HYDRO-PAC, INC.

FLEXI-POWER™ High-Pressure Pumps

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FLEXI-POWER™ High-Pressure Pumps were developed by Hydro-Pac in response to a need for more efficient pressurization of large closed volumes.

FLEXI-POWER™ high-pressure pumps are a combination of our most successful designs. They offer several benefits to the user.

One benefit is the patented sliding-cylinder design that allows replacement of the high-pressure packing without disassembly of the intensifier.

Another benefit is providing greater capacity at lower operating pressures.

For batch process applications, a higher capacity can significantly reduce the pressurization time.

These pumps are available for pressures from 15,000 to 100,000 psi and 10 to 150 hp.

Pump Design

FLEXI-POWER™ High-Pressure Pumps have two basic components, an intensifier and a hydraulic power unit.

The Intensifier, mounted on top of the console, is made up of two process fluid cylinders and a hydraulic drive cylinder. Each cylinder contains a piston.

Tie-rods attach the process fluid cylinders to the hydraulic cylinder. A hydraulic flange and isolation space separate the hydraulic fluid from the process fluid cylinders.

The Hydraulic Power Unit, contained within the console, is made up of an electric motor, hydraulic pump, oil reservoir, directional control valve and other hydraulic components.

The power unit provides pressurized hydraulic oil to the intensifier. The intensifier uses this pressurized hydraulic oil to pump process fluid.

The four-way valve controls the direction of hydraulic oil flow to and from the intensifier.

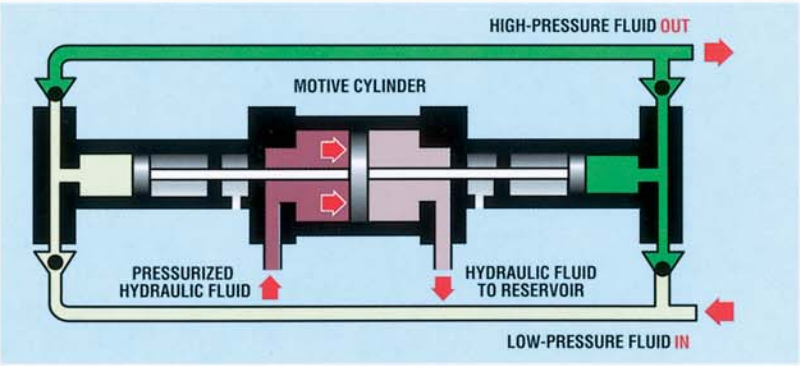
Intensifier Operation

– Process fluid flows through the inlet check valve and fills the process fluid cylinder.

– Pressurized hydraulic fluid acting on the hydraulic piston strokes the piston assembly to the right. Process fluid in the right cylinder is forced through the discharge check valve. At the same time, fluid flows through the inlet check valve on the left cylinder filling this cylinder.

– At the end of this stroke, the four-way valve changes position and directs pressurized hydraulic fluid to the right side of the hydraulic piston. The piston assembly moves to the left, discharging fluid from the left cylinder.

– The piston assembly reverses direction automatically and the cycle repeats.

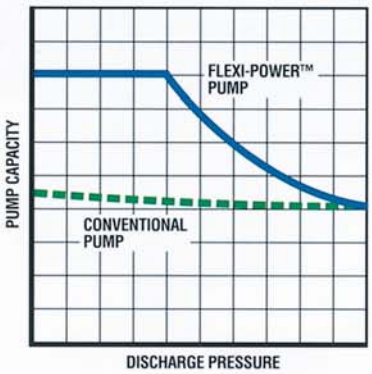


Advances

Increased Capacity at Lower Operating Pressure.
FLEXI-POWER™ pumps adjust their stroke rate automatically according to the operating conditions.

This increase in stroke rate makes full use of available horsepower and results in higher capacity when the discharge pressure is low. For batch process applications, a higher capacity can significantly reduce the pressurization time.

Cold Isostatic Pressing
is an ideal application for FLEXI-POWER™ pumps since most of the powder compaction occurs at low pressures. The higher capacity of the FX pump can reduce compaction time by 50% or more in some cases.



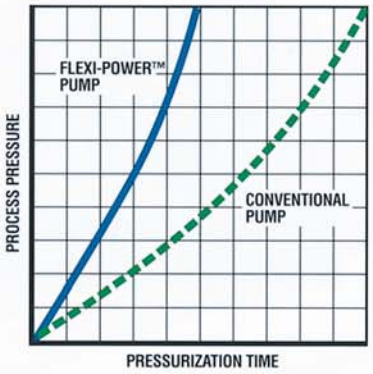
FLEXI-POWER™ Pump Efficiency

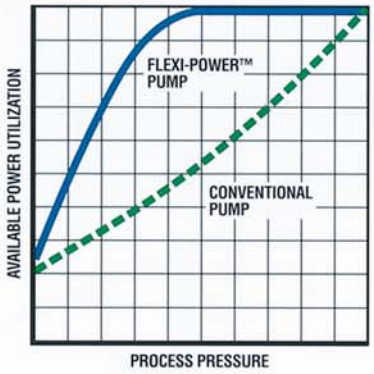
Conventional, fixed-displacement pumps produce a near-constant flow of process fluid *regardless of the discharge conditions.* When process pressures are low, a relatively small percent of available horsepower is utilized by the pump. These pumps waste power and time.

FLEXI-POWER™ pumps use most of their available power even when discharge pressures are low. At low discharge pressures, the intensifier strokes faster displacing more fluid.

As pressure increases, FLEXI-POWER™ pumps slow down to produce a higher pressure with the corresponding maximum flowrate.

At the maximum discharge pressure, the FLEXI-POWER™ pump displaces the same amount of process fluid as a conventional fixed-displacement pump.

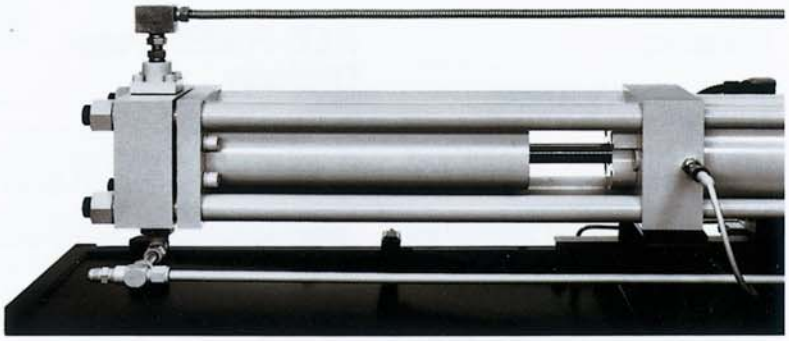




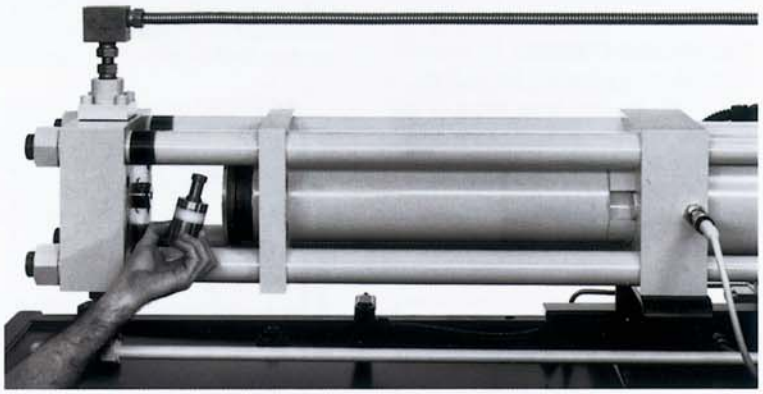
Intensifier Design Features

Hydro-Pac's Patented Sliding Cylinder Design enables seal replacement in minutes without major disassembly of the intensifier. The high-pressure seals are pressure energized allowing them to adjust automatically for wear.

To replace seals, detach the pump cylinder from the check valve body. The seals are easily accessible. There is no need to remove the tie-rods or any of the high-pressure tubing connections.



Intensifier with shield removed.



Intensifier cylinder retracted and high-pressure piston removed.

Inlet and Discharge Check Valves are housed in a check valve body. The valve seats are reversible. The poppet, guide and spring are a cartridge. The guide accurately aligns the poppet with the seat. Large ports allow free flow of process fluids and reduce pressure drop.

Hydraulic Drive Features

The Hydro-Pac FLEXI-POWER™ pump is powered by an advanced hydraulic drive system.

- Sound-dampening panels enclose the hydraulic drive system. The panels are easily removed.
- The hydraulic drive system allows the machine to be started under full load. Special unloading devices are not required.
- The slow operating speed and low inertia load eliminate the need for special foundations.
- Hydraulic oil is cooled and constantly filtered.
- Oil reservoir is baffled for cooling and foam dispersion, and is furnished with a cleanout cover.
- Entire fluid-power system is enclosed and protected by panels which are easily removed for quick access.

Major Advantages

FLEXI-POWER™ High-Pressure Pumps

Hydraulic Cylinder provides a very long, slow pump stroke and generates the great force needed to achieve high pressures.

Long, High-Force Stroke minimizes the number of cycles required for a given capacity. Fewer cycles equate to longer life.

Slow Speed
- Decreases seal wear
- Encourages cylinder filling during intake stroke
- Increases efficiency
- Reduces turbulence and shock
- Minimizes vibration and foundation requirements

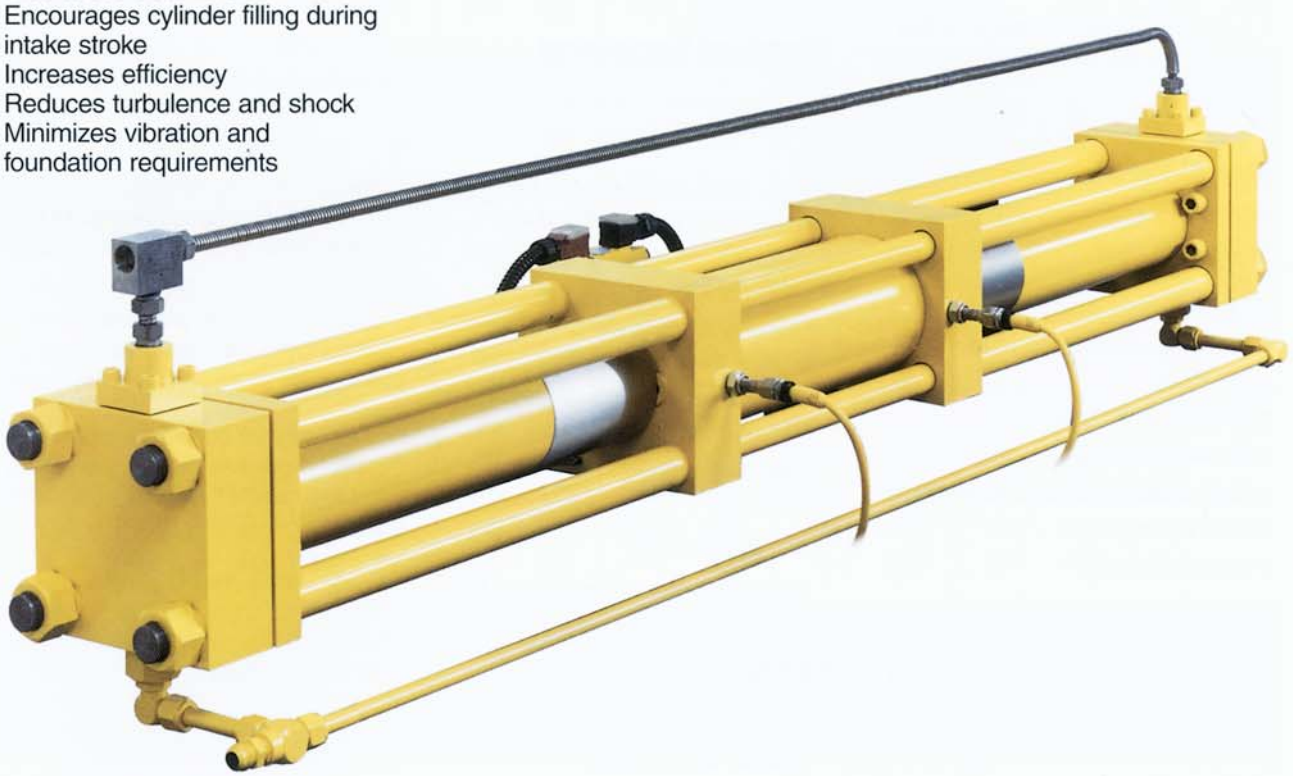
Long Stroke and Low Ratio of clearance volume result in unusually high volumetric efficiency.

Positive Alignment is achieved from the concentric design.

Leak-Before-Failure Design enhances safety.

Simplicity of design eliminates stress concentrations.

Piston Assembly is the only moving part of the intensifier.



Safety

- Pumps are designed and built for maximum safety.
- A pressure-compensated hydraulic pump and backup hydraulic relief valve provide redundant protection against over pressurization of the hydraulic system.
- Protective panels shield the hydraulic-drive system and electric motor.
- Leak-before-failure design of the high-pressure seals enhances safety.

Applications

FLEXI-POWER™ High-Pressure Pumps are ideally suited for:

- Cold isostatic pressing
- Pressure sterilization of food products
- Supercritical extraction
- Pressure testing
- High-pressure chemical reactions
- Well injection
- Material testing
- Hydroforming
- Blowout preventer testing
- Fatigue testing

Hydro-Pac Quality

We are committed to providing the best possible pumps. Some of the many steps taken to ensure the quality of Hydro-Pac pumps are:

- Careful, conservative engineering of all equipment.
- All machines are run at maximum-rated conditions prior to shipment.

Service and Spare Parts

- Trained service technicians are available for field repair.
- We provide training on the operation and maintenance of all our products.
- Complete product overhaul and rebuild can be done at our facility.
- Our computer based inventory allows parts shipment from stock.

Standard Equipment

FLEXI-POWER™ Pumps are furnished as complete units.

- High-pressure intensifier with inlet and discharge check valve
- Electric motor, TEFC, 230/460 v, 3-ph, 60 Hz
- Gauges for oil pressure, level and temperature
- Sensors for low oil level and high oil temperature.
- Heat exchanger for hydraulic oil
- Oil filter
- Suction strainer
- Instruction manual with parts list

Fluids

- Oil
- Soluble oil and water
- Glycol
- Other noncorrosive fluids
- Optional flammable fluids

Utilities

- Electrical:
  230/460 v, 3 ph, 60 Hz
  (Other voltages available)
- Cooling water is required. The amount depends on the machine.

Optional Equipment

- Spare-parts kit
- Enclosure for intensifier
- Motor starter
- Pressure gauges for inlet and discharge lines
- Coolant-flow sensor
- Heater for oil reservoir
- Explosion-proof motor and controls
- Special motor and control power
- Complete pump packages
- Installation assistance

Selecting the best FLEXI-POWER™ Pumps for your needs:

Selection of a FLEXI-POWER™ pump for a batch process is complex. Hydro-Pac has developed a computer program for this selection.

This program considers process parameters and models the changing flowrate of the FLEXI-POWER™ pump.

Given the operating conditions, Hydro-Pac can optimize pump selection - a task best accomplished by our computer.

Specifications

Model	Pressure		Power		Reservoir		Length		Height		Width		Weight	
	psi	MPa	hp	kW	gal	liter	in	mm	in	mm	in	mm	lb	kg
P15-10FX	I5,000	105	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
P15-20FX	I5,000	105	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
P15-40FX	I5,000	105	40	30	70	265	110	2795	59	1500	34	865	4000	1815
P15-60FX	I5,000	105	60	45	80	300	122	3100	65	1650	37	940	7500	3400
P15-75FX	I5,000	105	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
P15-100FX	I5,000	105	100	75	165	625	144	3660	75.5	1920	44	1120	9350	4240
P15-150FX	15,000	105	150	115	165	625	144	3660	75.5	1920	44	1120	9500	4310
P30-10FX	30,000	210	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
P30-20FX	30,000	210	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
P30-40FX	30,000	210	40	30	70	265	110	2795	59	1500	34	865	4000	1815
P30-60FX	30,000	210	60	45	80	300	122	3100	65	1650	37	940	7500	3400
P30-75FX	30,000	210	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
P30-100FX	30,000	210	100	75	165	625	144	3660	75.5	1920	44	1120	9350	4240
P30-150FX	30,000	210	150	115	165	625	144	3660	75.5	1920	44	1120	9500	4310
P60-10FX	60,000	415	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
P60-20FX	60,000	415	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
P60-40FX	60,000	415	40	30	70	265	110	2795	59	1500	34	865	4000	1815
P60-60FX	60,000	415	60	45	80	300	122	3100	65	1650	37	940	7500	3400
P60-75FX	60,000	415	75	55	165	625	144	3660	75.5	1920	44	1120	9000	4080
P60-100FX	60,000	415	100	75	165	625	144	3660	75.5	1920	44	1120	9350	4240
P60-150FX	60,000	415	150	115	165	625	144	3660	75.5	1920	44	1120	9500	4310
P100-10FX	100,000	700	10	7,5	30	115	74	1880	44	1120	26.5	675	1500	680
P100-20FX	100,000	700	20	15	40	150	93	2360	54	1370	26.5	675	2600	1180
P100-40FX	100,000	700	40	30	70	265	110	2795	59	1500	34	865	4000	1815
P100-60FX	100,000	700	60	45	80	300	122	3100	65	1650	37	940	7500	3400

Capacity curves are available upon request.

When ordering or inquiring about FLEXI-POWER™ Pumps please specify:

- Operating pressure
- Discharge vessel volume
- Process fluid
- Powder volume before and after pressurization
- Mandrel volume (if any)
- Time allowed to reach pressure
- Utilities, voltage and frequency
- Indoor or outdoor installation
- Ambient temperature
- Options
- Model number (if known)

Other Products

Hydro-Pac designs and manufactures equipment to generate, control and monitor high-pressure fluids and gases.

- Low-pressure gas compressors 1000 to 10,000 psi, 3 to 40 hp.
- Large high-pressure gas compressors 2000 to 100,000 psi through 200 hp.
- High-pressure pumps 10,000 to over 100,000 psi, 1/2 to 400 hp.
- Large port valves, fittings and tubing for high-flow requirements at 40,000 to 100,000 psi.
- Electrical power and thermocouple glands to operate furnaces and electronic equipment in pressurized environments to 60,000 psi.
- Large high-pressure vessels designed and manufactured in accordance with ASME Code Section VIII, Divisions 1, 2 and 3.
- Complete high-pressure systems.

Call or write Hydro-Pac Inc. for your pressure equipment requirements. Our complete Product Catalog is available upon request.

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