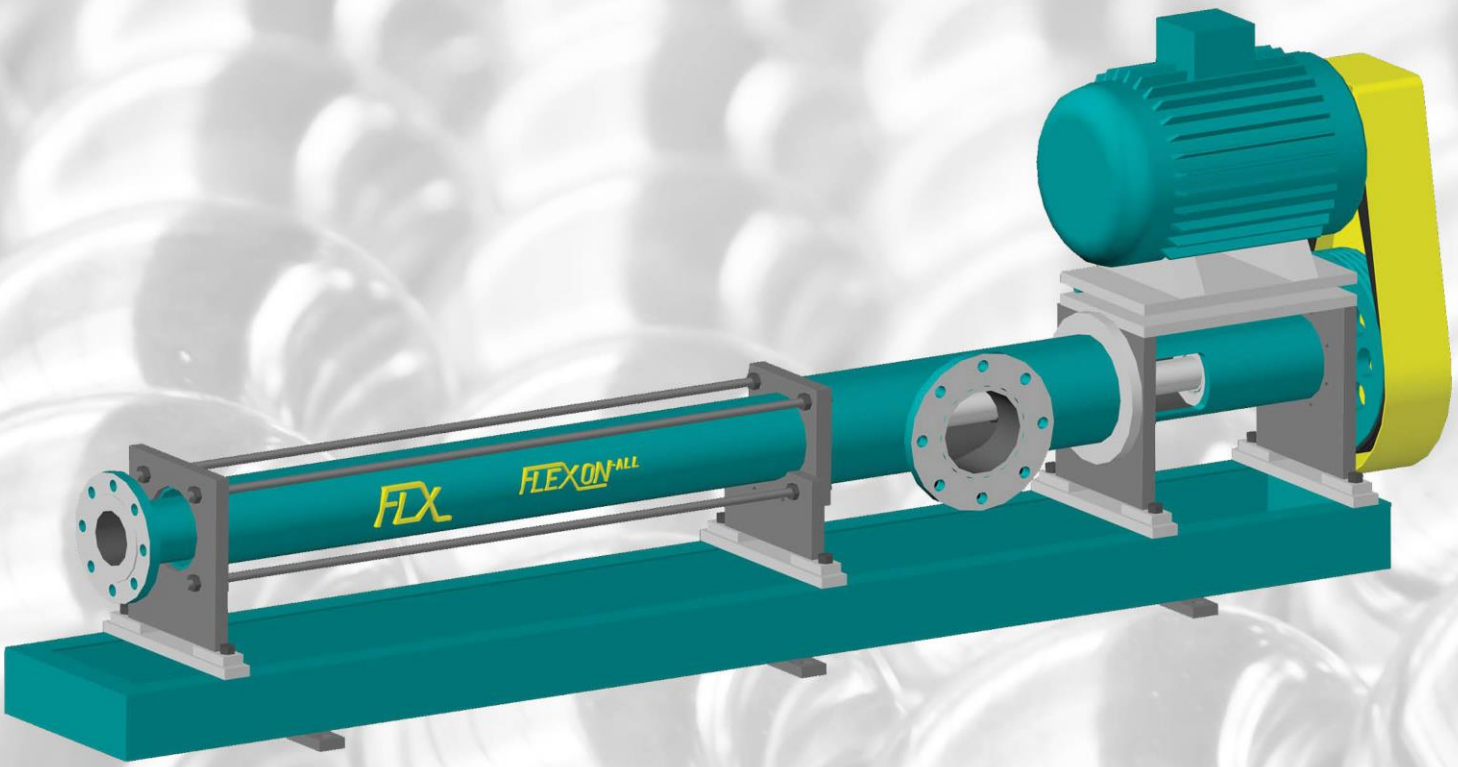
FLEXON-ALL



PROGRESSIVE CAVITY PUMP GROUP

(GPE)

GENERAL PRESENTATION & TECHNICAL CHARACTERISTICS OF PROGRESSIVE CAVITY PUMP GROUP
PRODUCED BY FLEXON-ALL

GENERAL PRESENTATION

FLEXON-ALL was set up in 2004 as a small company manufacturing technical polyurethane items, plastic and metal spare parts for oil drilling and production equipment and for other industrial equipment.

Since the very beginning of the activity we have been cooperating with UPETROM and AXON companies in the production of rotors and stators of progressive cavity pumps (PCP) for crude oil extraction, currently achieving deliveries of more than 5000 pieces on various markets (Romania, Albania, Russian Federation, Ukraine, Moldova, Kazakhstan)

ISO 9001 Certificate

ATEX Certificate

On the basis of the experience gained and our specialists' expertise in PCPs area, the company has become specialized in the repair of horizontal pumping groups provided with progressive cavity pumps, and developed the design and manufacture of pumps with various helical stator-rotor profiles for various flows and pressures.

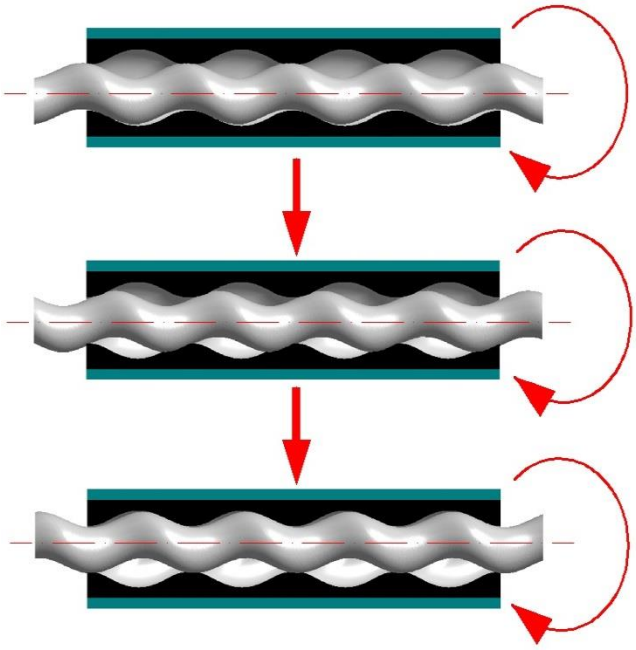
Since 2011 it has been started the design and manufacture of GPE-type helical pumping groups provided with progressive cavity (helical) pumps for carrying various fluids not posing ignition or explosion risks (drilling fluids, brine, slurries, etc.).

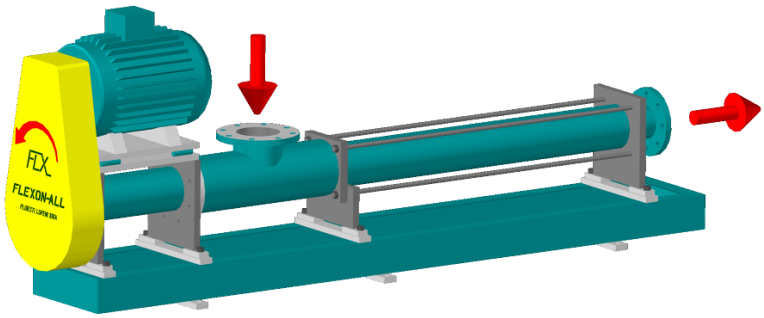
In 2013 we also began designing pumping units for dangerous fluids in terms of ignition or explosion (oil products, crude oil, etc.) used in oilfields, and since 2014 we have been accredited by INSEMEX Petrosani for the design and manufacture of such units.

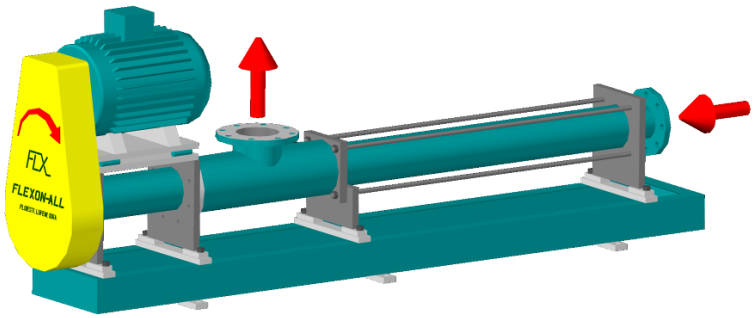
HOW THE GROUP IS WORKING

Helical pumping units (grupuri de pompare elicoidale - GPE) are equipment designed to pump various homogenous and/or heterogeneous sluggish dirty fluids containing solid abrasive or nonabrasive particles: crude oil, clean or waste brine, drilling fluids, oils, greases, grout, slurries, etc.

The pumping units are constructively based on driving by means of a mechanical transmission with belts or reducer gear from an electric motor to a drive bearing and further through double universal joint to the helical pump rotor.







The pump operating principle consists in the rotary motion of a single helix steel rotor within the double helix rubber profile of the stator, thus lenticular volumes being created between them. The cavities formed by the rotor and stator gear axially progresses throughout the pump length thus carrying the fluid in the pump with flows proportionate to cavity size and rotational speed of the rotor.

The number of progressive cavities resulting from the rotor and stator gear determines the amount of back pressure.

By changing the direction of rotor rotation the direction of fluid in the pump may also be changed. This way the suction chamber becomes discharge chamber, while the discharge chamber becomes suction chamber.

PROGRESSIVE CAVITY PUMP GROUP TYPE GPE - APLICATION - DESIGN

PROGRESSIVE CAVITY PUMP GROUPS

- GPE-type pumping units – provided with PCP progressive cavity pumps can pump, carry, and transfer fluids and sluggish materials in most industrial areas:

- in oil industry for crude oil extraction and transport, injection of salt water into the reservoir, and well drilling for drilling mud circulation.

- in chemical and petrochemical industry;

- in refineries for crude oil and sludge transportation;

- in wastewater treatment plants and environmental cleaning of sludge pits;

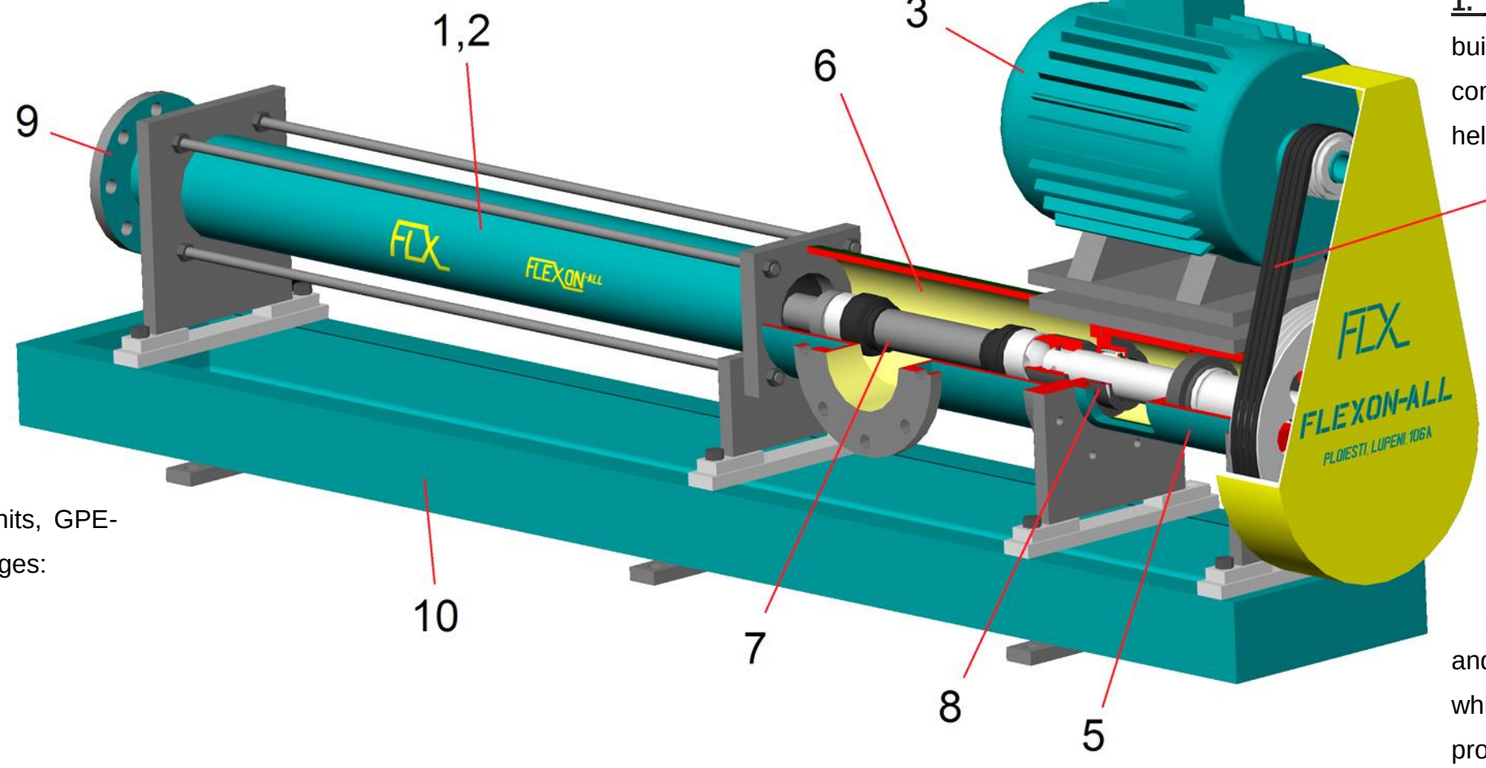
- in civil engineering industry for the transport of slurry, fluid concrete, etc;

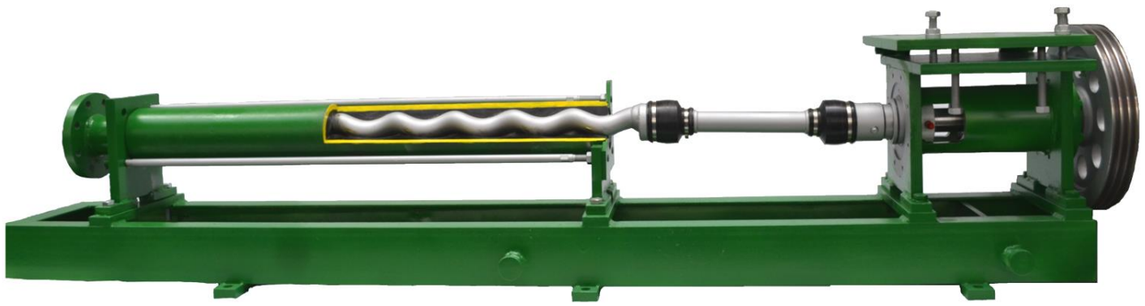
- in food industry for pumping vegetal oils, fats, syrups, etc.

Advantages:

Compared to the other pumping units, GPE-type units offer a number of advantages:

- Operation without pulsations;
- High flow rates at low speeds;
- Simple construction without pistons, valves, diaphragms;
- Reduced mechanical stress;
- No priming required;
- Easily pumping fluids with suspended solid impurities without danger;
- Easy maintenance;
- Not allowing for vapor leaks into the atmosphere;
- Low noise level;
- Fluid temperatures up to 180°C





According to the operating conditions, progressive cavity pump groups are built in the following versions:

- **horizontal (GPEO) –** mounted at the same level with the tank from which the fluid to be carried is pumped.

- **vertical (GPEV) –** with the pump sunk in the fluid to be carried and the surface driving part attached to the tank.

In construction terms both types, GPEO and GPEV, are similar as they consist in:

- Progressive cavity pump (1; 2);
- Electric motor (3);
- Power transmission system with V-belts or speed reduction unit (4);
- Transmission bearing (5);
- Suction chamber (6);
- Pump shaft propeller (7);
- Suction chamber seal (8);
- Discharge chamber (9);
- Unit chassis (10).

Progressive cavity pump (helical) – the main unit part is the one that provides unit performances, such as the flow and pressure.

HORIZONTAL PROGRESSIVE CAVITY PUMP GROUPS

1. The stator of each pump is designed and built by us in single block design, being composed of a steel shell which has a double helix profile inside made of rubber resistant to the working fluid temperature.

The main elastomer types used in stator anufacturing are NBR-; HNBR-XNBR ; FLUORIDE , POLYURE - THANE- type and are based on our own compounding developed, tried and tested with our collaborators from AXON in abrasive media, chemically aggressive fluids and various working temperatures.

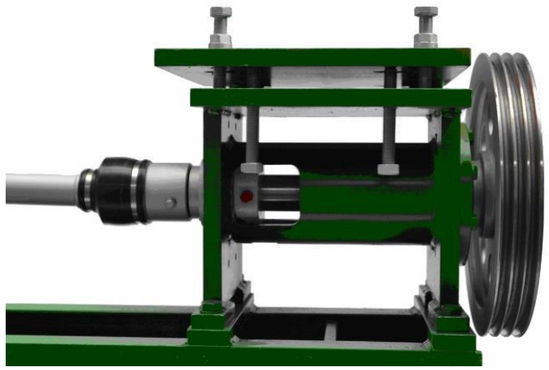
2. Rotor of each pump is designed by us and built in cooperation with UPETROM, which has available specific equipment for processing and chrome plating.

Depending on the work environment, they are made of annealed alloy carbon steel plated on the outside with 0,3-0,4 mm layer of hard chrome. For highly corrosive and aggressive environments, rotors are made of stainless steel, also plated with hard chrome on the outside.

PROGRESSIVE CAVITY PUMP GROUP TYPE GPE - APLICATION - DESIGN

3.The electric motor is in framed or flanged design, three-phase for 380 - 500V voltages and speed for normal work environments or ANTIEX for potentially explosive environments.

4. The system transmitting the rotation from the motor to the pump has antistatic V-shaped driving belts, with spare pulleys for various speeds and belt idler and strain locking system.



5. Transmission bearing – is in sealed design composed of cylindrical metal housing sealed at both ends with oil-seal rings in which two bearings (radial - axial) immersed in grease are mounted.

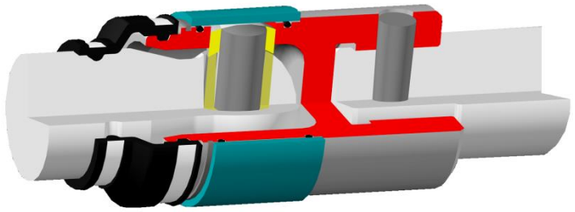
Bearings seat the main shaft which transmits the rotation by the belt pulleys on the pump drive shaft.

6. Suction chamber – is in welded design provided with pump nozzle with ISO1092 union flange, which can be mounted, depending on the placement positions, in three positions shifted by 90° left/up/right.
There are plugged drain and inspection outlets provided on the suction chamber.

7. Pump shaft propeller - is a double “pin joint” type design with bolts and bushings of wear resistant material with two coupling heads, one at the main axis of the bearing and the other at the pump rotor.

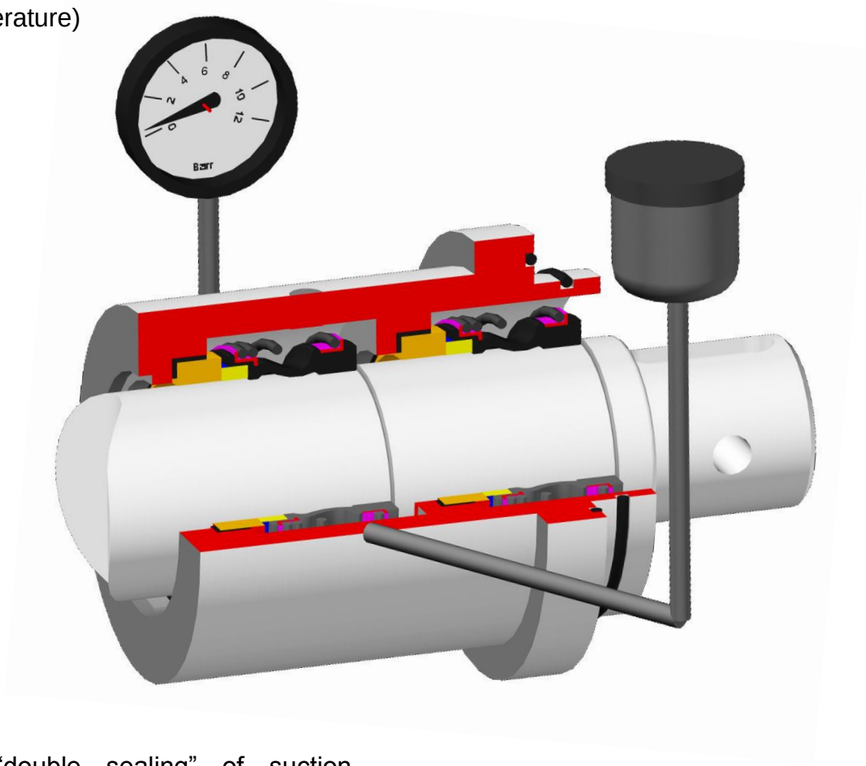
The shaft propeller and its joints work immersed in pumped fluid and ensure the taking over of eccentric movement provided by the rotor.

The joints are permanently lubricated with grease, the seal being provided with flexible rubber bellows tightened with metal clamps at ends.



8. Suction chamber sealing

- is of “mechanical seal” type, permanently lubricated by the circulated fluid and chosen to withstand working conditions (work fluid, pressure, temperature)



We offer “double sealing” of suction chamber as a safer solution, consisting in placing two “mechanical seals” in sequence, the first for working and the second for spare in case the first one is damaged.

For lubrication purposed, the space between them communicates with a lubricant feeding system that also monitors lubricant presence and whether the first seal (work seal) has been damaged.

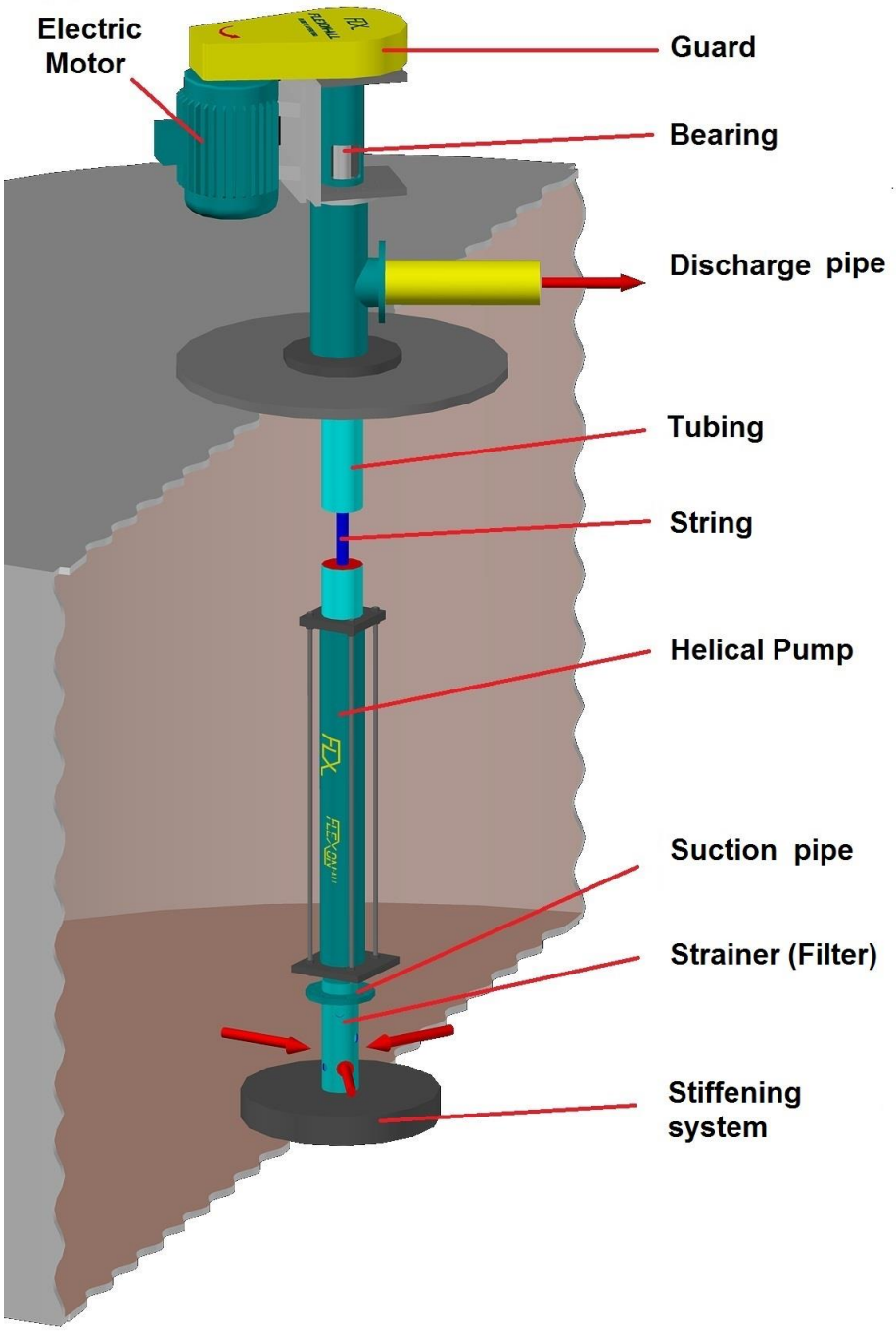
9. Discharge room provided with flange according to ISO 1092 for the size and pressure appropriate to the maximum size and pressure discharged by the pump.

10. Unit chassis – provided with clamps for securing the unit to the floor and collecting pan for leaks or residues resulting from cleaning, interventions

VERTICAL PROGRESSIVE CAVITY PUMP GROUP

This type of progressive cavity pump group is designed to pump fluids from inside of closed tanks. The unit is vertically mounted to the tank and has the pump sunk in the fluid to be pumped.

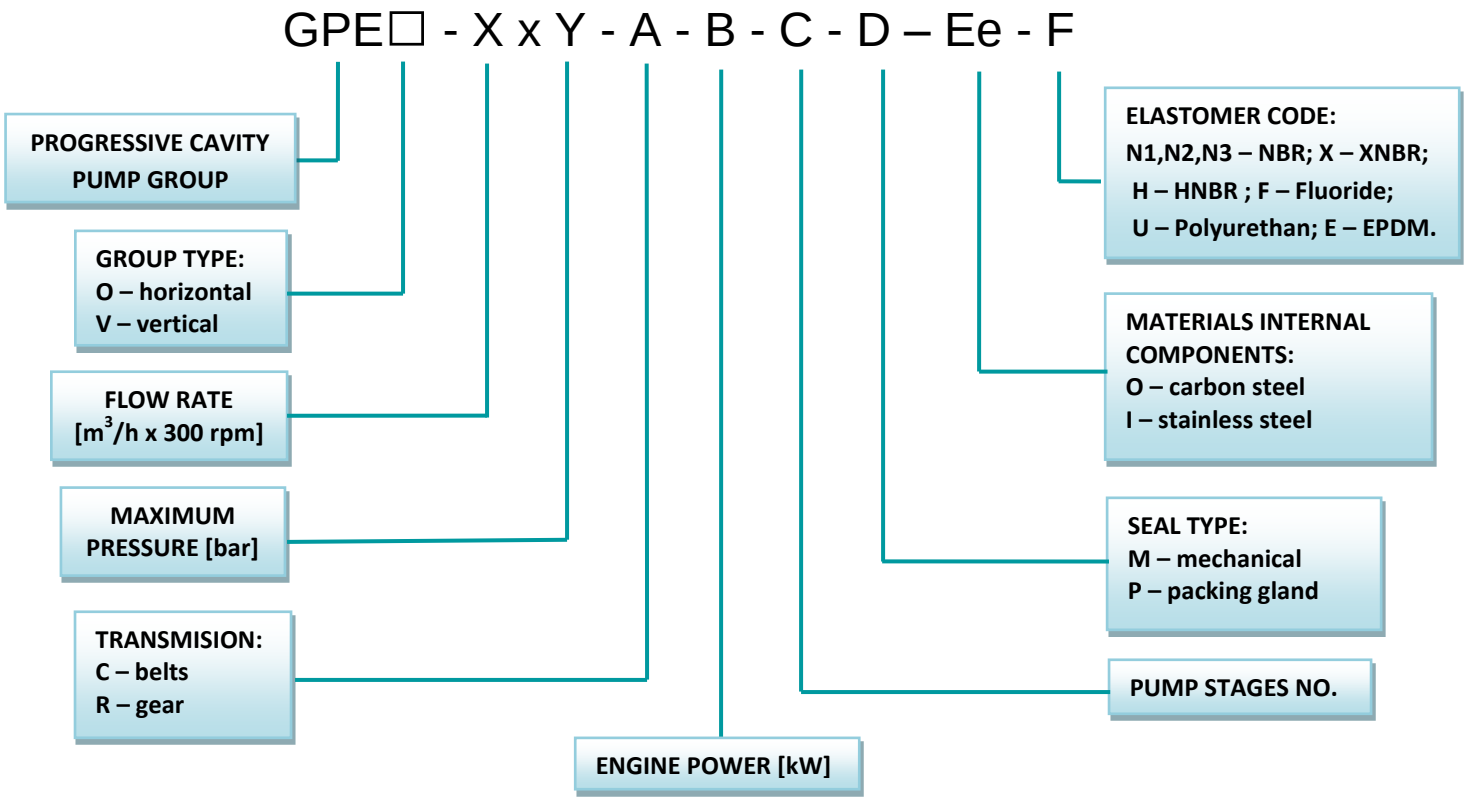
The bearing and the electric motor are mounted above the tank, away from the working fluid. Construction of a vertical helical pumping unit is similar to horizontal helical pumping unit, the only difference being the insertion of tubing, string, filter to avoid suction clogging, and a stiffening system for the entire drive unit, which is mounted above and on the bottom of the tank.



SYMBOLS

For the selection of a GPEO type - horizontal or GPEV type - vertical progressive cavity pump group, their symbols have included functional characteristics, type and component materials.

Symbols for GPE type progressive cavity pump groups:



Symbolisation example 1:

GPEO – 16,5 × 24 – C - 22 - 5 - M - 0 - N

☐ = O - Horizontal ;

X = 16,5 – Max. flow [m^3/h x 300 rpm];
Y = 24 – Max. discharge pressure [bar];
A = C – Belt transmission;
B = 22 – Engine power [kW];
C = 5 – Pump stages no.;
D = M – Mechanical seal;
Ee = O – Carbon steel;
F = N - NBR.

Symbolisation example 2:

GPEV – 7,5 × 12 – R – 3 - 2 - P - I - H

☐ = V - Vertical

X = 7,5 – Max. flow [m^3/h x 300 rpm];
Y = 12 - Max. discharge pressure [bar];
A = R – Reduction gear;
B = 3 – Motor power [kW];
C = 2 – No. of pump stages;
D = P – Mechanical seal;
Ee = I – Stainless steel
F = H - HNBR.

TYPES AND SIZES

We are currently manufacturing progressive cavity pump groups in two construction versions:

- horizontal: - with belt drives (table 1);
  - with gear assembly (table 2).
- vertical: - with drive belts (table 3).

and have their assimilation in progress with completed manufacturing preparations.

Table 1

HORIZONTAL PROGRESSIVE CAVITY PUMP GROUPS – BELT DRIVE						
Types and sizes Nominal flow x Pressure (m^3/h x bar)	Flows [m^3/h] / Speed (rpm)			Pump		Max. Power required [kW]
				Model	Stages.	
*GPEO 7,5 x 06-C	5 / 200	7,5 / 300	12,5 / 500	PET – 7,5	2	3
*GPEO 7,5 x 12-C					3	5,5
*GPEO 7,5 x 24-C					5	11
*GPEO 7,5 x 48-C					9	22
GPEO 7,5 x 64-C					12	30
GPEO 7,5 x 96-C			-		18	30
GPEO 10 x 06-C	6,5 / 200	10 / 300	14,5 / 450	PET – 10	2	3
GPEO 10 x 12-C					3	7,5
GPEO 10 x 18-C					4	11
GPEO 10 x 24-C					5	15
GPEO 10 x 48-C			-		9	18,5
GPEO 10 x 64-C			-		12	22
GPEO 10 x 96-C			-		18	37
*GPEO 16,5 x 06-C	11 / 200	16,5 / 300	25 / 450	PET – 16,5	2	5,5
*GPEO 16,5 x 12-C					3	11
*GPEO 16,5 x 24-C					5	22
*GPEO 16,5 x 48-C					9	30
GPEO 16,5 x 64-C			-		12	37
GPEO 16,5 x 96-C			-		18	55
GPEO 20 x 06-C	13 / 200	20 / 300	30 / 450	PET – 20	2	7,5
GPEO 20 x 12-C					3	15
GPEO 20 x 18-C					4	18,5
GPEO 20 x 24-C					5	22
GPEO 20 x 48-C			-		9	37
GPEO 20 x 64-C			-		12	45
GPEO 20 x 80-C			-		18	55
GPEO 30 x 06-C	20 / 200	30 / 300	40 / 400	PET – 30	2	9
GPEO 30 x 12-C					3	15
GPEO 30 x 18-C					4	22
GPEO 30 x 24-C					5	37
GPEO 30 x 48-C			-		9	55
GPEO 30 x 64-C		-	-		12	55
GPEO 50 x 06-C	33 / 200	50 / 300	58 / 350	PET – 50	2	11
GPEO 50 x 12-C					3	22
GPEO 50 x 18-C					4	37
GPEO 50 x 24-C			-		5	45
GPEO 50 x 30-C			-		6	55
GPEO 60 x 06-C	40 / 200	50 / 250	60 / 300	PET – 60	2	11
GPEO 60 x 12-C					3	22
GPEO 60 x 24-C			-		5	45

*Sizes certified by INSEMEX for work in potentially explosive environments (Ex II 2G IIB T4).

TYPES AND SIZES

TABLE 2

HORIZONTAL PROGRESSIVE CAVITY PUMP GROUPS - GEAR ASSEMBLY						
Types and sizes Nominal flow x Pressure (m^3/h x bar)	Flows [m^3/h] / Speed (rpm)			Pump		Max. power required [kW]
				Model	Stages.	
GPEO 2 x 06-R	2 / 300	2,5 / 400	3 / 500	PET – 2 (PE - 16)	2	3
GPEO 2 x 12-R					3	1,5
GPEO 2 x 24-R					5	3
GPEO 2 x 48-R					9	5,5
GPEO 5 x 06-R	5 / 300	6,5 / 400	8,5 / 500	PET – 5 (PE - 42)	2	2,2
GPEO 5 x 12-R					3	3
GPEO 5 x 24-R			-		5	5,5
GPEO 7,5 x 06-R	7,5 / 300	10 / 400	12,5 / 500	PET – 7,5 (PE - 60)	2	3
GPEO 7,5 x 12-R					3	5,5
GPEO 10 x 06-R	10 / 300	12,5 / 400	16 / 500	PET – 10 (PE - 76)	2	3,5
GPEO 10 x 12-R			-		3	3,5

TABLE 3

VERTICAL PROGRESSIVE CAVITY PUMP GROUPS - BELT DRIVE						
Types and sizes Nominal flow x Pressure (m^3/h x bar)	Flows [m^3/h] / Speed (rpm)			Pump		Max. Power required [kW]
				Model	Stages.	
GPEV 7,5 x 06-C	2,5 / 100	5 / 200	7,5 / 300	PET – 7,5	2	2,2
GPEV 7,5 x 12-C					3	3
GPEV 7,5 x 24-C					5	5,5
GPEV 10 x 06-C	3,3 / 100	6,6 / 200	10 / 300	PET – 10	2	2,2
GPEV 10 x 12-C					3	5,5
GPEV 10 x 24-C					5	7,5
GPEV 16,5 x 06-C	5,5 / 100	11 / 200	16,5 / 300	PET – 16,5	2	3
GPEV 16,5 x 12-C					3	5,5
GPEV 16,5 x 24-C					5	11
GPEV 30 x 06-C	10 / 100	20 / 200	30 / 300	PET – 30	2	5,5
GPEV 30 x 12-C					3	11
GPEV 30 x 24-C					5	22
GPEV 50 x 06-C	16 / 100	32 / 200	50 / 300	PET – 50	2	11
GPEV 50 x 12-C					3	18,5
GPEV 60 x 06-C	20 / 100	40 / 200	60 / 300	PET – 60	2	11
GPEV 60 x 12-C					3	22

We can equip any other pumping group with FLEXON helical pumps equivalent to the initial one, within the limit of the maximum power of the electric motor.

We can also deliver FLEXON helical pumps as spare parts, as well as other spare parts for any other pumping unit.

SELECTION

When selecting a type GPE progressive cavity pump group necessary for a certain application, the user and the manufacturer should consider the following criteria:

I. Identification of functional characteristics according to table **1:**

- unit types and sizes;
- discharge flows and pressures;
- no. of pump stages (rotor-stator configuration);
- required power of electric motor.

2. Resistance of component materials to circulated fluid aggression and working temperatures:

- type of steel for internal and external metal elements (carbon steel / stainless steel)
- type of stator elastomer – selection according to table 4

Moreover, in selecting a pumping unit it should be considered that for circulating very sluggish fluids or fluids with high content of abrasive components the working speeds must be drastically reduced in order to achieve effective pumping and low wear.

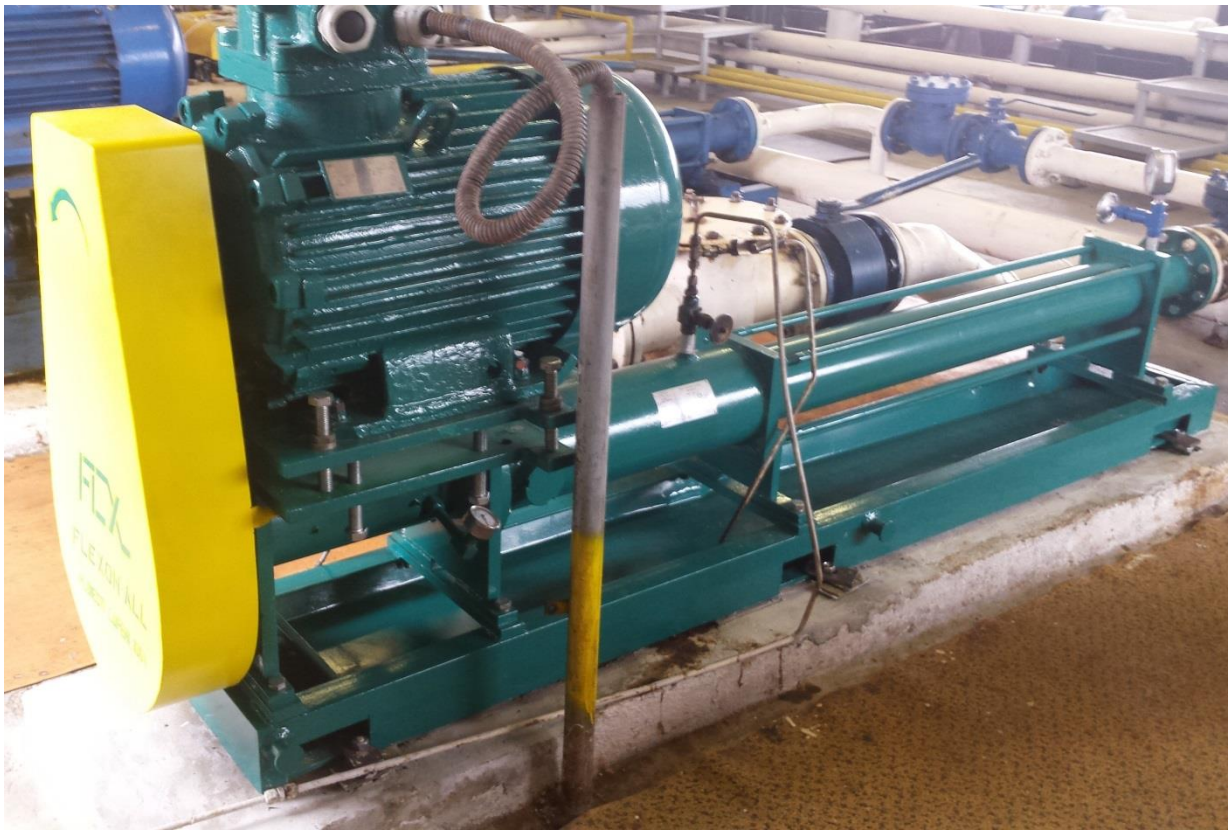
For a better selection of a **GPEO** or **GPEV type progressive cavity pump group, we recommend filling in of a specification sheet (Annex 1) with** abstract data on the application so as to choose together the most appropriate pumping unit you need.

TABLE 4

Elastomer		Recommended working environments	Max. working temperature	Aggresive working environments (not recommended)
Code	Type			
N1	**NBR 1**	- Heavy crude oil (paraffin oil) - Salt water with sand in suspension max 3% - Oils, grease etc.	80°C	- With fuels, solvents, strong acids, ketones, aldehydes,halogenated compounds, ozone environment.
N2	**NBR 2**	- light and heavy crude oil (weak aromatic) - Salt water with sand in suspension max 3% - Oils, oil and aqueous slurries	80°C	
N3	**NBR 3**	- light and heavy crude oil; - Salt water with sand in suspension max 3%; - Oils, grease etc	110°C	
X	**XNBR**	- Heavy paraffin crude oil; salt water; drilling mud; oils, oil and aqueous slurries with mechanical impurities Abrasive environments with sand in suspension.	80°C	
H	**HNBR**	- Light and heavy crude oil (weak aromatic); salt water; sand in suspension max 5%.	120°C	
F	**Fluoride**	- Light and heavy crude oil (aromatic), fuel, solvents, halogenated compounds etc.	180°C	- Ketones, esters, bases, abrasive environments
E	**EPDM**	- Acids, bases, ozon environments, water.	150°C	- Light or heavy petroleum products, solvents, hydrocarbons
U	**Polyurethane**	- Abrasive environments, drilling mud, crude oil (paraffin oil), fluid concrete, grout, oil and aqueous slurries with mechanical impurities	70°C	- Acids, bases, aromatic hydrocarbons, solvents, , halogenated compounds

GPEO-16,5x24 mounted in skid.

GPEO-7,5x24 mounted in skid.



GPEO-16,5x24 working in Parc 34 Talpa, ASET IV Moesia Sud.

FLEXON-ALL Ploieşti, Lupeni 106A	APPLICATION SPECIFICATIONS PROGRESSIVE CAVITY PUMP GROUPS	Rev.0

ANEXX1

1. Beneficiary _____ **Name** _____

Address _____ **Contact person** _____

Telephone _____ **E-mail** _____

2. UNIT MODEL

- Horizontal ☐
- Vertical ☐

3. OPERATION AND PERFORMANCE DATA:

- Pumped fluid: _____
  - solid content (%): _____
  - gas content (%): _____
  - operating temperature (°C): min. _____ max. _____
  - density (kg/m^3): min. _____ max. _____
  - viscosity at operating temperature [cst] _____
- Flow (m^3/h): nom. _____ min. _____ max. _____
- Suction pressure (bar): min. _____ max. _____
- Discharge pressure (bar): nom. _____ min. _____ max. _____
- Operation: continuous ☐ / discontinuous ☐
- Ambient temperature (°C) min. _____ max. _____

4. CONSTRUCTION:

- Hazard area: Area / Group / ATEX category _____
- Constant speed: _____
- Variable speed (type): _____
- Transmission: belts ☐ / gear assembly ☐
- Seal type: simple mechanical seal ☐ / double mechanical seal ☐
  blacklead packing cord ☐
- Motor: Power [kW] _____ , Voltage [V] _____ , Speed [rpm] _____
- Connections: Suction – Dn _____ , Pn _____
  Discharge – Dn _____, Pn _____

5. REQUIRED SAFETY ACCESSORIES:

- Fluid presence sensor ☐
- Heating kit ☐
- Pressure switch ☐
- Check valve ☐

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