

Hydra-Cell[®]

Seal-less Pumps

**Accurate Metering and Superior Handling of Abrasives
and Particulates for Polyurethane Processing**



Polyurethane Processing



Pressure Injecting and Mixing • Transfer • Spraying • Metering and Dosing

Rigid Foam

(High-pressure requirements from 2175 to 3480 PSI)

Typical end products:

Panel insulation, packaging, and frame insulation for building products

Isocyanates & Polyols:

Hydra-Cell can pump Isocyanates and Polyols from large tanks and silos to smaller tanks and day tanks, and then into the production process. If the pressure requirement does not exceed 2500 PSI, one Hydra-Cell pump can handle the job of two pumps by eliminating the need for a feeder pump. Costs are also reduced because Hydra-Cell has no dynamic seals to wear or replace.

Blowing agents:

Hydra-Cell metering pumps can meet the same pressure and flow requirements in a much smaller footprint than traditional metering pumps. This lowers acquisition costs and facilitates maintenance.

Soft Polyurethane

(Medium-pressure requirements from 870 to 2175 PSI)

Typical end products:

Insulation, car dashboards, life-saving equipment, and foam for beds, car seats, household furniture, cushions, and pillows

Isocyanates & Polyols:

Hydra-Cell can pump Isocyanates and Polyols from large tanks to smaller tanks and day tanks without damage to the pump if crystals form in Isocyanates due to exposure to air.

Catalysts & Additives:

Hydra-Cell pumps are also used to pump catalysts and additives into the production process.

Hard or Dense Polyurethane

(Low-pressure requirements up to 875 PSI)

Typical end products:

Agricultural tires, shoe soles, simulated wood and laminates, and as a replacement for fiber glass and silicon seals

Isocyanates & Polyols:

Seal-less Hydra-Cell pumps are ideal for pumping Polyols and Isocyanates from large tanks into smaller tanks and day tanks without the constant need to replace worn seals used in other pumps.

Isocyanates, Polyols & Additives:

When pumping Polyols, Isocyanates, or additives into the production process, accurate dosing is often required, as is a low-speed, low-flow rate with minimal pulsations. Hydra-Cell exceeds API 675 performance criteria for accuracy, linearity and repeatability with virtually pulse-free flow - including low-speed, low-flow performance. As a result, Hydra-Cell can eliminate the need for expensive pulsation dampeners.

Hydra-Cell Standard Pumps and Metering Pumps

Hydra-Cell positive displacement pumps are available in 14 pump models covering a wide range of flows and pressures.



Eight (8) standard Hydra-Cell models are ideal for transfer, spraying, and pressure injecting and mixing.

Six (6) metering pump models are ideal for metering and dosing, spraying, and pressure injecting and mixing.



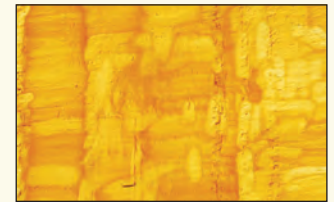
Hydra-Cell pumps are used in many industries manufacturing products made with polyurethane plastic and foam.



Appliances

Automotive

C.A.S.E.
(Coatings, Adhesives, Sealants & Elastomers)



Cast Elastomer Wheels

Footwear

Furniture

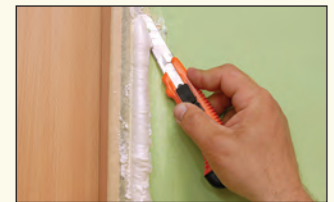
Insulation
(Thermal & Sound)



Packaging

Padding

RIM Solid Plastics
(Enclosures for Business Machines, Medical & Electronic Equipment)



Slabstock

Sporting Goods & Facilities

Structural Foam & Simulated Wood



Typical Chemicals and Liquids Pumped	Challenges in Pumping	The Hydra-Cell Advantage
Isocyanates (TDI 80, PMDI)	Exposure to air and moisture causes crystals to form. Crystals can cause premature wear of dynamic seals and other pump components that require a lubricating film. Frequent and expensive maintenance needed to replace seals.	<ul style="list-style-type: none"> Seal-less design means no rotary shaft seals to wear or replace, preventing air and moisture contamination. Seal-less design and spring-loaded, horizontal disk check valves also enable liquids with particulates up to 800 microns diameter (depending on pump model) to be pumped without damage to the pump.
Polyols (Standard, Filled, HR, Polymer, Melamine, Visco, Polyester)	Abrasive substance that can vary in viscosity; less viscous Polyol often requires low-pulse flow.	<ul style="list-style-type: none"> Handles liquids with viscosities up to 5000 cPs (depending on pump model). Provides virtually pulse-free flow without expensive pulsation dampeners.
	Very difficult to transfer using pumps that have dynamic seals.	<ul style="list-style-type: none"> Seal-less design can handle difficult liquids containing particles.
	Abrasive fillers often added that can damage many pumps.	<ul style="list-style-type: none"> Seal-less design and vertical check valves can handle fillers up to 9 MOH hardness.
	Pressure can vary due to chemical composition.	<ul style="list-style-type: none"> Models can handle a wide range of pressure requirements.
Blowing Agents (Pentane, Freon)	Non-lubricating with low vapor points requiring cooling and high inlet pressures to maintain in liquid form. The refrigeration unit must be large enough to accommodate the metering pump.	<ul style="list-style-type: none"> Compact design can provide the same or greater metering capability with a much smaller footprint and up to 30% lower initial cost. Can handle 250 - 500 PSI inlet pressures (depending on pump model). Smaller refrigeration unit needed, resulting in significant capital equipment, maintenance, and operational savings.
	Vapors can leak through dynamic seals.	<ul style="list-style-type: none"> 100% sealed pumping chamber; no leak paths.
Catalysts & Additives (Catalysts - BASF/DOW Proprietary Catalysts, Amine) (Additives - Silicone 1, Silicone 2, Silicone 3 Ester, DEOA, Health Guard, FLE 200, Fire Retardant 1, Fire Retardant 2, Coloring Dyes and Pigments)	Require extremely accurate dosing, typically at very low flow rates.	<ul style="list-style-type: none"> Exceeds API 675 performance standards for Steady-State Accuracy, Repeatability, and Linearity at flow rates as low as 0.032 GPH.
	Need to operate across a wide range of low-to-high pressures.	<ul style="list-style-type: none"> Several models available with maximum pressure ratings from 1000 to 2500 PSI.
	Additives can be difficult to pump and contain abrasives due to crystallization when additives come into contact with air or other chemicals.	<ul style="list-style-type: none"> Seal-less design and spring-loaded, horizontal disk check valves handle abrasives and reduce clogging. Can run dry without damage to the pump. Variety of materials of construction (metallic and non-metallic) suited for fluids and additives pumped.
Acids (Formic, Sulfonic)	Corrosive, abrasive substances that can damage pump.	<ul style="list-style-type: none"> Seal-less design provides no leak path and handles abrasives. Corrosion-resistant liquid head materials available.
	Crystallization can occur when excessive air leaks through seals, causing clogging and reduced efficiency.	<ul style="list-style-type: none"> Spring-loaded, horizontal disk check valves reduce clogging and maintain efficiency.
De-ionized Water (Pure, Distilled)	Aggressive against metal surfaces; especially a problem for any tight tolerances.	<ul style="list-style-type: none"> No tight tolerances in the pump head.
	Non-lubricating.	<ul style="list-style-type: none"> Pumping action does not need lubrication.

Lower Initial Investment and Lower Energy Costs

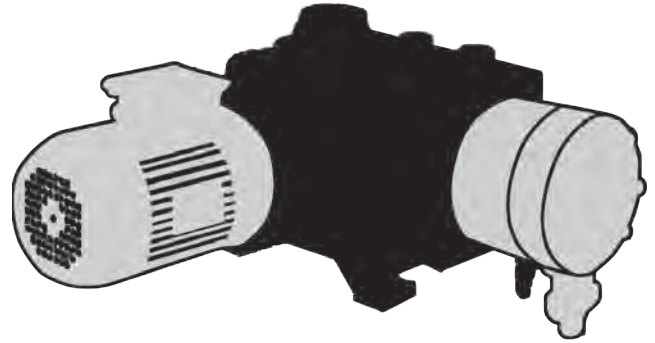
Uses lower HP motors

- Although both pumps have the same pressure rating, the lighter, more compact Hydra-Cell has a higher flow rating while requiring a less expensive, lower HP motor. This means Hydra-Cell saves approximately 30% to 55% on initial costs.



Hydra-Cell metering pump

Weight: 51 lbs.
 Rated: 2500 PSI at 35 GPH
 Motor: 1-1/2 HP

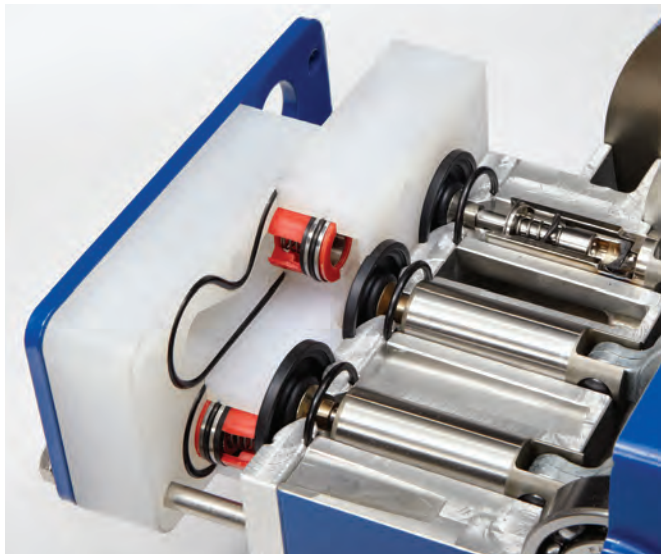


Traditional metering pump

Weight: 220 lbs.
 Rated: 2500 PSI at 29 GPH
 Motor: 5 HP

Low power consumption - 85% to 90% energy efficiency

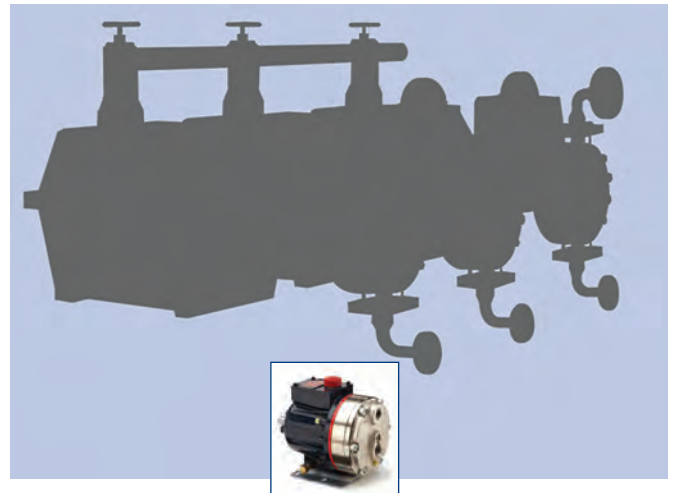
- The lower HP requirement of the Hydra-Cell pump achieves the same performance but with greater energy efficiency and less power consumption.
- Hydra-Cell positive displacement pumps show significant energy savings when compared to screw pumps and multi-stage centrifugal pumps.



The multiple-diaphragm liquid head of Hydra-Cell also allows a less expensive, energy-saving motor to be used.

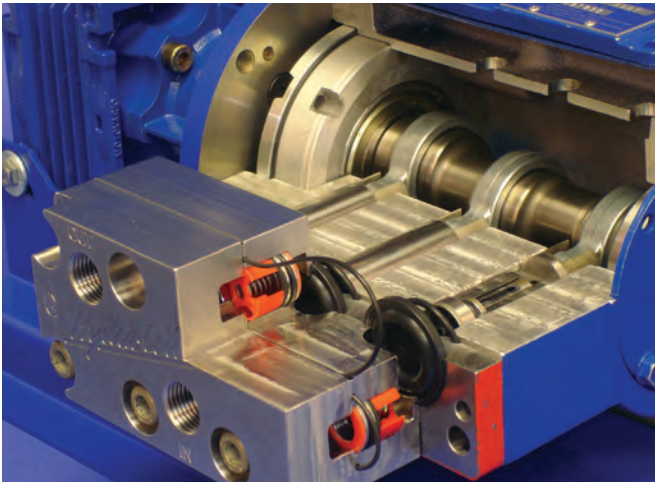
Small footprint for savings

- Compact design can mean up to 30% lower initial cost compared to other pumps.
- Space-saving design creates a smaller footprint for more efficient use of plant space and easier servicing.
- Pumping blowing agents requires a refrigeration unit. Significant capital savings are realized because space-saving Hydra-Cell can be housed in a smaller refrigeration unit compared to other types of pumps.



This Hydra-Cell pump shown to scale has the same flow capacity and pressure rating as this conventional triplex metering pump system.

Pumps Abrasives and Low-to-High Viscosity Fluids



Hydra-Cell's horizontal check valves operate in a horizontal liquid flow and will handle abrasives and particulates without clogging or damage to the pump.

Handles abrasives and particulates

- Seal-less design and spring-loaded, horizontal disk check valves provide superior handling of particulates - including abrasive fillers in Polyols and crystals that form in Isocyanates.

Runs dry without damage

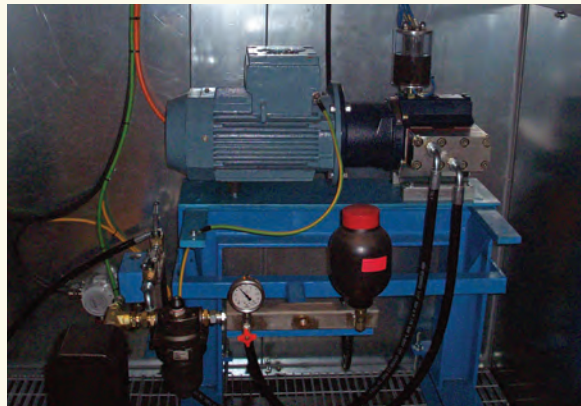
- Hydraulically-balanced diaphragms with Kel-Cell® technology enable Hydra-Cell pumps to run dry or in a blocked suction line without damage.
- Seal-less, leak-free pumping chamber; no seal maintenance required.
- Liquids are 100% sealed from the atmosphere.
- No leak path for toxic vapors.
- Can pump liquids containing solid particles up to 800 microns diameter (depending on pump model) and up to 9 hardness on the MOH scale.
- Non-lubricating liquids can be pumped reliably.

Low-shear pumping action

- Ideal for pumping and protecting shear-sensitive polymers.
- Pumps non-viscous as well as viscous liquids up to 5000 cPs (or more, depending on pump model).



Hydra-Cell pumps can be installed in-line or as part of a turnkey system with a lower initial investment and lower operating costs than other types of pumps.



Pumping blowing agents requires a refrigeration unit. Significant capital savings are realized because space-saving Hydra-Cell pumps can be housed in a smaller refrigeration unit compared to pump types with the same flow and pressure ratings.



Injection of a proprietary catalyst into a high-volume polyurethane system. Where high-flow is needed, standard Hydra-Cell pump models have maximum flow rates ranging from 1 to 37 GPM.

Accurate Metering and Dosing with Pulse-free, Linear Flow

Accurate electronic flow control

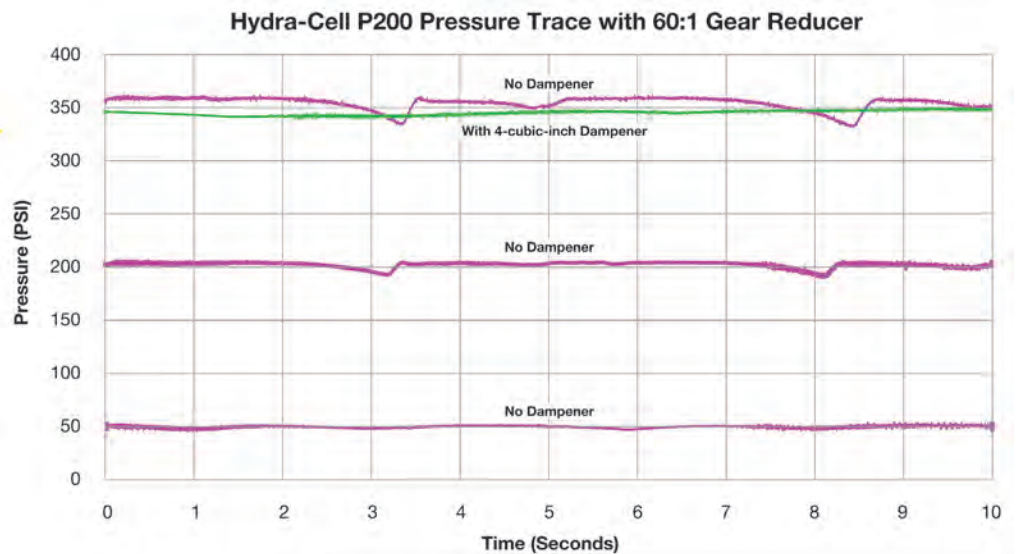
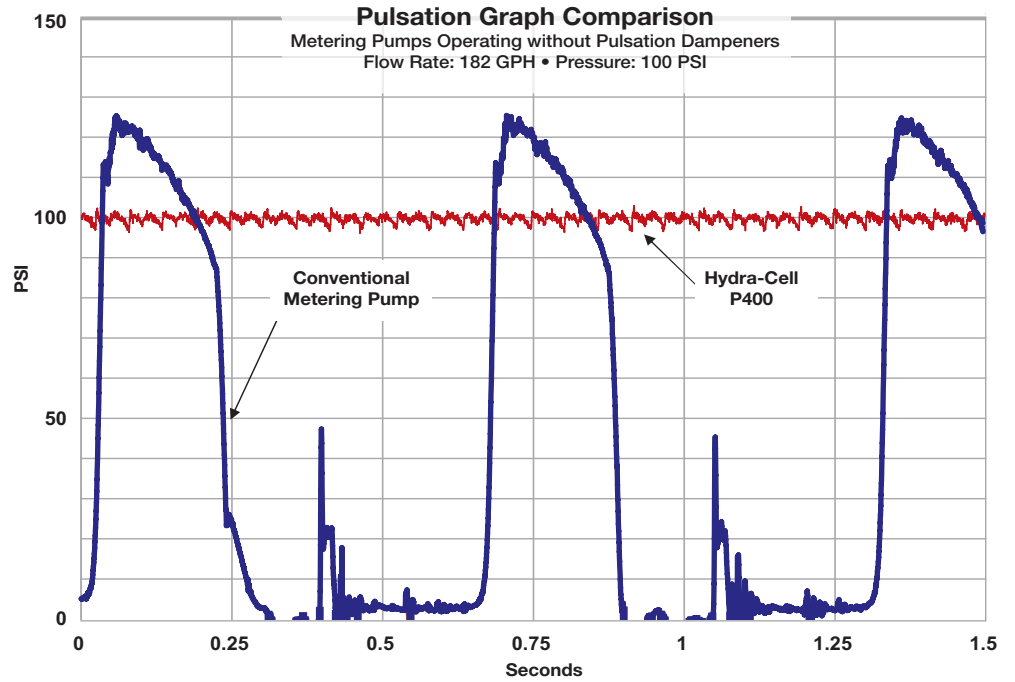
- Compared to pumps that rely on manual stroke adjustment or expensive actuators to change flow, Hydra-Cell metering pumps utilize speed control for greater accuracy throughout the turn-down range.
- Can be equipped with solid-state electronic flow control where the volume per every stroke is constant and a known value.
- Electronic flow also provides easy calibration of the desired feed rate and a near instantaneous rate of change (0 to maximum rpm in 0.3 seconds).

	Standard Models	Metering Pumps
Steady State Accuracy	>±1%	>±0.5%
Repeatability	>±3%	>±1%
Linearity	>±3%	>±1%

Typical results for recommended speed range

Virtually pulse-free flow

- Multiple-diaphragm design minimizes pulsations, eliminating the need for expensive pulsation dampeners for most Hydra-Cell models.
- Reduces pipe strain.
- Enhances operating safety.
- Minimizes maintenance.
- Reduces acceleration/friction losses in the suction line.
- Provides accurate metering with linear, constant flow.
- Lowers system acquisition costs.



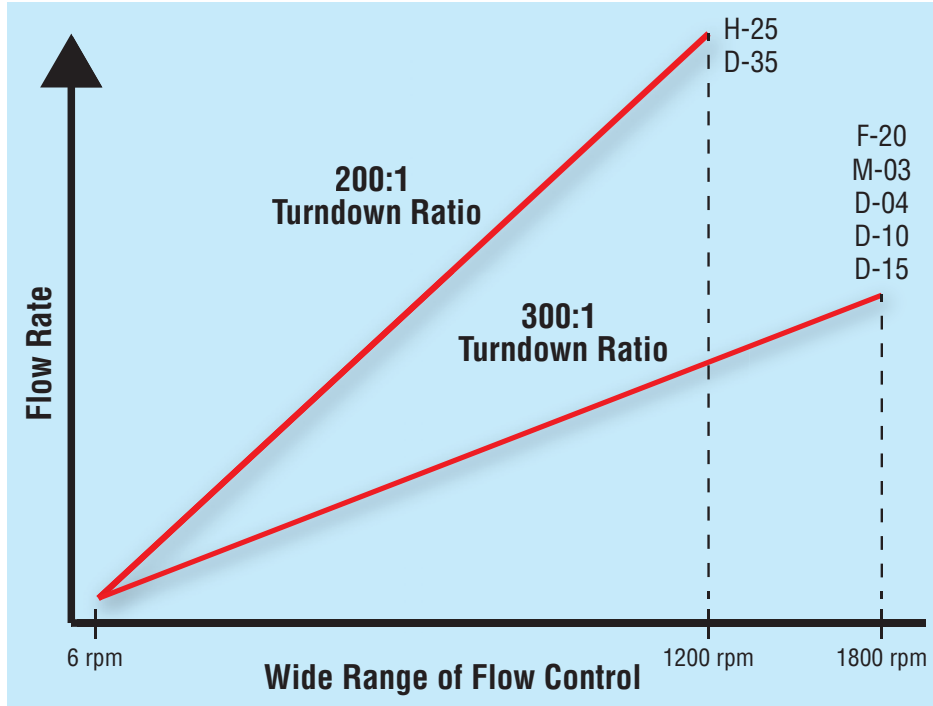
One Versatile, Low-Maintenance Pump Design

Adaptable to many applications

- One Hydra-Cell seal-less design with 14 models (8 standard; 6 metering) covers a wide range of operating flows and pressures.
- Can be fitted with ANSI or DIN flanges, IEC or NEMA motor mounts, or provided with ATEX certification to adapt to specific applications or meet international standards.
- Proven record of replacing different pump technologies with improved abrasives handling, less maintenance, and other benefits (as detailed on pages 8-9).

Extensive operating range

- Shaft speeds from 6 rpm to 1800/1200 rpm, yielding a 300/200:1 turndown ratio.
- Maximum discharge pressures from 1000 to 2500 PSI.
- Maximum flow rates for standard Hydra-Cell models from 1 to 37 GPM and for metering pumps from 27 to 895 GPH
- Minimum flow rates less than 0.15 GPH at approximately 6 rpm; custom pumps can operate at 0.032 GPH.



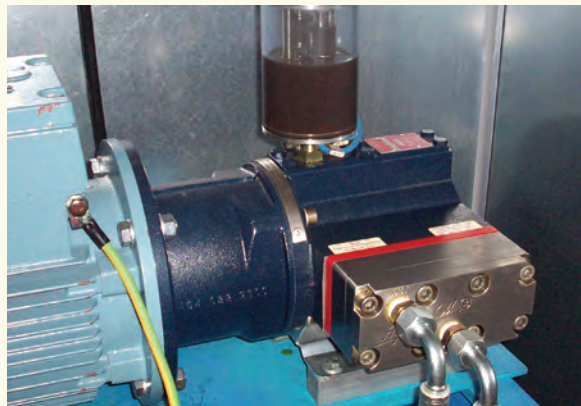
	Minimum	Maximum
Flow Rate	0.0025 GPM (0.15 GPH)	37 GPM (2220 GPH)
Discharge Pressure	0 PSI	2500 PSI

Simple pump head design

- Liquid head materials can be changed readily, enabling Hydra-Cell to be used for many different chemicals and liquids pumped.
- Minimal maintenance required.
- Low cost of spare parts.

Low maintenance

- One design for all applications minimizes the need for standby pumps and spare parts, which optimizes training and service expertise and reduces inventory size and expense.
- Since there are no dynamic seals to wear or replace, Hydra-Cell pumps need little maintenance and will operate reliably under continuous duty at high pressure.
- Typically run 6,000 hours before changing lubricating oil (compared to 1,500 hours recommended by many piston pump manufacturers).



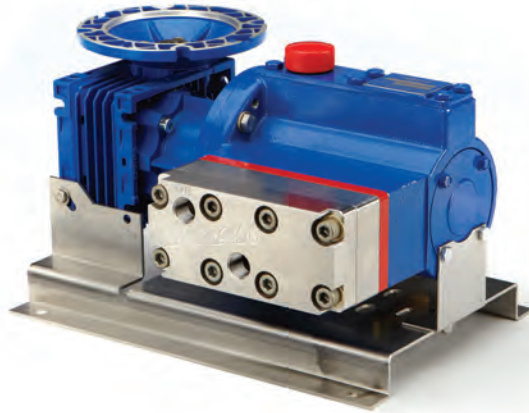
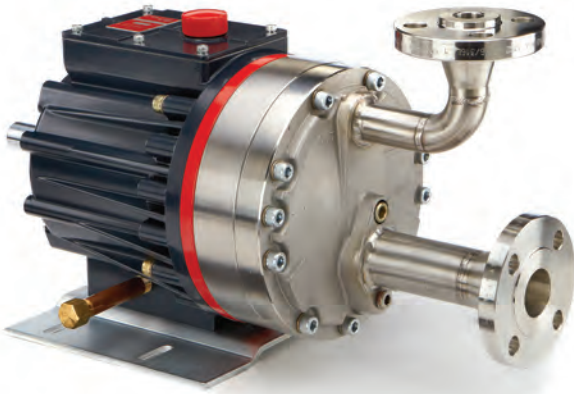
Hydra-Cell pump used in high-precision Pentane dosing. Hydra-Cell metering pumps can provide precise dosing at flow rates as low as 0.032 GPH.

Hydra-Cell® Performance Advantages Compared to Other Types of Pumps

Magnetic Drive Pump Disadvantages:	Hydra-Cell Advantages:
<ul style="list-style-type: none"> • Cannot run dry without damage to the pump. 	<ul style="list-style-type: none"> • Seal-less design enables Hydra-Cell to run dry without damage to the pump.
<ul style="list-style-type: none"> • Requires monitoring to ensure fluid flow. 	<ul style="list-style-type: none"> • Ensures proper fluid flow without monitoring.
<ul style="list-style-type: none"> • Designed to pump clean, low-viscosity fluids. 	<ul style="list-style-type: none"> • Seal-less pumping chamber and spring-loaded, horizontal disk check valves can handle particulates and abrasive fillers.
<ul style="list-style-type: none"> • Higher power requirements and energy costs. 	<ul style="list-style-type: none"> • Low-shear pumping action handles higher viscosity fluids.
<ul style="list-style-type: none"> • Can have a long horizontal footprint with higher acquisition and replacement costs. 	<ul style="list-style-type: none"> • Smaller footprint compared to some magnetic drive pumps. • More energy efficient. • Easier to service. • Lower acquisition, operating and replacement costs.

Axial Piston Pump Disadvantages:	Hydra-Cell Advantages:
<ul style="list-style-type: none"> • Tight tolerances prevent use in fluids with particulates greater than 7 microns, especially with liquids (e.g. Isocyanates) that react with air and form crystals in the liquid. 	<ul style="list-style-type: none"> • Tolerances are not an issue because the seal-less design and spring-loaded, horizontal disk check valves enable Hydra-Cell to pump solids, abrasive fillers and particulates up to 800 microns in diameter (depending on pump model).
<ul style="list-style-type: none"> • Filter and fluid reservoir necessary to maintain fluid cleanliness. 	<ul style="list-style-type: none"> • Inherently simple design separates the lubricating film from the pumped liquid.
<ul style="list-style-type: none"> • Cylinder barrel can separate from valve plate, causing loss of lubricating film and damage to the barrel or plate. 	<ul style="list-style-type: none"> • Requires no external filtration of pumped fluids.
<ul style="list-style-type: none"> • Back pressure can cause seal failure and mechanical damage. 	<ul style="list-style-type: none"> • No packing and seal-less design, so it will not leak from seal failure.

Internal Gear Pump Disadvantages:	Hydra-Cell Advantages:
<ul style="list-style-type: none"> • Mechanical seals and packing require maintenance, and replacement or adjustment. 	<ul style="list-style-type: none"> • The seal-less design of Hydra-Cell means that there are no seals or packing to leak or replace.
<ul style="list-style-type: none"> • Does not tolerate thin/non-lubricating liquids, and does not handle solids, abrasives or particulates well. 	<ul style="list-style-type: none"> • Seal-less pumping chamber and spring-loaded, horizontal disk check valves can pump solids, abrasive fillers and particulates while handling liquids thick or thin.
<ul style="list-style-type: none"> • Designed for operating at low speeds and low pressure ratings. • Low volumetric efficiency. 	<ul style="list-style-type: none"> • Operates at low-to-high speeds and at higher pressures with higher volumetric efficiency.
<ul style="list-style-type: none"> • Component wear reduces accuracy and efficiency. 	<ul style="list-style-type: none"> • No internal gears to wear so there is less maintenance and spare part replacement. • Accuracy and efficiency are more stable.
<ul style="list-style-type: none"> • One bearing runs in the pumped fluid. 	<ul style="list-style-type: none"> • No bearings in the pumped fluid.
<ul style="list-style-type: none"> • Unbalanced - overhung load on the shaft bearing. 	<ul style="list-style-type: none"> • Hydraulically balanced design so there is no overhung load.

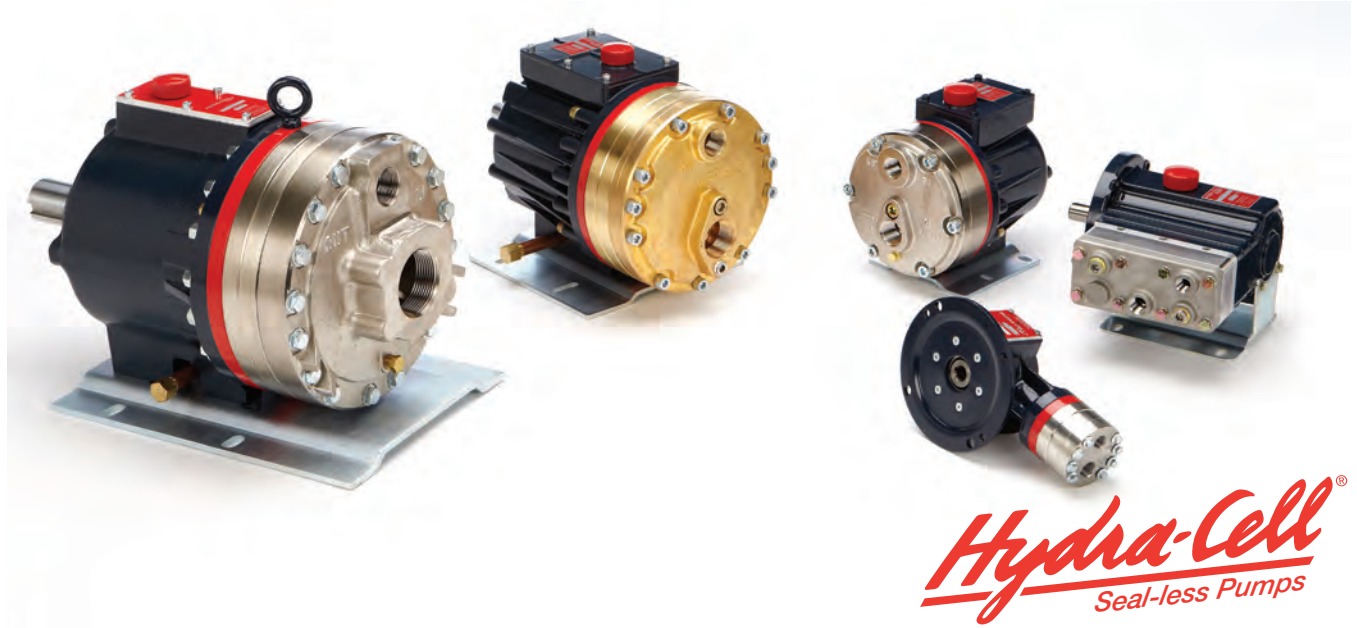


Compared to other pumps, Hydra-Cell requires minimal maintenance for polyurethane processors. Hydra-Cell has no packing or seals that leak or need to be replaced and no internal gears to wear.

External Gear Pump Disadvantages:	Hydra-Cell Advantages:
<ul style="list-style-type: none"> • Mechanical seals and packing require maintenance, and replacement or adjustment. 	<ul style="list-style-type: none"> • The seal-less design of Hydra-Cell means that there are no seals or packing to leak or replace.
<ul style="list-style-type: none"> • Does not tolerate solids, abrasives, or particulates. 	<ul style="list-style-type: none"> • Seal-less pumping chamber and spring-loaded, horizontal disk check valves can pump solids, abrasive fillers and particulates.
<ul style="list-style-type: none"> • Component wear reduces accuracy and efficiency. 	<ul style="list-style-type: none"> • No internal gears to wear so efficiency is more stable and there is less maintenance and spare part replacement.
<ul style="list-style-type: none"> • Contains four bushings/bearings in the fluid area. 	<ul style="list-style-type: none"> • No bushings/bearings in the pumped fluid.
<ul style="list-style-type: none"> • Fixed end clearances are typical. 	<ul style="list-style-type: none"> • Design does not rely on clearances.
<ul style="list-style-type: none"> • Efficiency drops as outlet pressure increases. 	<ul style="list-style-type: none"> • Efficiency remains relatively constant over its range of operating pressures.
<ul style="list-style-type: none"> • Depends on pumped liquid for lubrication. 	<ul style="list-style-type: none"> • Seal-less design does not require pumped liquid for lubrication.

Traditional Metering Pump Disadvantages:	Hydra-Cell Advantages:
<ul style="list-style-type: none"> • Use manual stroke adjusters or expensive actuators to control flow, which can result in pumping inaccuracies, lost motion, operator error, and a greater chance of leakage. 	<ul style="list-style-type: none"> • Hydra-Cell employs optional Variable Frequency Drive (VFD) electronic flow control for greater accuracy and repeatability, eliminating lost motion, reducing the chance of operator error, and removing a potential leak path.
<ul style="list-style-type: none"> • Require expensive pulsation dampeners to minimize pulsations. 	<ul style="list-style-type: none"> • Multiple-diaphragm design provides virtually pulse-free flow, so expensive pulsation dampeners may not be required.
<ul style="list-style-type: none"> • May only offer PTFE diaphragms, requiring frequent replacement due to stress and poor elastomeric memory. 	<ul style="list-style-type: none"> • Available with a wide choice of cost-effective, elastomeric diaphragm materials.
<ul style="list-style-type: none"> • Large footprint to achieve required maximum flow and pressure. 	<ul style="list-style-type: none"> • Can meet the same flow and pressure requirements with a much smaller footprint, saving space and costs.
<ul style="list-style-type: none"> • Different plunger and liquid end sizes needed to accommodate changes in operating pressures. 	<ul style="list-style-type: none"> • Operates over a wide range of pressures without changes to the plunger or liquid end size.
<ul style="list-style-type: none"> • Integral gearing (necessary to prevent cross-contamination of actuating oil) is difficult and expensive to maintain. 	<ul style="list-style-type: none"> • The simplicity of design means lower parts and maintenance costs. • Separate gearbox prevents cross-contamination of the actuating oil.

Hydra-Cell Positive Displacement Diaphragm Pumps are Ideal for Handling Abrasives and Particulates



- Unmatched versatility for a wide range of pumping applications required in the production of polyurethane.
- Features a seal-less design and horizontal disk check valves that enable the pump to handle abrasives and particulates that might damage or destroy other types of pumps.
- Simple, compact design reduces initial investment and lowers maintenance costs.
- Variety of models that can operate with very low to very high flow rates and discharge pressures up to 2500 PSI.
- Available in a wide range of pump head materials of construction and diaphragm materials.
- Variety of options and accessories to optimize performance.

Gallons per Minute (GPM) Capacities & PSI Pressure Ratings

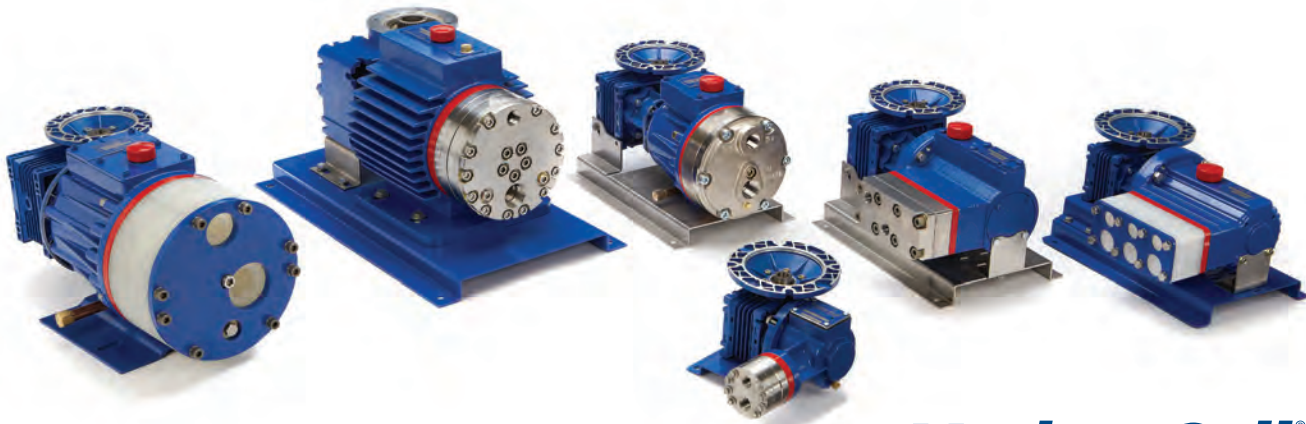
Model*	Maximum Capacities	Maximum Discharge Pressure (PSI)		Maximum Suction Pressure (PSI)
		Non-Metallic	Metallic	
F-20	1 GPM	250	1500	250
M-03	3 GPM	250	1000	250
D-04	3 GPM	N/A	2500	500
D-10	8 GPM	250	1000	250
D-12	8 GPM	N/A	1000	250
D-15/17	13 GPM	N/A	2500	500
H-25	20 GPM	250	1000	250
D-35	37 GPM	250	1200	500

* Ratings are for X-Cam design

Pumps with metallic heads have a maximum operating temperature of 250°F; pumps with non-metallic heads have a maximum operating temperature of 140°F.

For complete specifications and ordering information, consult the Hydra-Cell catalog.

Hydra-Cell Metering Pumps Exceed API 675 Standards and Provide “Pulse-free” Linear Flow



- Designed for use with Variable Frequency Drive (VFD) electronic flow control to maintain greater accuracy throughout the turn-down range.
- Multiple-diaphragm design (except the P100) provides virtually pulse-free flow, eliminating the need to purchase expensive pulsation dampeners.
- Offers all the features and benefits of standard Hydra-Cell pumps (F/M/D & H Series’) including seal-less design, horizontal disk check valves, and space-saving, compact design.
- Variety of models that can operate with very low to very high flow rates and discharge pressures up to 2500 PSI.
- Available in a wide range of pump head materials of construction and diaphragm materials.
- Every model is available with a variety of gear box ratios to meet your application needs.
- Variety of options and accessories to optimize performance.

Gallons per Hour (GPH) Capacities & PSI Pressure Ratings

Model	Maximum Capacities	Maximum Discharge Pressure (PSI)		Maximum Suction Pressure (PSI)
		Non-Metallic	Metallic	
P100*	27 GPH	250	1500	250
P200	81 GPH	250	1000	250
P300	82 GPH	N/A	2500	500
P400	243 GPH	250	1000	250
P500	426 GPH	N/A	2500	500
P600	895 GPH	250	1000	250

* Custom P100 available to operate at low flow of 0.032 GPH at approximately 6 RPM.

Pumps with metallic heads have a maximum operating temperature of 250°F; pumps with non-metallic heads have a maximum operating temperature of 140°F.

For complete specifications and ordering information, consult the Hydra-Cell metering pumps catalog.

Hydra-Cell®

Seal-less Pumps

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