themselves. This will provide for more efficient cooling/lubrication of the packing. Also, an automatic-type solenoid should be installed into the water or the water or cooling medium supply line to avoid running the packing sets dry. This solenoid should be tied into the main motor circuit.

Identifying Signs of Excessive Friction:

- Streaking marks of packing residue on the plungers
- A burnt odor to the failed packing
- Dry, brittle feel to the packing upon removal

#### **Product or Chemical Attack**

For any packing to work successfully, the packing material must be compatible with the material being pumped. A fair amount of problems with packing failure can be attributed to improper selection of packing with respect to products and cleaning solutions. When a machine is ordered and a product is identified, a certain packing material will be specified for compatibility with the product. The amount of new products being developed far exceeds the new packing materials developed within a given time frame. For that reason it is a good idea to contact us, if you are changing products or cleaning solutions.

Identifying Signs of Product Chemical Attack:

- Packing has a washed-out look
- Packing will have a tendency to become very soft
- Packing will fray or break down

#### **Abrasion**

This is a problem that can be caused by many factors. In addition to causing packing problems, it can also be detrimental to other components within the packing assembly. One of the major causes is debris in the fluid media being pumped. The debris can become lodged between the plunger and packing and act as sandpaper, destroying both the packing and the plunger. Obviously, the fluid media should be kept as clean as possible; perhaps, involving the use of strainers and filters.

Another major cause is incompatibility between the packing and the plunger; i.e., the packing material being too hard and scoring the softer plunger. This results in a scored plunger, which will make short work of the packing, as well.

Identifying Signs of Abrasion:

- Longitudinal scoring along length of the plunger
- A tattered, frayed i.d. on the packing
- Scoring lines on the i.d. of the packing adjusting ring

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#### **Improper Installation**

The means by which a packing is installed can enhance or decrease its life. It is well worth the effort to ensure proper handling during the installation process. Most Gaulin pumps and homogenizers are packed from the front of the cylinder block with the packings being driven in by means of a packing installation tool. The packings should be coated with a petroleum jelly or O-ring lubricant before installing. The correct number of pieces is also important. Should you be unsure of the correct number, contact the Service Dept. Always consult the manual for proper packing installation technique for your particular machine.

Identifying signs of Improper Installation:

- Immediate leakage
- Deformed packings
- Signs of chocking in the packing bore

#### **Defective Packing**

Although this can be the most frustrating of the causes of failure, it occurs very infrequently in comparison to the other failure modes. It can be very difficult to recognize defective packing with just a visual examination.

The problems with defective packing are varied but very frequently can be tied to either dimensional inadequacy or material composition deficiencies.

As stated before, it is very hard to recognize if a packing is inferior. If you suspect the packing being supplied to you is defective or not a Gaulin part, feel free to call our Service Department for verification. We will be able to verify by identifying a mold mark (or lack thereof).

Identifying Signs of Defective Packing:

- A loose fit, particularly on the i.d. of the packing
- Abnormally soft or hard packing
- Absence of a Gaulin part number on the sealed package

#### **Cavitation**

This occurs as a result of a lack of proper infeed pressure to the inlet side of a homogenizer or pump, while it is under pressure. This can have disastrous effects on the entire piece of equipment; and, ultimately the packing is affected as well. The pressure spikes generated by the reciprocating action of the machine, compressing slugs of air rather than product, can take a devastating toll on the equipment.

In most cases a packing failure, as a result of starving a machine, should be considered a blessing in disguise. Repeated starvation/cavitation can often times result in a cracked cylinder block, which can be very costly. If you suspect you may have a cavitation problem or are unsure of the proper infeed pressure for your particular model, you should immediately contact the Service Department.

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#### Identifying Signs of Cavitation:

- A major packing failure in seemingly normal operating conditions
- An inconsistent knocking noise emanating from the cylinder head of the machine
- A persistent breakage of wettable parts
- A ring of "pits" around a plunger in the area of the packing seal

Hopefully, this bulletin will be of help in recognizing and identifying the reasons behind premature packing failures. If you have any questions on packing or with the machine, in general, please do not hesitate to call the Service Department.

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