Hydra-Cell Pump Components
Function and materials of wear components

By: Chris Pasquali, CEO Factory Direct Pipeline Products, Inc.

Components of a Hydra-Cell Pump
Hydra-Cell pumps are sealless positive displacement pumps whose only components in contact with the pumped fluid are the elastomers and check valve assemblies. This article describes the function of these components, lists the available materials of construction and provides additional information in support of selecting the most appropriate materials for your application.

Most Hydra-cell pumps have a 12-character part number with each character associated with a specific pump characteristic. Choice of the best suited materials for your application improves reliability and reduces downtime as well as labor and parts costs associated with maintenance.

D10ERCGHFECA
This article focuses in on the materials in contact with the pumped fluid and their function, which are defined with the 6th – 11th characters of the part number.

1	2	3	4	5	6	7	8	9	10	11	12
D	1	0	E	R							A

The first characters reference the Hydra-Cell pump model, so in the example above the part number is for a model D10 Hydra-Cell pump. The 4th character references the flow rate at a given RPM. The purpose of this customization is to establish the desired flow rate at an appropriate fluid velocity; abrasive fluid applications benefit from lower velocities across the internal check valve assemblies because it corresponds directly to reduced check valve wear.

The 5th character describes an aspect about the pump head or the hydraulic cylinder of the pump. The 12th character is a reference to the type of oil used in the hydraulic end of the pump. Most applications use a common 10W30 or 10W40 synthetic motor oil although there are specialized applications requiring food contact and other specialty oils.

#6: Pump Head Materials & Function
The pump head consists of two parts, the manifold and the check valve plate. These components often last the life of the pump and are selected based upon chemical compatibility with the pumped fluid. Hydra-Cell pump heads are offered in a variety of alloy and non-alloy materials:

- 316LSS: an iron alloy generally required for low and high PH fluids as well as applications using stainless steel piping
- Brass: consisting of about 60% copper and 36% zinc its an inexpensive material for water and other non-aggressive liquids
- Duplex Alloy 2205: typically used for sea water and marine environments because it is twice as corrosion resistant than 316SS for those applications

- Hastelloy® C: a nickel alloy providing a broader range of chemical and corrosion resistance than 316SS and capable of higher pressures then non-alloys
- Nickel-plated cast or ductile iron: The least expensive pump head material used for both water and hydrocarbon-based liquids as well as abrasive slurries
- Polypropylene: used for chemical resistance and less expensive than exotic alloys
- PVDF: provides better abrasion resistance and chemical resistance than polypropylene

The pump head is not considered a wear item, even when the fluid is an abrasive slurry.

Character #7: Elastomers
These are the diaphragms, o-rings and gaskets – all almost exclusively selected based upon chemical compatibility with the pumped fluid:

- Aflas®: 80 to 250°F, a fluoroelastomer which offers better resistance to amines than FKM
- EPDM: 50 to 212°F, resistant to chemistries where FKM is not compatible and PTFE or Aflas aren't available for a given pump model. Requires a special hydraulic end oil
- FKM: 40 to 250°F, a partially fluorinated material having low gas permeability, well suited for petroleum products and a variety of common industrial chemicals including aromatic and chlorinated hydrocarbons
- PTFE: 60 to 200°F, a fully fluorinated and impermeable material, highly resistant to a variety of chemicals including strong acids and oxidizing agents. Consisting of a light-blue PTFE material laminated onto a black rubber backing, it is the only diaphragm material which is considered a wear item
- Neoprene®: 50 to 120°F, excellent resistance to refrigerants, vegetable oils, ammonia and halon
- Buna-N®: 30 to 230°F, general purpose for oil, water and solvents that are not highly polar

Diaphragms are often replaced when replacing the check valves because it is easy to do and "resets the clock" on all the materials within the pump head. Diaphragms are damaged by chemical

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incompatibility, over-pressurization and extreme temperatures. With the exception of PTFE diaphragms, physical wear is only cosmetic. O-rings and gaskets enforce the desired flow path and are replaced each time the pump is serviced.

Characters #8-9: Valves and Valve Seats

The valve disc sealing against its corresponding valve seat is responsible for maintaining the flow path from inlet to outlet of the pump. Each revolution of the pump shaft causes the valve and seat to "mate" and can cycle up to 30 times per second! These are the main wear items of Hydra-Cell pumps. You know they are worn when the flow rate/pressure decreases. It is a gradual type of wear and not sudden nor catastrophic; just a slightly louder sounding, rougher running pump.

How long do Hydra-Cell check valves last?

There is no direct answer to this question, we can only estimate based upon prior experience with similar fluids. Applications involving reclaimed water or machining coolant using stainless steel valves/seats will likely last 6000 hours (8+ months of continuous use). 25% lime slurry applications might last as long, however only if operating the pump at lower RPMs (reducing velocity across the valves/seats) and using an abrasion resistant material such as ceramic.

Selecting the check valve material involves consideration of both chemical compatibility and economical longevity. Stainless steel valves for a high-pressure water application operated only 8 hours a day could last over 2 years; it would be tough justifying the cost of using tungsten carbide even though that material lasts 20 times longer (40 years!) because it costs 36 times more than SS. We select check valve materials that will last approximately 6-9 months given what we know about similar customers and applications. The following materials are suitable for 15 to 250°F:

- Ceramic: used for abrasive resistance and liquids aggressive to alloys
- 17-4 stainless steel: has slightly better wear resistance than 316SS due to its hardness
- 316L stainless steel
- Hastelloy® C
- Nitronic® 50: an austenitic Stainless Steel more chemically resistant and having superior sub-zero temperature performance than 316 stainless steel
- Tungsten carbide maximizes abrasion resistance

Character #10: Valve Spring

The valve spring is the only component in contact with the pumped fluid that must be an alloy material. The springs are not considered a wear item unless the fluid is not chemically compatible. These ensures quick re-seating of the check valve and are compatible with temperatures of 15 to 250°F:

- 17-7 stainless steel, has slightly better wear resistance than 316SS due to its hardness
- Elgiloy: a nickel cobalt alloy more corrosive resistant than stainless steel and resists fatigue from temperature and set-resistance better than stainless steel or Hastelloy® C
- Hastelloy® C

Character #11: Valve Spring Retainer

The retainer is the component which compresses the spring which in-turn seals the valve against its seat. The compression of the retainer is accomplished by sandwiching it between the pump manifold and valve seat. This is not considered to be a wear item as they are damaged by chemical incompatibility or an upset condition involving an extreme temperature. Retainers are available in the following materials:

- 17-7 stainless steel: 15 to 250°F
- Celcon (Polyoxymethylene): 15 to 160°F, resistant to alcohols, hydrocarbons, water, most agricultural chemicals, esters and ethers.
- PVDF, 15 to 160°F
- Polypropylene: 15 to 160°F
- Hastelloy® C: 15 to 250°F
- Nylon (Zytel®): 15 to 160°F, resistant to benzene, ethylene glycol, gasoline, hexane, methanol, freon and ethanol.

Our web-based repair kit part number and pricing calculator (Click Here) will convert your pump part number into the three repair kit part numbers (elastomers only, check valves only and a complete kit containing both).

1	2	3	4	5	6	7	8	9	10	11	12
D	1	0	E	K	C	G	H	F	E	C	A

Complete Fluid End Kit P/N:	D10K52GHFEC	$327
Valve Kit P/N:	D10V52GHFEC	$249
Diaphragm Kit P/N:	D10D52GXXXX	$135

Chris Pasquali has provided sales and engineering support for Wanner Engineering since 2001