REDUCE CAPITAL AND MAINTENANCE COSTS WITH

CODIP P.T.F.E. PUMPS

AIR OPERATED TUBULAR DIAPHRAGM

PRODUCT INFORMATION

CODIP manufactures the only range of air-operated pumps with P.T.F.E. tubular diaphragm, a unique construction compared with the conventional AOD pumps.
At present the *CODIP* pump range embraces five models depending on the capacity and covers nominal flow rates from 20 litres/min (4,4 GPM) to 300 litres/min (66 GPM), each pump being capable of producing heads of 10 bar (335 ft. H2O) at temperature of up to 90°C as standard and up to 180°C with simple modification.
Various materials of construction allow many configurations for each model in order to suit all industrial applications.

The dry suction lift capability ranges from 1 m RP 20 to 4 m RP 150 and Duplex pumps with standard ball check valves, subject to operating conditions (specific gravity, suction pipework, viscosity, temperature, vapour pressure and stroke frequency).
An optional check valve with PTFE shuttle replacing the standard ball achieves higher suction lifts (3,5 m RP 20 to 5 m RP 60 Duplex based on water at 18°C) and ensures positive seating.

OPERATIONAL FEATURES

The *CODIP* pump is operated by compressed air supplied through an independent automatic air distributor to one side of a flat rubber air-diaphragm. This diaphragm is deflected, thus displacing the inert liquid inside the pump casing. In its turn the inert liquid transmits the pressure UNIFORMLY to the PTFE tubular diaphragm without any mechanical stress.

The rubber diaphragm therefore operates with an air pressure on one side, and an equally and opposite fluid pressure on the other side, so that this diaphragm is hydrodynamically balanced.

Similarly, the tubular diaphragm (which is "*the heart*" of the system) operates with medium inside, and inert liquid outside, at the same internal and external pressure also this diaphragm is hydrodinamically balanced. This means that the differential pressure acting on the tubular diaphragm walls is always zero, therefore completely eliminating any diaphragm stress for which results in an extremely long tubular diaphragm life.

In the *CODIP* pump, all components parts that come into contact with the pumped medium are isostatically moulded from pure virgin PTFE. The pump has no mechanical seal , packing or O-rings that seal the pumped liquid from the environment, and it is therefore virtually impossible that the *CODIP* pump leaks any pumped liquid into the environment.

The fact that the process fluid is prevented from entering an exhaust port by means of a secondary containment is another important feature of the *CODIP* concept which addresses the continuously growing demand for sealless pumps and ensures zero leakage in the event of a diaphragm failure.

The PTFE tubular diaphragm safely handles most corrosive liquids, both hot and cold.

FLOW CHARACTERISTICS AND AIR REQUIREMENTS

The theory of the **CODIP** pump design is that the quantity of medium displaced is equal to the quantity of inert liquid displaced.

The air pressure should never be less than **2,5** bar, and should be kept at 1 to 3 bar above the liquid discharge pressure in order to maintain the nominal flow of the pump.

By eliminating any dead air volume in the RP 20 and RP 60 simplex pumps we have reached the maximum possible efficiency related to air consumption of the pumps.

The minimum N.P.S.H. required by *CODIP* pumps normally 3/4 metres.

CONSTRUCTIONAL FEATURES

P.T.F.E. Tubular Diaphragm

The mild movements of the tubular diaphragm, and the non-stick properties of PTFE make the *CODIP* pump suitable for the unstable dispersions without fear of coagulation or shearing.

Also since no electricity is required, the pump body is conductive and PTFE is sparkproof, the *CODIP* pump is ideal for handling **solvents and explosives** ; providing the system is adequately earthed to protect against static electricity discharge.

Many *CODIP* pumps are installed for handling ultra-pure products in the pharmaceutical and food industries where the prime considerations are : **no contamination, no contact with atmosphere and ease of sterilisation with steam.** Steam at 180°C is quite acceptable.

The *CODIP* tubular diaphragms are supplied with a guarantee of 10,000 hours of continuous trouble-free service when handling **clean** liquids.
The check valve balls are also available in glass reinforced PTFE (type **"RA"**) and ceramic, the valve seats are also available with glass filled PTFE inserts (at max. working temperature of 70°C) and a special designed PTFE tubular diaphragm called **"SD"** is available to increase lifetime in case abrasive liquids must be handled requiring PTFE for wetted parts.

However, pumps having PTFE components may have a reduced operating life when handling liquids containing abrasives or crystals in suspension. For this type of application *CODIP* pumps are available to special order with all parts which come into contact with the medium in HYPALON®, VITON® or EPDM, synthetic elastomers which have an excellent resistance to abrasion, as well as a good resistance to a wide range of chemicals.

Rubber pumps are limited to a maximum working temperature of 100°C for Hypalon, 135°C for EPDM and 150°C for Viton.

Check Valves and Flanges

The PTFE linings of the check valves and flanges are isostatically moulded, and then introduced into their respective metal components by a special *CODIP* method. For this reason it is not possible to supply linings separately. Whereas rubber linings are separately available.

P.T.F.E. Check Valve Balls

Normally when liquids to be handled have a specific gravity and a viscosity below 1,000 cps, the *CODIP* pumps are supplied with pure PTFE balls.

For higher specific gravities and viscosities, the balls are in PTFE-lined steel but with this option the maximum working temperature is 80°C.

When the pumps handle liquids containing abrasive or crystals in suspension the balls are in glass filled PTFE **type RA.**
For the above applications are also available **stainless steel AISI 316 balls**.

Flexible Rubber Diaphragm

The RP 20 and RP 60 pumps are normally supplied with a thick **natural rubber** elastic diaphragm. The RP 150 and RP60/RP 150 Duplex pumps are supplied with a thinner more flexible neoprene rubber diaphragm fixed to a disc driven by a driving shaft.

For service temperatures above 90°C and up to 120°C the natural rubber is replaced by a special grade of **neoprene**, and between 120°C and 150°C by a special grade of reinforced **silicone** rubber.

On demand other elastomers are available : **HNBR** (hydrogenated nitrilic rubber) for high temperatures when the pump has to be filled with silicone oil as inert liquid or **Neoprene backup Viton** overlay when chemical compatibility with the handling liquid is required.

Pump casing

The external casing of the pump is a aluminium alloy casting or ductile iron protected by an outer coating of epoxy powder, cured at approximately 180°C, to a minimum thickness of 250 microns. The casings are hydrostatically tested up to a pressure of 25 bar.

Air distributor

The air distributor valve is the external drive unit of the pump and it operates independent from any other part of the pump, so it is not possible the pump will ever get stuck in a deadlock, or that the stroke frequency is changing by a changing pump head. This high precision air valve can be accessed by 2-socket bolts without disturbing the piping, process fluid, hydraulic fluid or pump housing. The air distributor does not require any lubrication, it works with dry, clean, filtered air and it is maintenance free.

In the compact model (RP 20 and RP 60 only) all moving parts are cylindrical and all gaskets are of the self-lubricating O-Ring type; this type of distributor is supplied with a pilot valve to allow frequencies as low as 20 cycles/min, but should not normally be increased above 120 cycles/min (nominal capacity is achieved at approximately 120 cycles/min under test conditions).
RP 150 and Duplex pumps work regularly at a maximum 100 cycles/min.

In principle the pump capacity is not affected and/or regulated by the discharge pressure, but the capacity or stroke frequency is regulated manually with the pilot or can be adjusted (optional) by a pneumatic or electropneumatic signal for a remote control (3-15 Psi or 4-20 mA) unit.

A totalizing-predetermining impulse counter (batch controller) is optionally available.

Installation, Operation and Servicing

If the *CODIP* pumps are installed in accordance with the Installation and Operating Instructions which are issued with every pump, they will operate without problem for a very long period (years) and are often "forgotten" by the maintenance department.

Listed below are some mistakes which can occur during the installation, operation or maintenance periods, and create inefficient operation :

a) Short radius elbows or tees on suction or discharge pipes.

b) Motive air pipe not blown out before connecting to air distributor : **result**- dirt and rust can enter the distributor causing air restriction, jamming, tearing of the O-Rings, and scarring of the pistons. Lubricated driving air flooding the air distributors accumulator chamber. Or a small residue of synthetic lubricants from the compressor can swell the O-rings in some cases.

Lubrication in Driving Air

a) Oil can have detrimental effect on rubber O-rings and diaphragm. Shuttle jams, O-rings swell and distort.

b) If for maintenance reasons the inert liquid is replaced, the vent cock and adjustment valve should be resealed (wire seal). Experience has shown that if this is not done unsealed taps and valves are often opened by "experts" allowing inert liquid to escape and air to enter the pump body.

Result : pumping capacity is drastically reduced.

(c) Air pocket in the suction line (syphon break effect) which cannot be eliminated.
Result : pumping capacity drastically reduced.

(d) Attempting dry suction lift when the discharge pipe is filled with fluid. This is impossible if static head is more than 2 m (H_2O) because the pump cannot compress air sufficiently to overcome it. Make sure that the discharge head is lower than 2 meters of liquid column.

SPECIAL DESIGNS

Steam Heating System

The RP 20 and RP 60 Simplex and Duplex models can be supplied with an internal stainless steel AISI 316 heat exchanger coil to heat the pump eliminating the need of expensive electrical tracing especially for explosion hazardous areas. Also the air distributor can be supplied with a SS AISI 316 spacer to avoid its overheating and create room for an external insulation jacket.

The a.m. system can be used also to cool the handling liquid or for maintaining a constant process temperature. It can be easily hooked up to any exsisting jacketing system.

Remote Control

The *CODIP* pumps are available also with a 3-15 PSI controller (pneumatic actuator) ; the remote control unit can include a 4-20 mA converter to transform an electrical signal (4-20mA) into a pneumatic signal (3-15 psi).

Emergency stop

The *CODIP* emergency stop unit is designed to stop the pump manually from a distant position by blocking the air distributors pilot air exhaust outlet. This stops any pump action in the shortest possible time. It comes with a typical big RED safety button.

Leak detection

The *CODIP* leak detection system is designed to detect the smallest contamination of the inert liquid, in order to minimize the safety hazards in case of a diaphragm failure no matter how small in the air diaphragm or in the tubular diaphragm. Also diffundated parts of the pumped liquid can be detected to avoid a slow contamination of the inert liquid after a very long time of use. This system is available for electrical safe areas, for explosion proof zones.

CODIP PTFE TUBULAR DIAPHRAGM PUMPS - APPLICATIONS

CODIP pumps are installed in a wide variety of chemical, pharmaceutical and foodstuff plants all over the world for handling a the most corrosive liquids, when conventional pumps work with trouble, difficulty or not at all. Also *CODIP* pumps often replace other pumps in order to reduce downtime, maintenance and operating cost.

CODIP pumps still find several other types of applications :

A) Since they can run "dry" (without liquid) without suffering any damage, *CODIP* pumps handle hot highly corrosive liquids (diluted acids, etc.) in automated plants in which an automatic control may fail.

B) *CODIP* pumps can run deadhead without any damage.

C) The RP 20 pumps can handle small flows at high discharge pressures (5-6 bar). This cannot be achieved by centrifugal pumps.

D) *CODIP* PTFE "non-sticking" property permits use of *CODIP* pumps for handling paints, varnishes, glues.

E) *CODIP* spark-proof and conductive body properties permit use of *CODIP* pumps for handling explosives (nitric-sulphuric acids mixtures, etc.) and all kinds of solvents.

F) *CODIP* air consumption is as low as possibily achievable thanks to the zero dead air volume.

G) *CODIP* pumps handle mixtures of acid and solvents, of acids and ketones (e.g. HF and MEK)

H) *CODIP* pumps handle mercury and heavy fluids (with inverted check valves).

I) *CODIP* pumps handle perfumes and flavours, since no drops of liquid or fumes can leak out from the pump.

J) *CODIP* pumps are installed in pharmaceutical plants for handling fermentation broths, antibiotics and vitamines since they can be easily sterilized with steam at 180°C and since all parts in contact with product are manufactured in PTFE.

K) *CODIP* pumps handle any kind of natural or synthetic latex (also polyvinyldene chloride - PVDC) and do not produce coagulation of product.

L) *CODIP* pumps meet the rigid guidelines of the semiconductor, electronic, pharmaceutical industries for pumping corrosive high purity liquids without contaminating them.

M) *CODIP* pumps have all peripheral components like the leak detection system, batch controller, emergency stop etc. available for explosion hazarduous areas which in principle does not allow the use of any kind of electricity.