Introduction

The peristaltic pump belongs to the family of positive displacement volumetric pumps. Its operation principle is simple and known from a long time, although in the last years the development of new impeller tubes with high mechanical strength for withstanding a long service life and capacity for working at high pressures (up to 16 bar), has converted this type of pumps in exceptional.

Operation

The impeller tube can be compressed either by the roller system (BOYSER Series AMP), or by the pad system (BOYSER Series RBT). When the roller or pad passes compressing the tube, two effects are produced: in suction area, the tube recovers is initial shape, creating a negative pressure that converts the pump in self-suction type, reaching a vacuum up to 9,5 m.w.c.. In discharge area, the pressed tube generates a volumetric change that pushes the fluid forward, being the flow directly proportional to rotation speed.

Tube Flattening

During pumping, the tube compression must be total. This avoids the appearance of "slip" (leak in opposite direction of part of the fluid), and the loss of the self-suction capacity. This is specially important when pumping fluids with solids in suspension, because the percentage of pumped fluid, versus the percentage of solids, could be reduced, even producing a block in the tube or impulsion pipe. In addition, the appearance of this phenomenon induces also to a premature wear of the tube.

On the contrary, an excessive flattening of the tube would also induce to excessive wear, and to increase the absorbed power and temperature. If in addition we think that rotation speed and working pressure will vary the tube compression parameters, we will understand the importance of adjusting the working distance of the roller or pad, according the indications in the Instruction Manual of BOYSER.

Pumping of Viscous Fluids

As a general rule, it is possible to pump viscous fluids with a peristaltic pump. However, when reaching certain viscosity's (depending in each case on the pump size, rotation speed, etc) it could be that the tube, once compressed, does not fully recover its initial shape. In this case, RBT Series has foreseen the erection of a small vacuum equipment connected to the pump body, that approximates the vacuum level existing inside the tube to the provoked in the pump body, achieving a better recuperation of tube, and the required pumping effect.

Solids in suspension

The maximum diameter of solids in suspension that could decant a peristaltic pump, depends on the diameter of the impeller tube, the solid percentage, and how cutting they are

For non-cutting solids, the maximum diameter will depend on the percentage

- If product is high concentrated in solids, the maximum diameter will be around 15% with respect to the inner diameter of tube.
- If product is low concentrated in solids, the maximum diameter will be around 25% with respect to the inner diameter of tube.

If solids to be pumped are soft and could be deformed when clutching, the maximum diameter will only be limited to the inner diameter of tube.

Pulsating Flow

When the roller or pad of the peristaltic pump compresses the tube while displacing towards the discharge, a volumetric change is produced. This originates a forward thrusting force in the fluid. This force continues until the roller or pad stops compressing the tube. In this moment the tube recovers its initial shape, producing a small de-pressurization, because a part of the pumped fluid is taking the place of the volume occupied by the roller or pad until that moment. In this point, the discharge flow is stopped for a moment up to receive the next push by the next roller or pad, varying the acceleration and de-acceleration, therefore changing the fluid pressure, originating a pulsating flow. (This phenomenon is presented in suction as well)

BOYSER has a series of pulsation dampers (discharge side), or pressure stabilizers (suction side) for avoiding the negative effects of the pulsating flow.

Discharge: it is necessary to install a pulse damper when the pressure peaks originated in the discharge could exceed the maximum working pressure recommended for every pump.

It is advisable the installation in the following cases:

- For avoiding unnecessary vibrations in piping
- For operating with more precision instruments as flow meters, metering devices, etc
- For a better feeding of filtration systems
- For feeding pulverizing nozzles, fluid curtains, etc

Suction: It is necessary to install a pressure stabilizer in suction when the pressure peaks exceed 0,4 bar, and also when the suction conditions are in their limit values. (You may consult the technical department of BOMBAS BOYSER. S.L.)

It is advisable to install them for reducing vibrations in piping.

CHEKLIST FOR BOYSER HOSE PUMPS

1. Pump speed

Must have been selected in green area of curves.
Mind you: At higher temperatures and/or counter pressures the speed is limited by the temperature figures printed right from the curves.

2. Pumping Pressure (counter pressure)

Should not go over maximum allowance (8 bar for AMP-Series, 2 bar for PHARMED tube in AMP-Series, 15 bar for RBT-Series). If hose failure looks like explosion check system for blocked lines, closed valves or failing pressure relief valves.

3. Product temperature

See also item 1, above.

4. Solids and particles

The maximum allowable size of the particles in the product is related to the inner diameter of the pump hose and the shape of the particles.
For non-sharp particles the maximum size is dependent on the percentage of solids.

- If the product consists of mainly particles, the sizes have to be smaller than 15% of the inner diameter of the hose.
- If the product has only a few round or non-sharp particles, the maximum size is 25% of the inner diameter of the hose.

If the pump is used for compressible products the maximum size is only limited by the inner diameter of the pump hose.

5. Shimming

Must be according to curves as added to each pump and printed in the maintenance manual.

6. Insufficient lubrication

The right quantity, as printed in maintenance manual, has to be in the pump housing. Also the composition of the lubricant is important. (Use only a original lubricant)

7. Suction conditions,

Inlet pressure has to be sufficient. Line diameters must be checked for width, to be related to viscosity of product and distance to the pump. Severe pulsation at the inlet side of the pump indicates bad suction conditions.

8. Hose resistance

Elastomer of hose must be compatible with product to be pumped.

9. Pressing shoes

Check for damage.
Damaged shoes will cause insufficient compression of the hose, which creates a back stream in the hose, and this damages the inner layer of the hose.
The outside of the hose will be damaged as well.

10. Sharp objects.

Sharp objects in the product can perforate the hose wall.

11. Cleaning
Check for cleaning procedure, aggressive cleaning product and temperature of cleaning liquid.

12. Pump cover

The front cover of the pump should not be removed whilst the hose is in position. This will cause a deformation . Only replace the cover when the hose has been extruded from the pump body.

13. Lubricant and coolant

Purposes:
- Lubricant should minimize the friction between pressing shoe and hose.
- The temperature, developed in the hose as a result of the compression energy and friction, should be passed on to the pump casing with regard to cooling.

Requirements:
- Good lubricant qualities
- Good transfer of temperature
- No attack of the rubber hose
- No aging
- Temperature range from minus 20 degr. C. to plus 80 degr. C.

14. Use our calculations if necessary.