

UNDERSTANDING DIAPHRAGM FAILURES

EXCESSIVE HEAT OR CHEMICAL ATTACK

You will notice bubbling, cracking or discoloration of the diaphragm, in which material of the diaphragm could be so bad that it pulls away from its internal lining. This situation can be avoided by reviewing the application to find a better material.

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Cracking



Discoloration



Bubbling

OVER TORQUE

In this case, the diaphragm will have a pronounced cut around the outside edge. This is caused by the chambers of the pump cutting into the diaphragms due to over tightening (usually metal only). To avoid this situation, pay close attention to the torque values in the pump manual.

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Cut on Edge

EXCESSIVE SUCTION SIDE PRESSURE

Diaphragms will appear to be imploded and miss-shaped with very short diaphragm life. Rubbing of the diaphragm on the air chambers may also be apparent in extreme cases. This would be evident by wear marks around the outer edge of the diaphragm on the airside. The rubber fitted diaphragms can handle up to 40 psi inlet, while the PTFE diaphragms will only handle about 4psi. High inlet pressures cause this and/or the cleaning process that the pump may undergo (i.e. with city water pressure). Dampening the inlet of the pump and/or consulting the factory for suggestions on how to help with inlet pressure are highly recommended for this situation.

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Imploded Air Side



Air Side Wear Marks

UNDER TORQUE

When proper torque is not applied to the liquid chamber bolts, the diaphragms outer edge will be pulled from the pumps casing because proper torque was not applied to the liquide chamber bolts. Once removed from the pump, the diaphragm will appear "out of round" and oval in shape. In addition, you may see the outer lines on the air side of the diaphragm as uniform and at one point travel off the diaphragm, indicating the area of the pull.

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Edge Pulled
Oval Shapped



UNDERSTANDING DIAPHRAGM FAILURES

ABRASION

On the liquid side of the diaphragm, there will be an abrasion ring worn where the diaphragm meets the outer disk. Life of the diaphragm will dictate whether the abrasion is excessive; as some wear is normal. The pumps are rated to 40% by weight solids, however, when this is exceeded or when solids are particularly sharp (i.e. silica slurry) this type of failure is more common. Maintaining a good flushing system, paying attention to the % solids, using an abrasion pad and/or slowing down fluid velocities will help.

Note: If a diaphragm is torn dramatically along the bottom side and there is bending of the center shafts, this is definitely a solids settling issue and should be addressed accordingly.

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Disk Wear

CENTER DISK CUT / BACKWARD INSTALLATION

In this case, there will be a pronounced cut line around the center of the diaphragm where the outer or inner disk comes into contact with the diaphragm. When the center disks are installed it is important to make sure that the round edges face the diaphragm to avoid a dramatic cutting effect. Additionally, if the diaphragm is installed backwards, you will notice the same dramatic cut around the center disk of the diaphragm. Either failure will drastically shorten the life of the diaphragm.

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Cut Out

DRY RUNNING

A diaphragm that has been dry run too much or too often will have a star-like wear pattern starting at the center, extending outward, and the diaphragm life will be abnormally short. To avoid this situation, use the proper operation with liquid level controllers, dry run detectors, speed control mufflers and/or by simply operating the system to avoid dry running. The pump will not self-destruct when dry run, however, the diaphragm does have a life cycle, whether there is liquid present or not. When the pump is run, with the presence of liquid or not, the diaphragm life is being consumed. This is compounded by a dry run situation, putting uneven pressure on the diaphragm and allowing for over speeding of the pump.

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Star Pattern

OVER PRESSURIZATION / AIR SIDE

The diaphragm will have a bloated appearance toward the liquid chamber. The bloating is caused by uneven pressure on the diaphragm. In this type of failure, the air pressure is greatly exceeding the required discharge pressure. A common cause of this is the opening up of the ball valve, allowing the pump to run wide open before being fully primed. It is not recommended to pressurize the system, in order to check for functionality, or to fully open up the air pressure before it is primed.

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Bloated