Session 16 –
"Introduction to Positive Displacement (Plunger) Pumps"

Aimed at Process and Mechanical Engineers, and Consultant Engineers who specify pumping equipment as well as Applications & Sales Engineers selecting and quoting them.
Pump engineers are generally knowledgeable about centrifugal pumps, but are less familiar with positive displacement pumps. This session will look at PD pumps in general but with particular focus on reciprocating plunger pumps.

AGENDA

SECTION 1

1- POSITIVE DISPLACEMENT VS CENTRIFUGAL

2- WHAT IS A RECIPROCATING PUMP?

SECTION 2

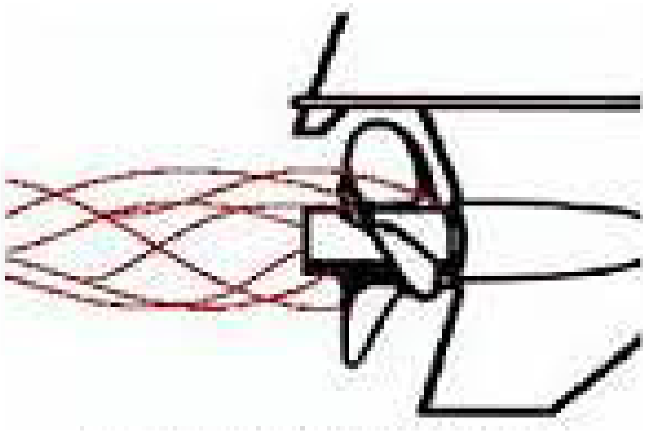
3- RUHRPUMPEN RDP PUMP

4- TESTING

5- PACKAGE OPTIONS

Section 1 Part 1-
POSITIVE DISPLACEMENT
VS
CENTRIFUGAL

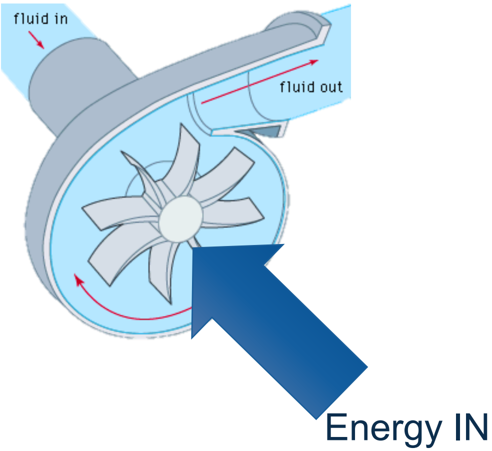
How is flow generated?
(Different thermodynamic process)



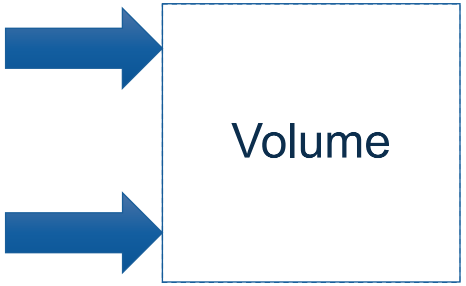
Inputs energy directly to liquid ($\dot{W}_{in}$)

Moves the boundary of the liquid

How is the flow generated?
(Different thermodynamic process)



Inputs energy directly to liquid $(\dot{W}_{in})$

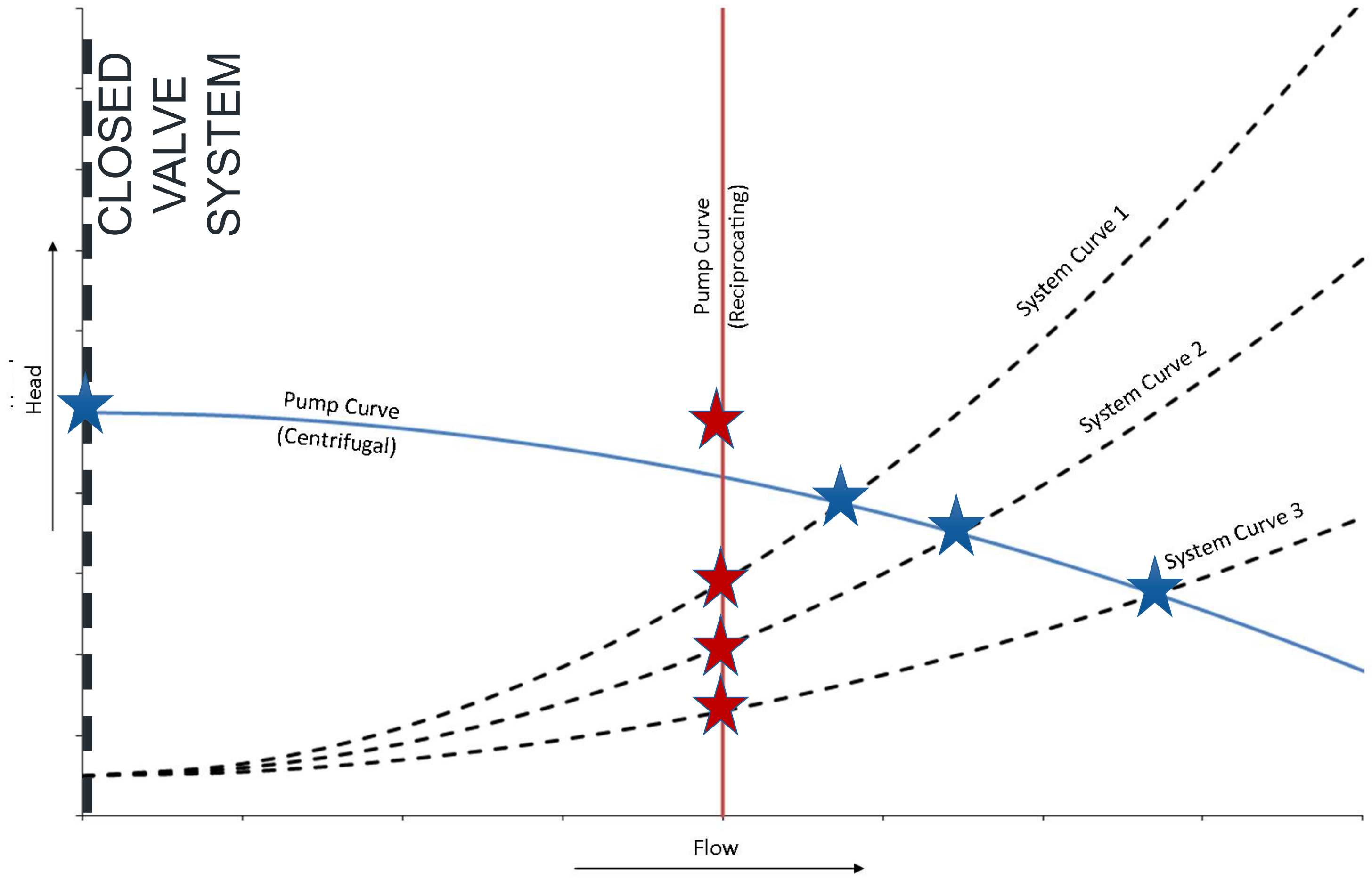


Moves the boundary of the liquid.

Flow = swept volume of cylinder x number of plungers

FLOW

- Flow is constant for a fixed speed pump

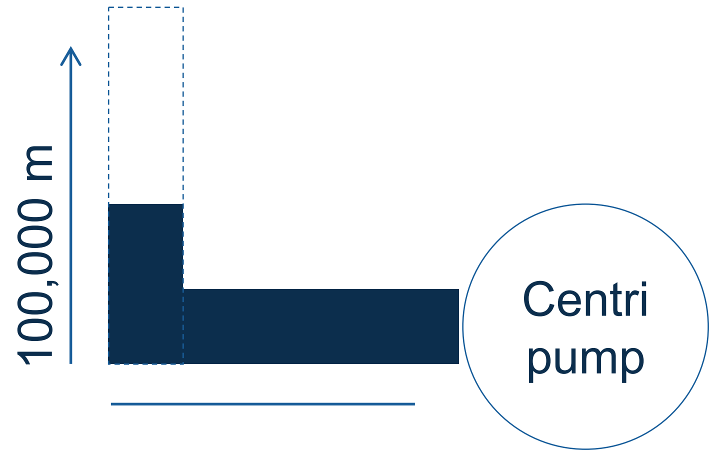


HEAD

Centrifugal Pump

Discharge head determined by pump hydraulics

Maximum head is limited

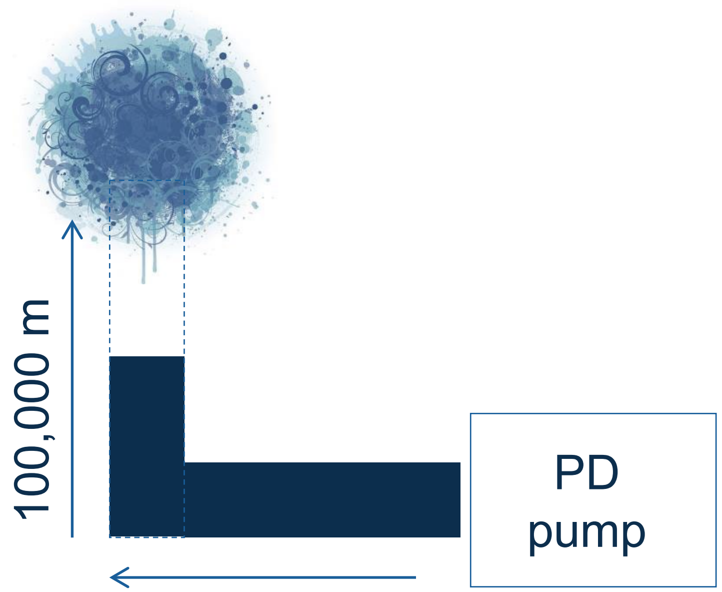


Reciprocating Pump

Discharge head determined by system back pressure

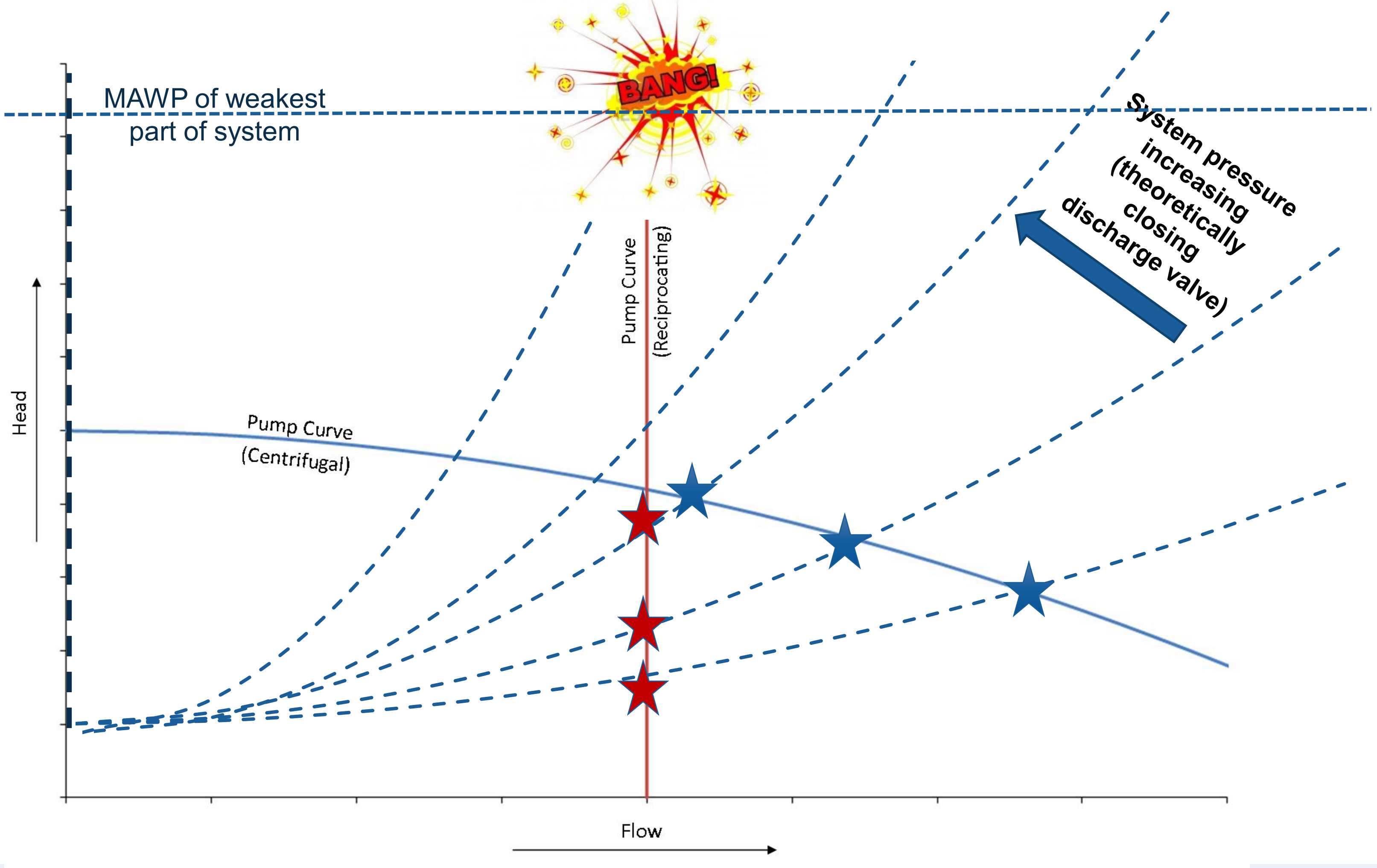
Head increase unlimited – theoretically infinite head at closed valve

Until failure of weakest part of the system

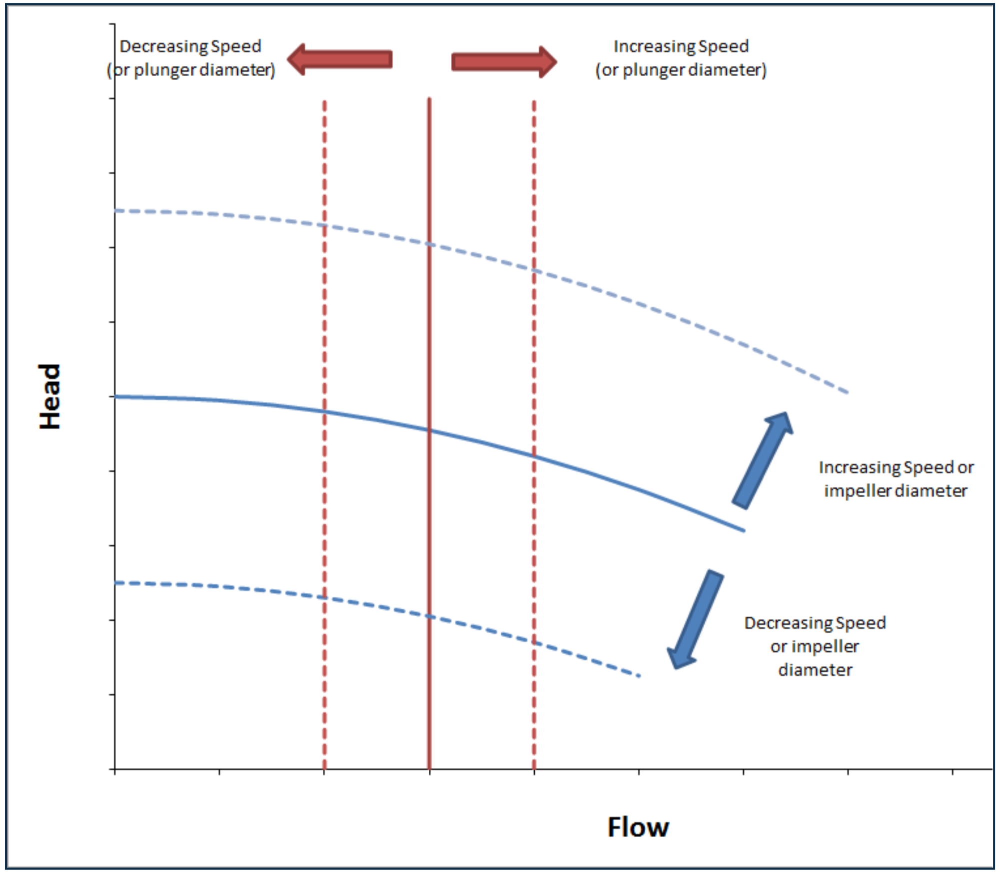


HEAD

- Theoretically infinite pressure when discharge valve is closed



SPEED EFFECT



PD pump flow is fixed for fixed speed

Flow varies directly with speed

Maximum Speed as defined by API 674

Stroke mm	50	70	100	150	200
RPM	450	400	350	270	210

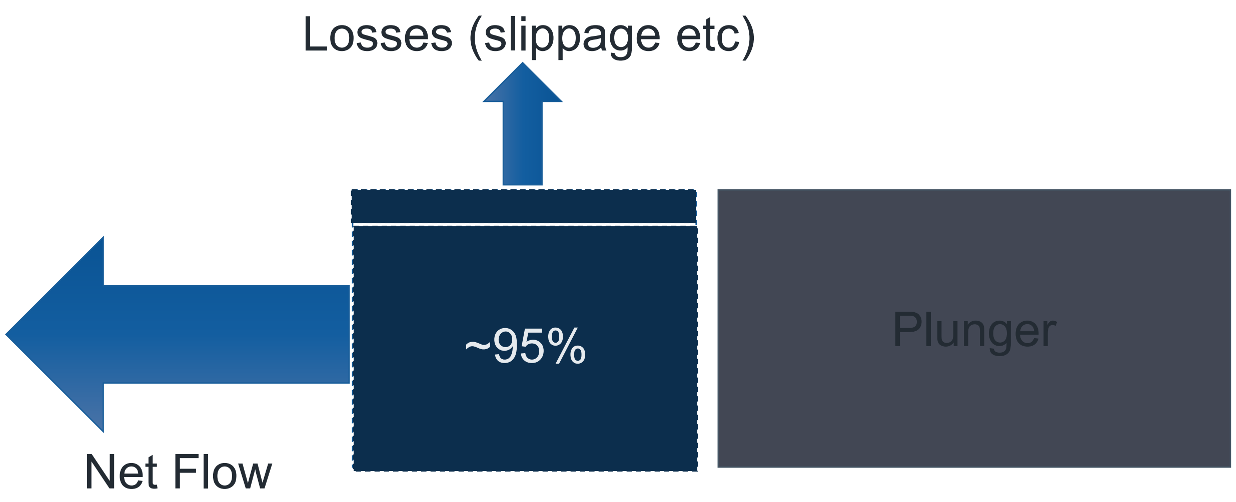
(RPD design allows us to run faster for non-API applications = smaller pump)

EFFICIENCY AND POWER

Efficiency for PD pump is fixed and does not change for changing flow/head.

RDP efficiency is approximately 98%.

API 674 states that we cannot use more than 95% for power calculation



Estimate …. $\text{Power (kW)} = \text{Pressure (bar)} \times \text{Flow(l/m)} \,/\, 540$

NPSH AND NPIP

- NPSHA = NET POSITIVE SUCTION HEAD AVAILABLE

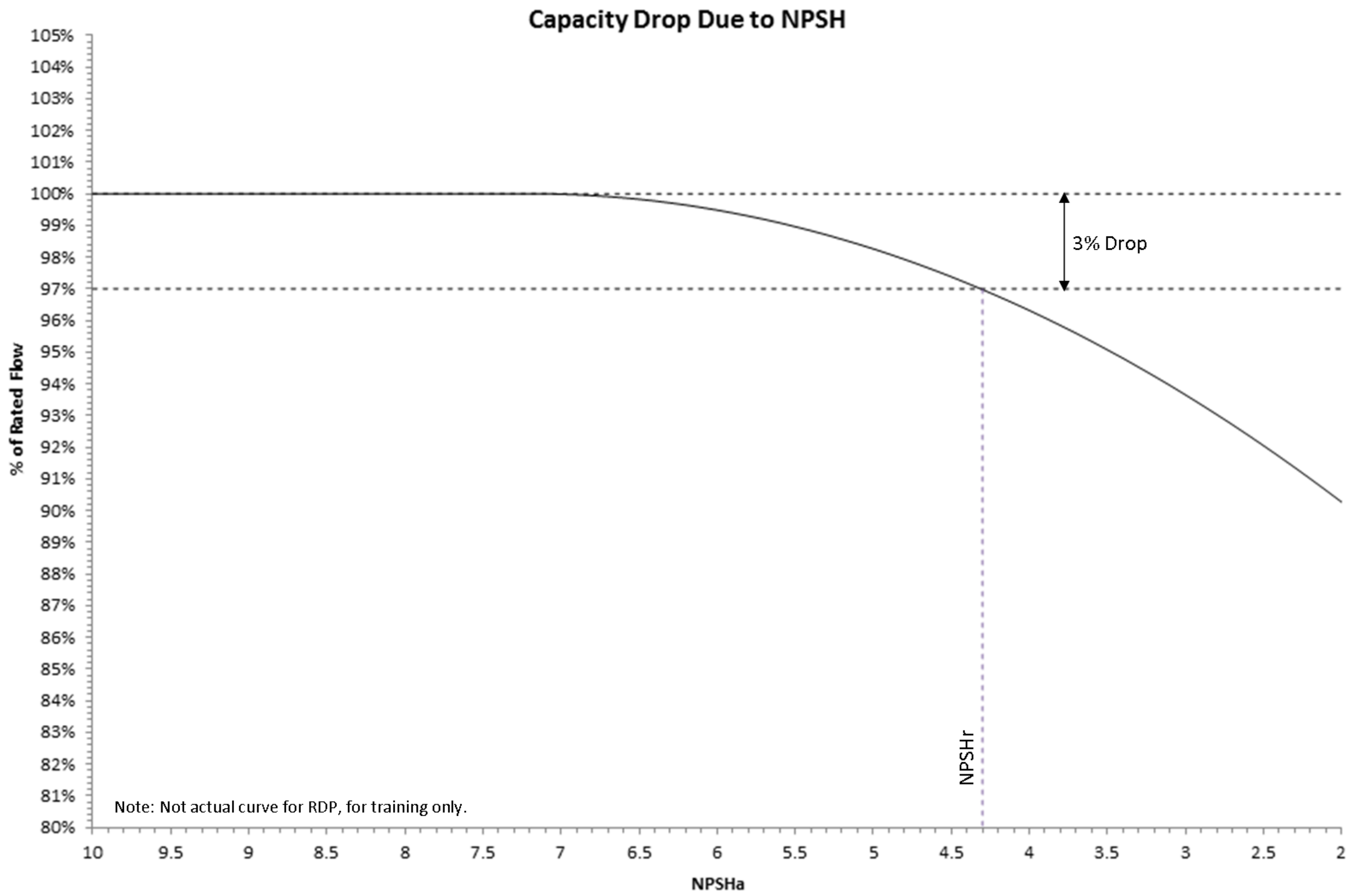
- NPIP = NET POSITIVE INLET PRESSURE

- NPIP and NPSHA are the same thing. NPIP is in terms of pressure and NPSHA is in terms of head. Either can be seen on API674 datasheet.
- Same principle as NPSHA and NPSHR in a centrifugal pump
  - High enough pressure when liquid is accelerated to avoid cavitation

- Also specifically for reciprocating pump …
  - NPHSA has to provide force needed to open valves and adequately fill the cylinders
  - Criteria is 3% FLOW drop (compared to 3% HEAD drop in centrifugal pump)
  - Note API 674 states that NPSHa should have a minimum of 1m margin to NPSHr

- Results of low NPSH margin
  - Erratic and unreliable performance
  - Reduced flow (in extreme cases!)
  - Erosion of plungers and valves due to cavitation
  - Noise

NPSHr (required)



EFFECT OF SG

Centrifugal pump power IS affected by SG (lifting something heavier uses more muscle!!)

$$\text{Power} = \frac{\text{Head} \times \text{Flow} \times \textbf{SG}}{\text{Efficiency} \times C}$$

Reciprocating is NOT affected (pushing 1m3 of feathers and 1m3 of lead from 1 point to another on a frictionless surface uses same energy!)

Estimate ….

$$\text{Power (kW)} = \frac{\text{Pressure (bar)} \times \text{Flow (l/min)}}{540}$$

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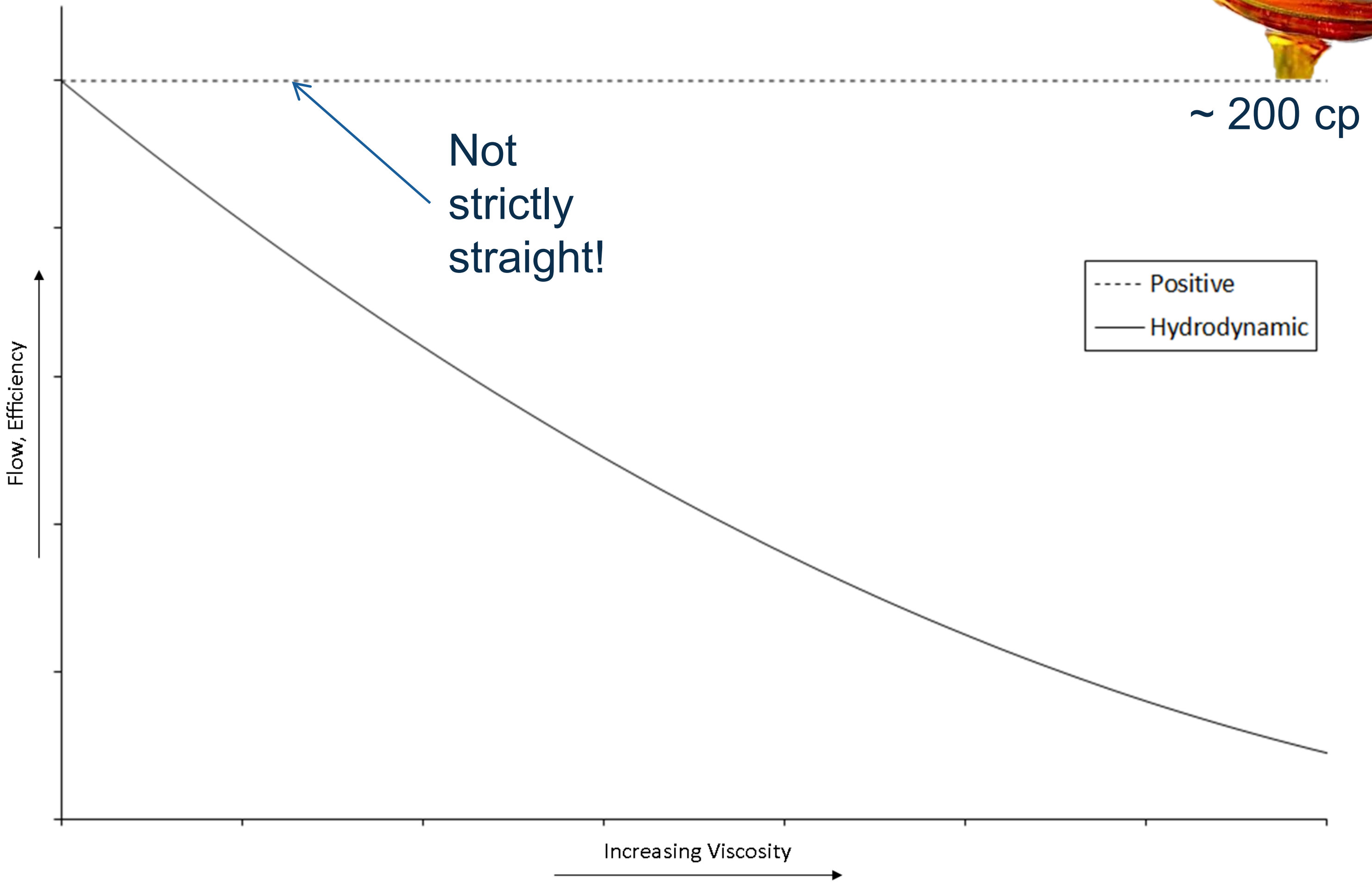
Viscosity Effects



Things to remember

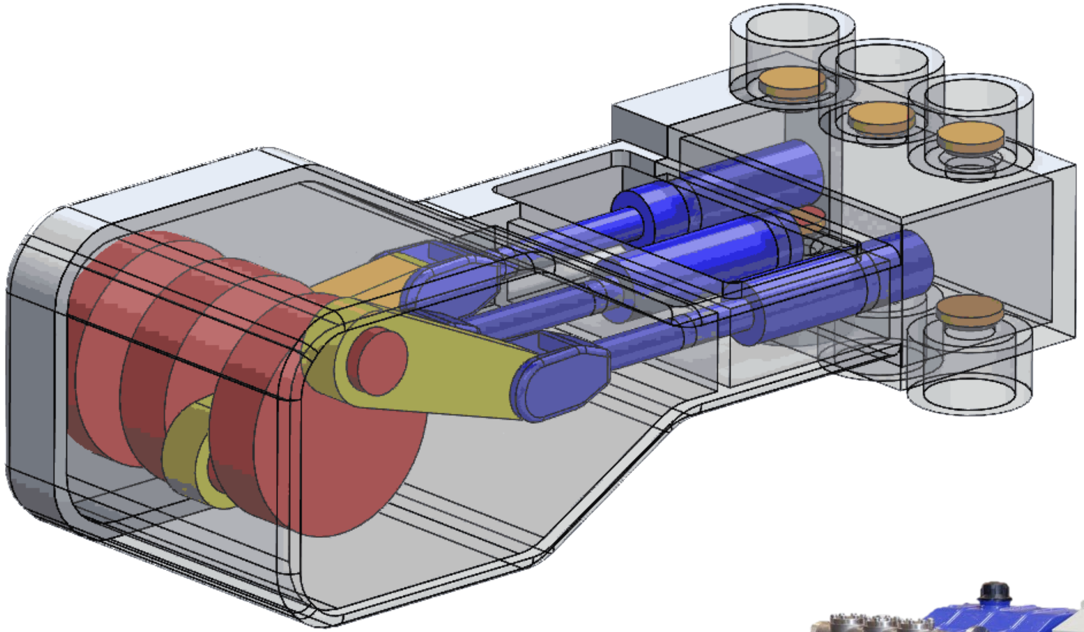
- ✓ Flow rate **=>** Determined by pump
- ✓ Suction/discharge pressure **=>** Determined by system
- ✓ Discharge pressure is only limited by the power supplied to the pump and structural limits of the weakest component.
  - Fluid head
  - Power end
  - System
- ✓ A plunger pump does not create pressure
- ✓ The system generates the pressure
- ✓ The pump, pumps against this pressure

Section 1 Part 2-
WHAT IS A RECIPROCATING PUMP?

What is a Reciprocating Pump?

A pump that moves a known quantity of liquid with each stroke of a plunger

RDP OVERVIEW
THE RDP IS....



- ✓ **Plunger** Pump
- ✓ **Power** Pump

- ✓ **Single** Acting
- ✓ **Horizontal** layout

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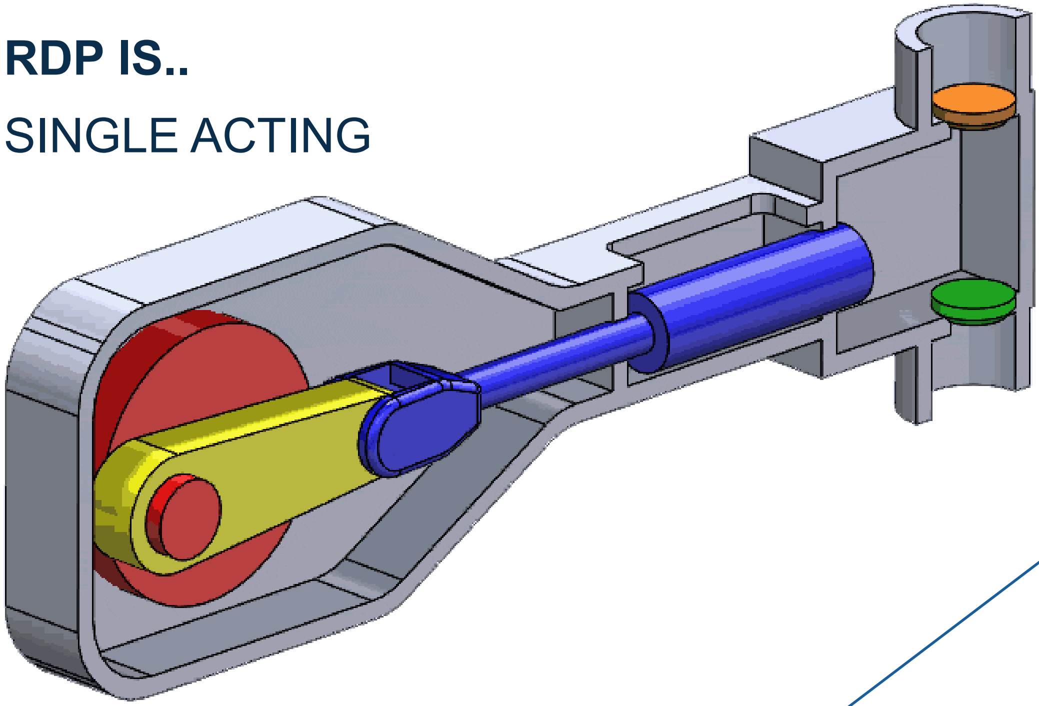
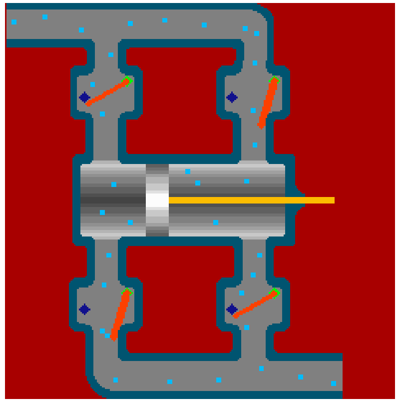
RDP IS..

SINGLE ACTING



RDP is not..

Double acting



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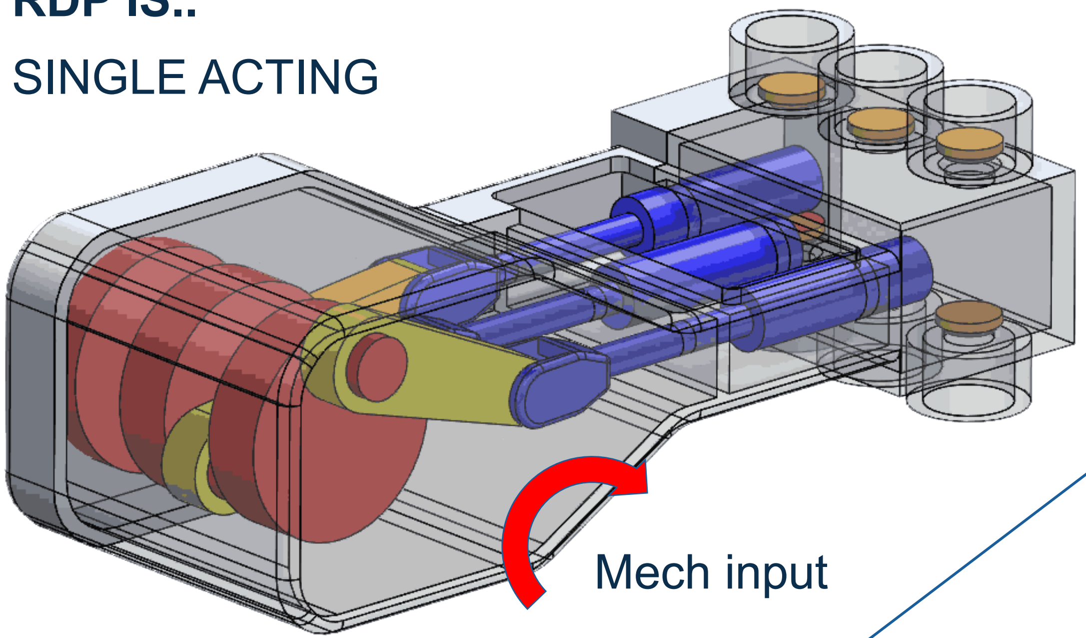
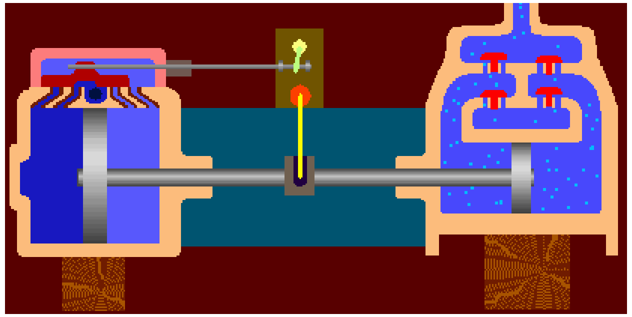
RDP IS..

SINGLE ACTING



RDP is not..

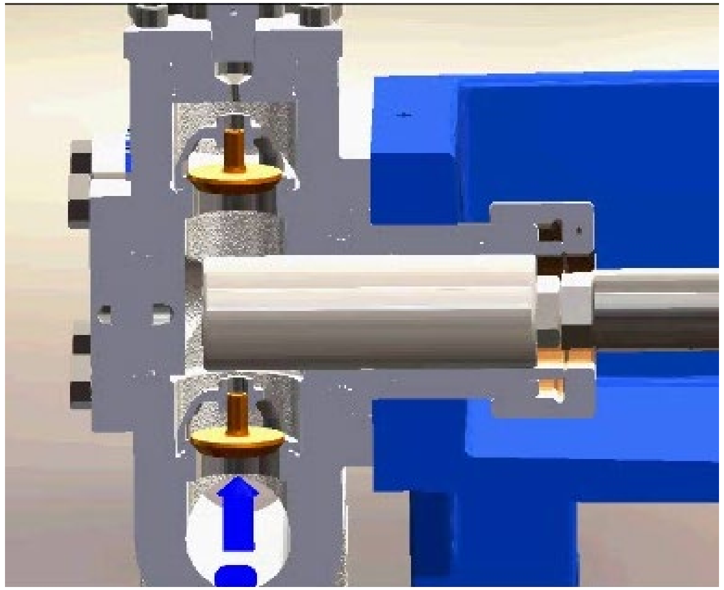
Direct acting



PLUNGER PUMP (RDP)

Sealing elements **FIXED** in a stuffing box, plunger moves through packings

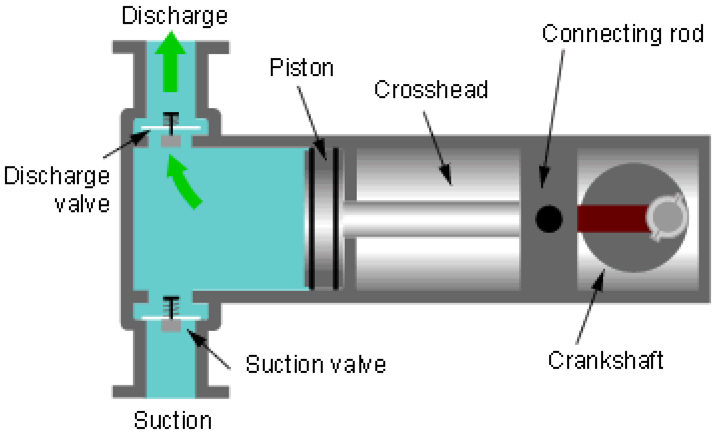
- Higher pressure/lower volume



PISTON PUMP

Sealing elements **MOVE** with a piston

- Higher volume/lower pressure



http://engineering.stackexchange.com/

Both types of pumps are covered by API 674

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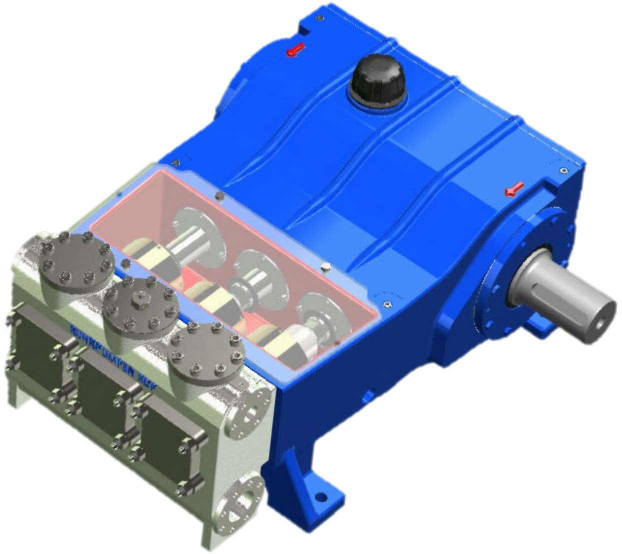
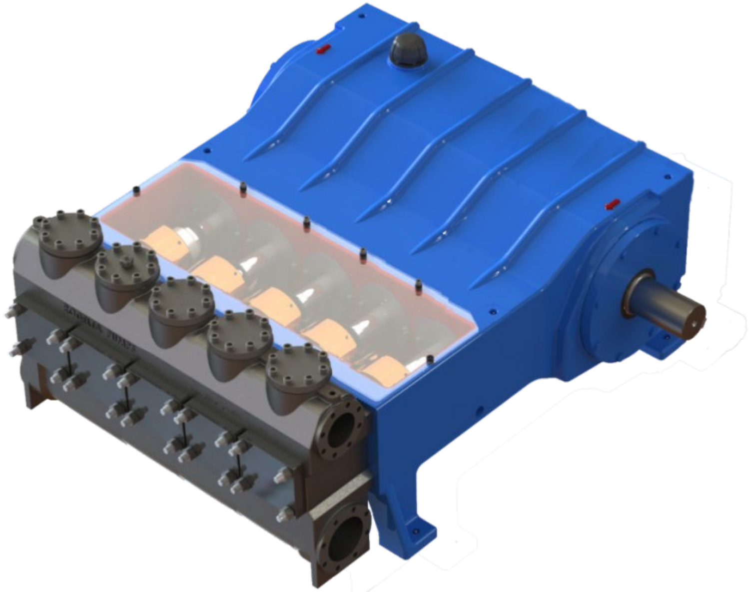
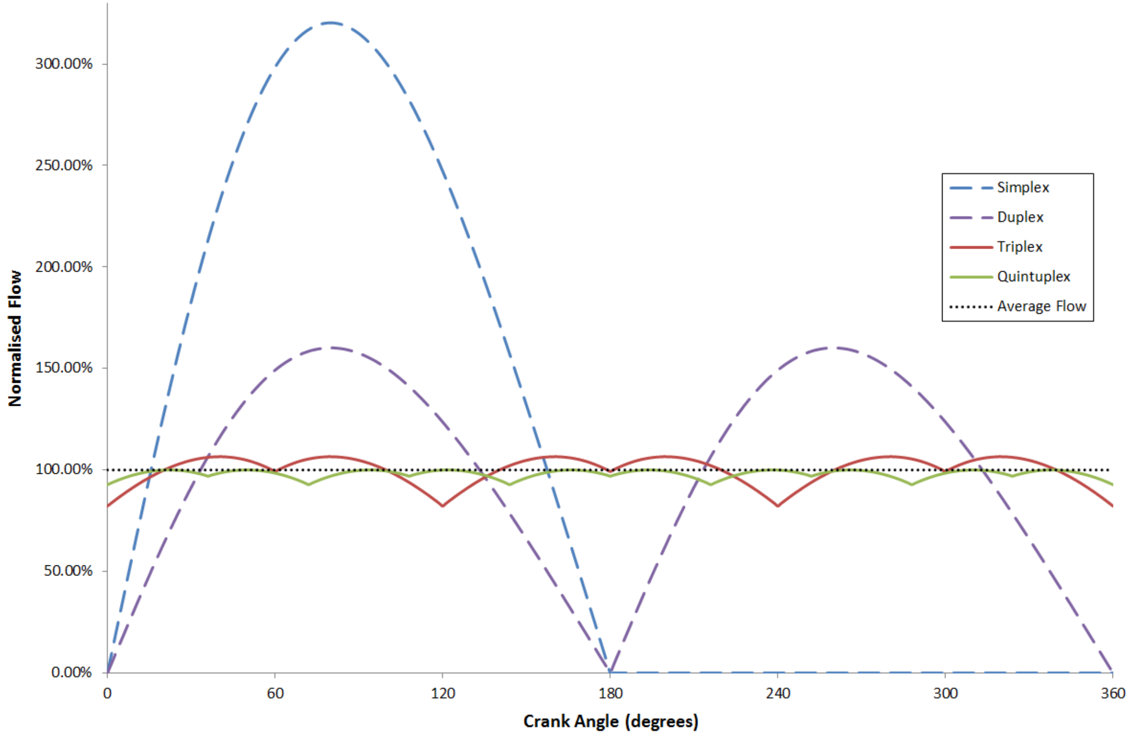
Name	No of Plungers
• Simplex	1
• Duplex	2
• Triplex	3
• Quintuplex	5
• Septuplex	7



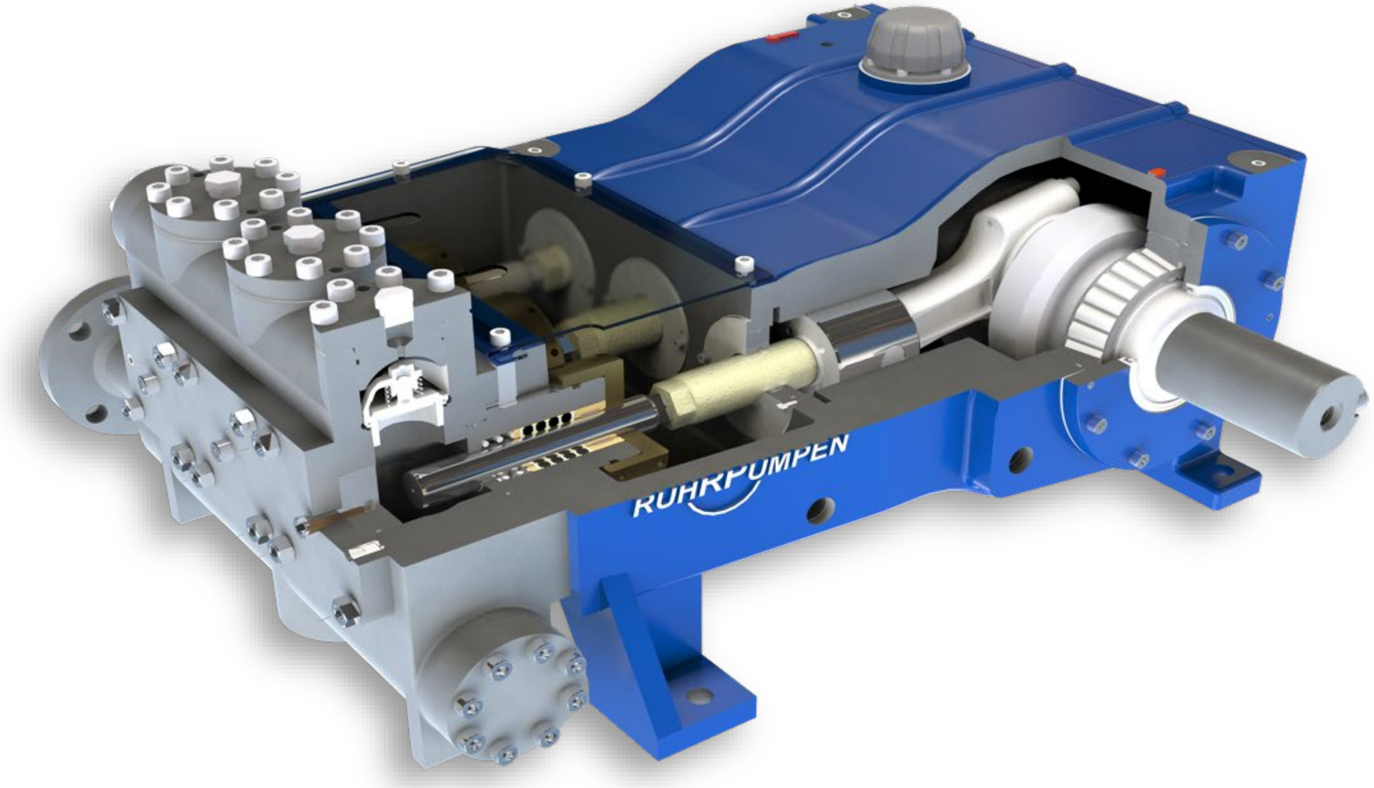


- Due to the nature of reciprocating pump action, flow pulses (unlike a centrifugal pump)
- The result is pulsations which are of different forms depending on number of plungers



Section 2 Part 3- RUHRPUMPEN RDP PUMP FEATURES

RUHRPUMPEN RDP PUMP



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Nomenclature :

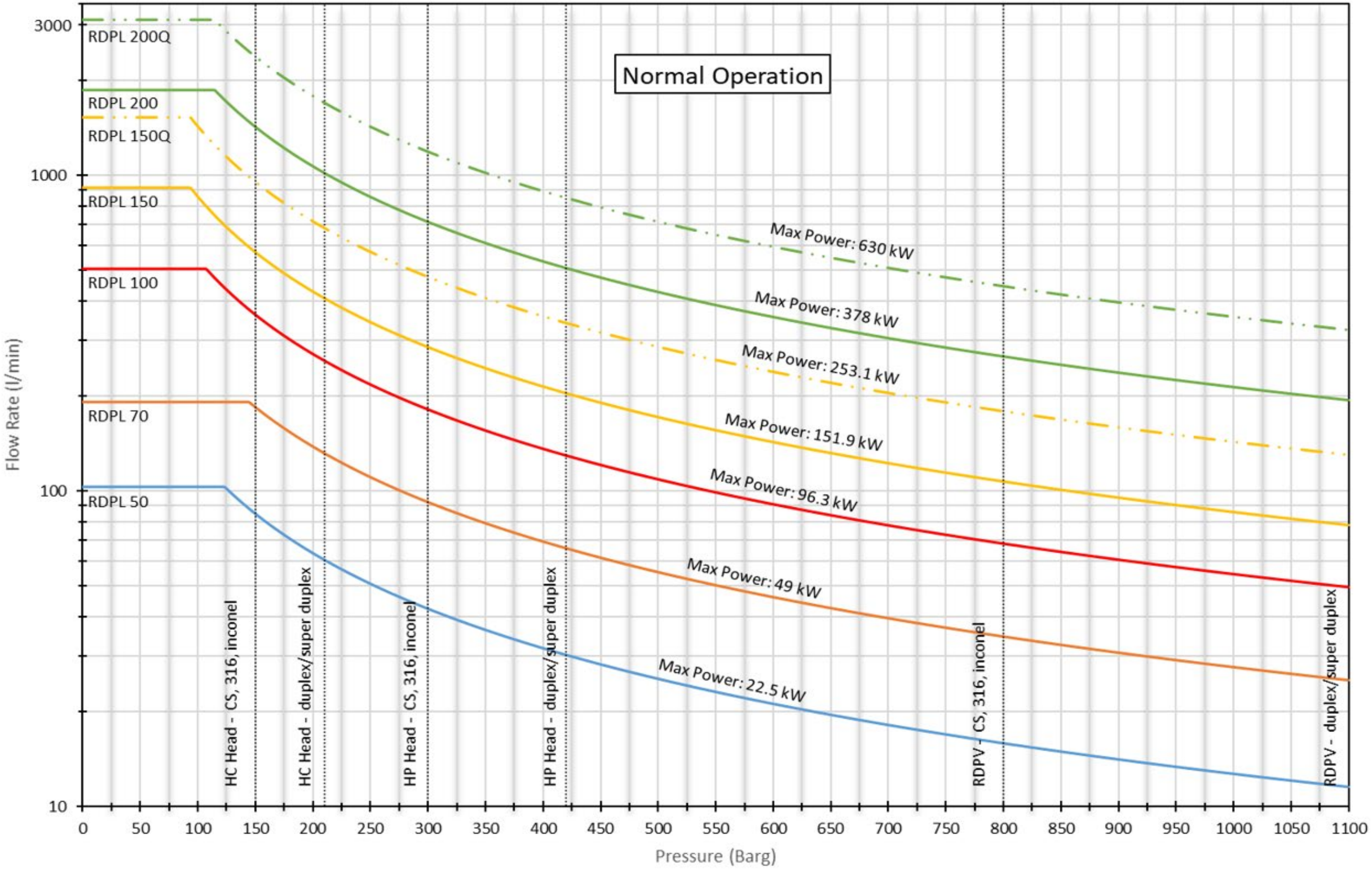
- Product name: RDP
- Suffix number: Stroke length
- Second number: plunger diameter
- Number of plungers: 3 (triplex) unless otherwise indicated by "Q" (quintuplex – 5 plungers)

Example:

RDP 100/55

Stroke length = 100 mm

Plunger diameter = 55 mm

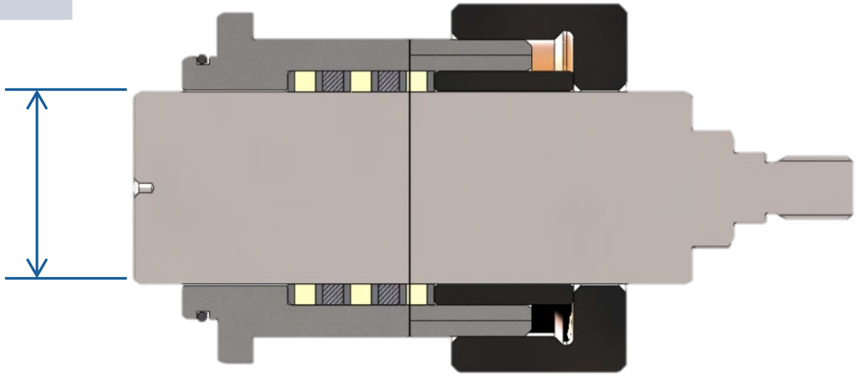


The Balancing Act

The Balancing Act

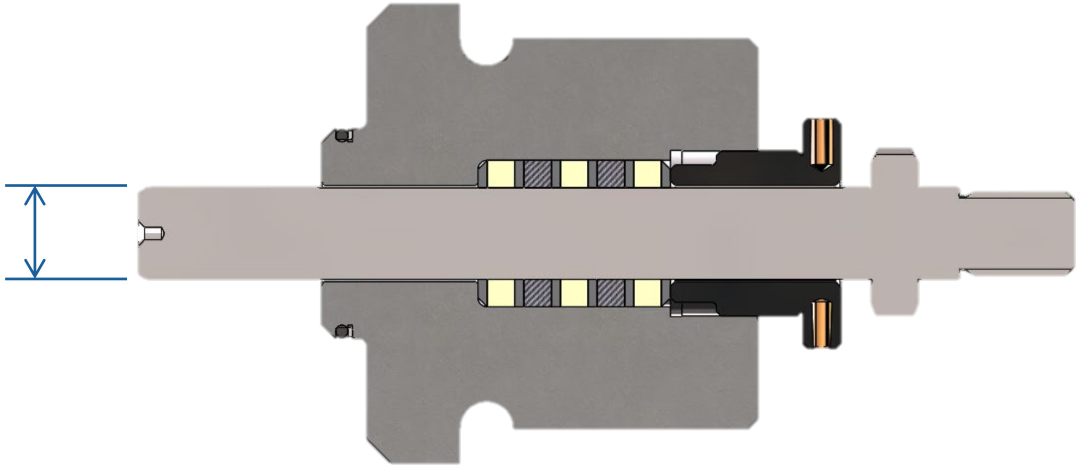
Pump Model	50	70	100	150	200
Max Rod Load Kg	3300	3500	5500	7500	15000

ø 200mm
@ 47 bar
=1500 Kg



Force = Pressure x Area

ø 43mm
@ 1000 bar
=1500 Kg



Pump Assembly

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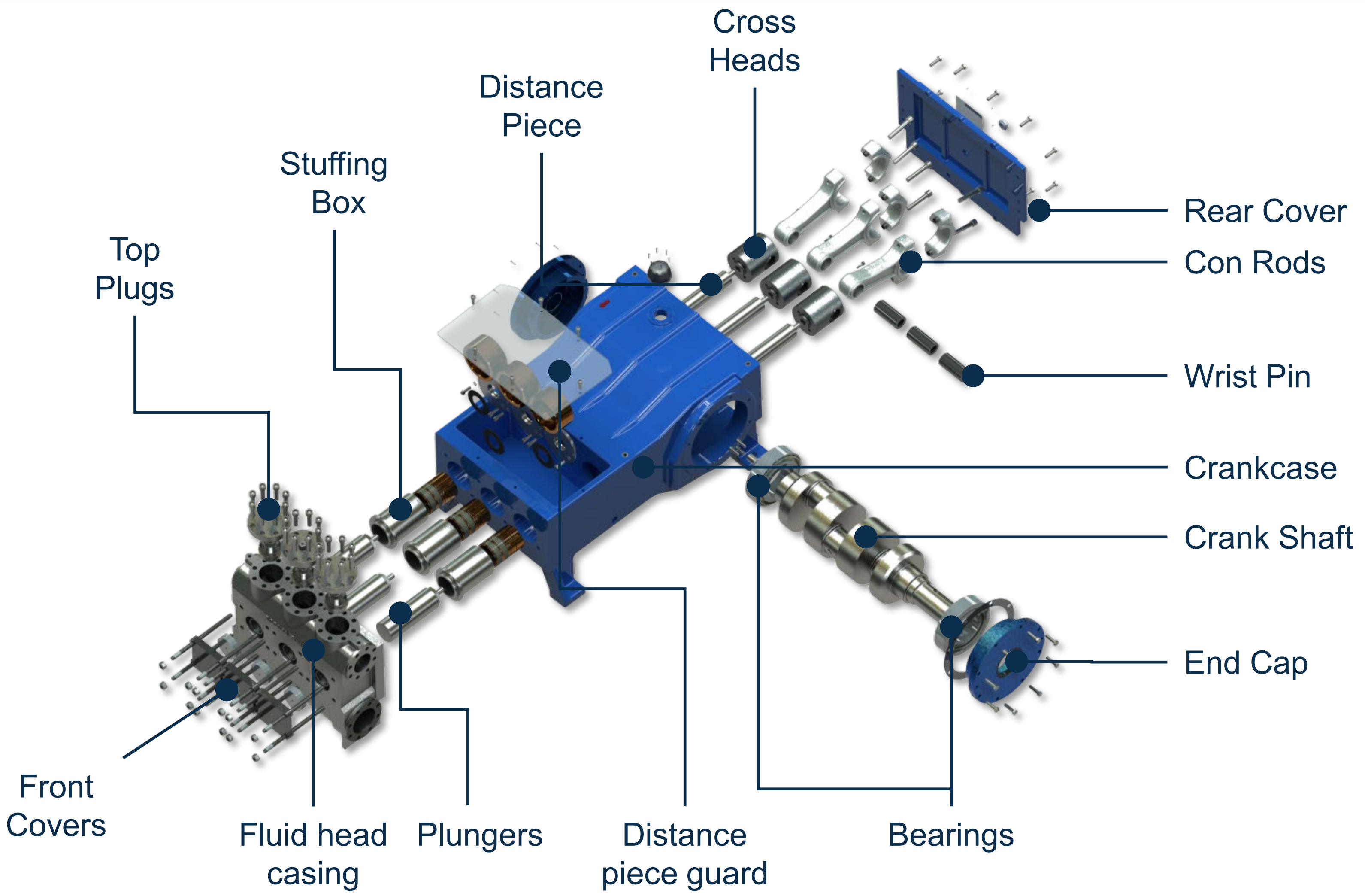
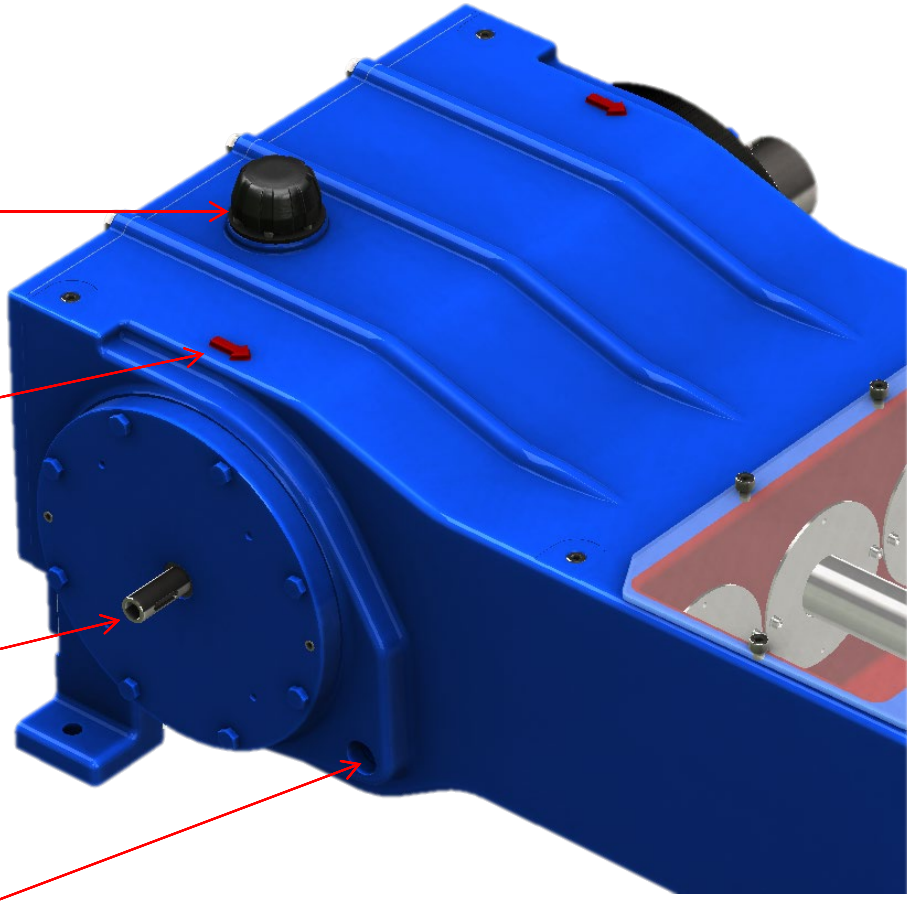
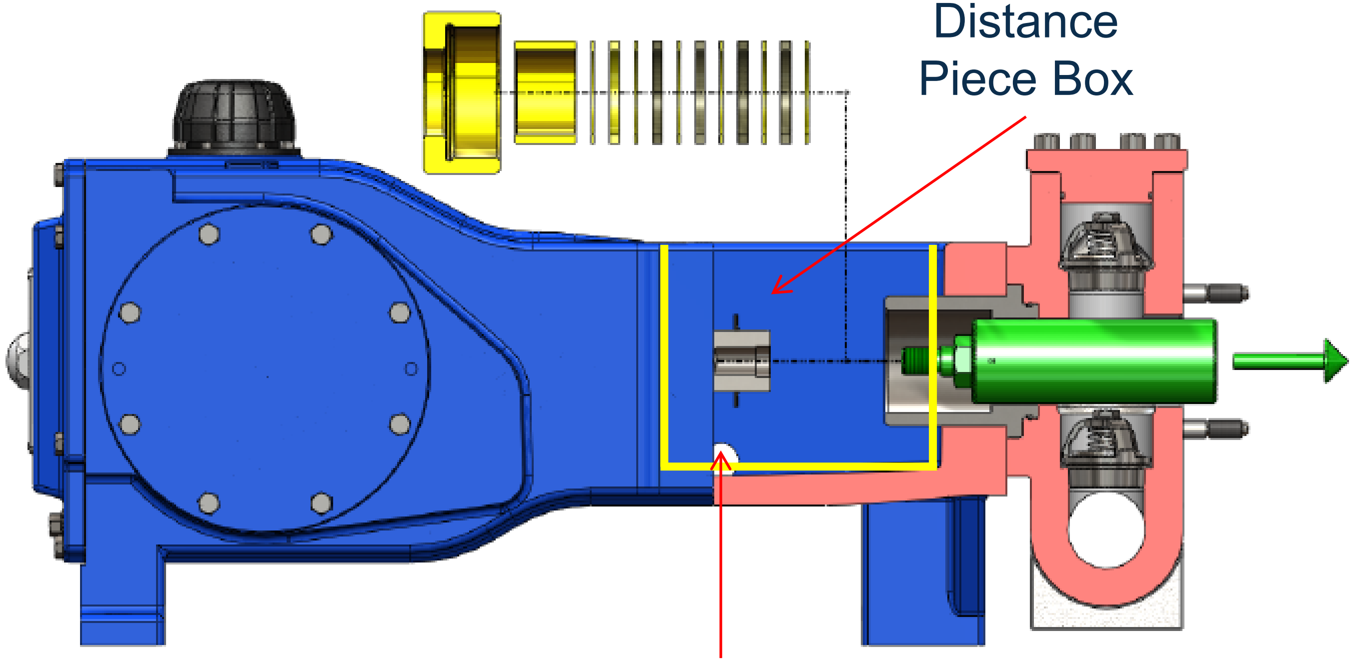



IP 65 Filler Breather
Direction Arrow
Power Take Off Shaft
Heater or Instrumentation port

Power End

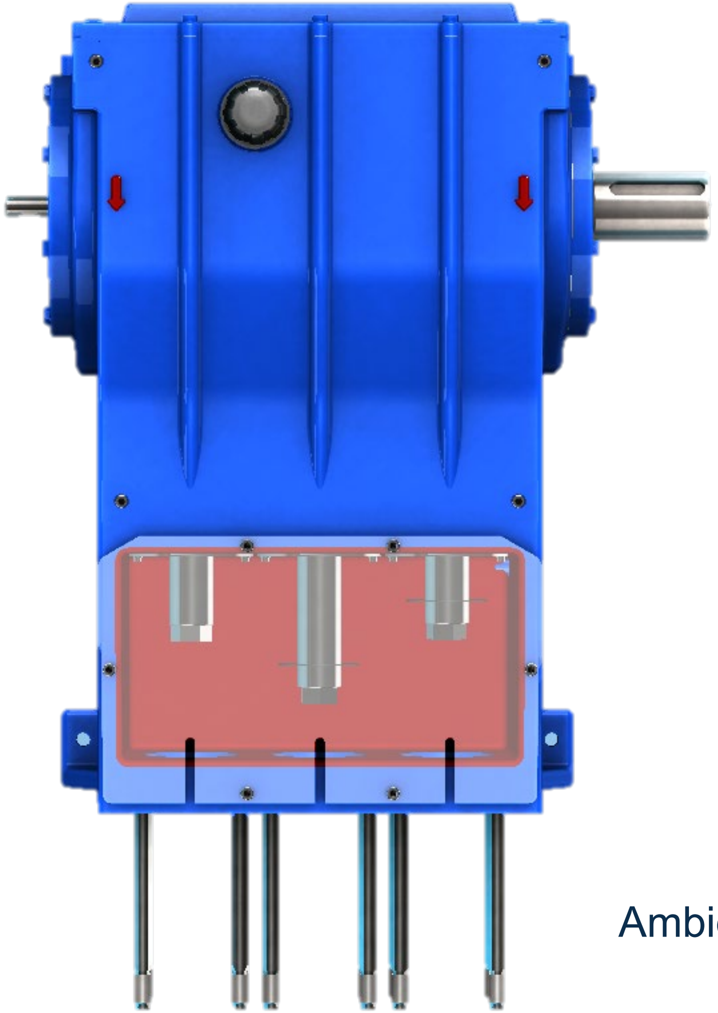


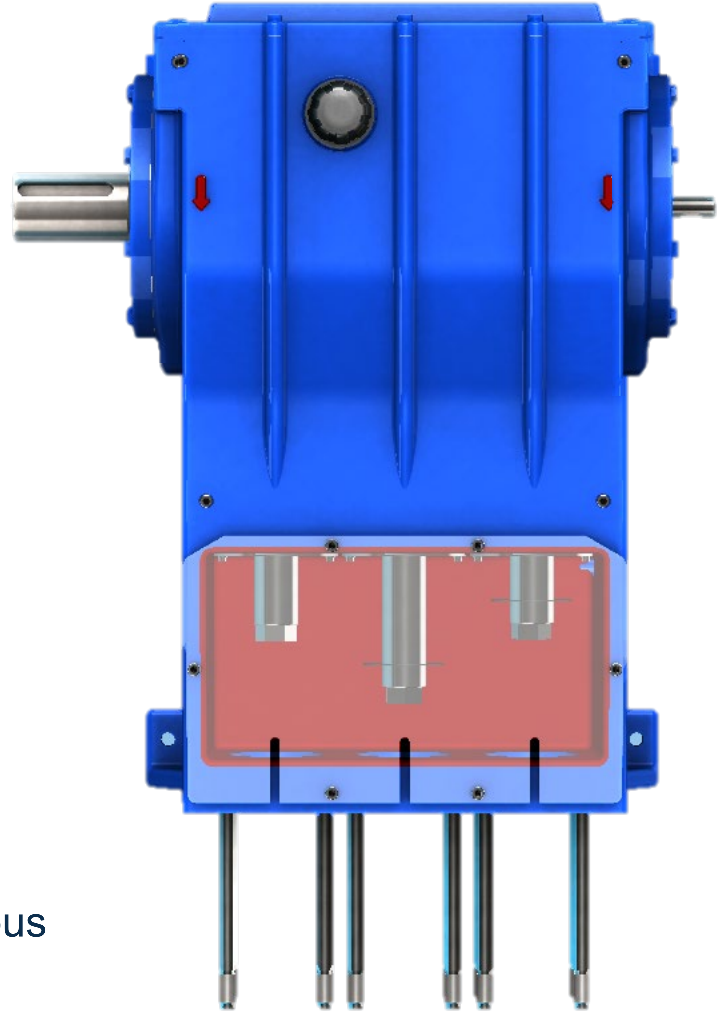
Distance Piece Box - an important maintenance feature – not all competitors have it

Permits piston and packing exchange without power end dis-assembly and other maintenance tasks (eg change oil lip seal) without disturbing fluid head end

Distance piece box can be used for containment of packing or oil leakage

Power End

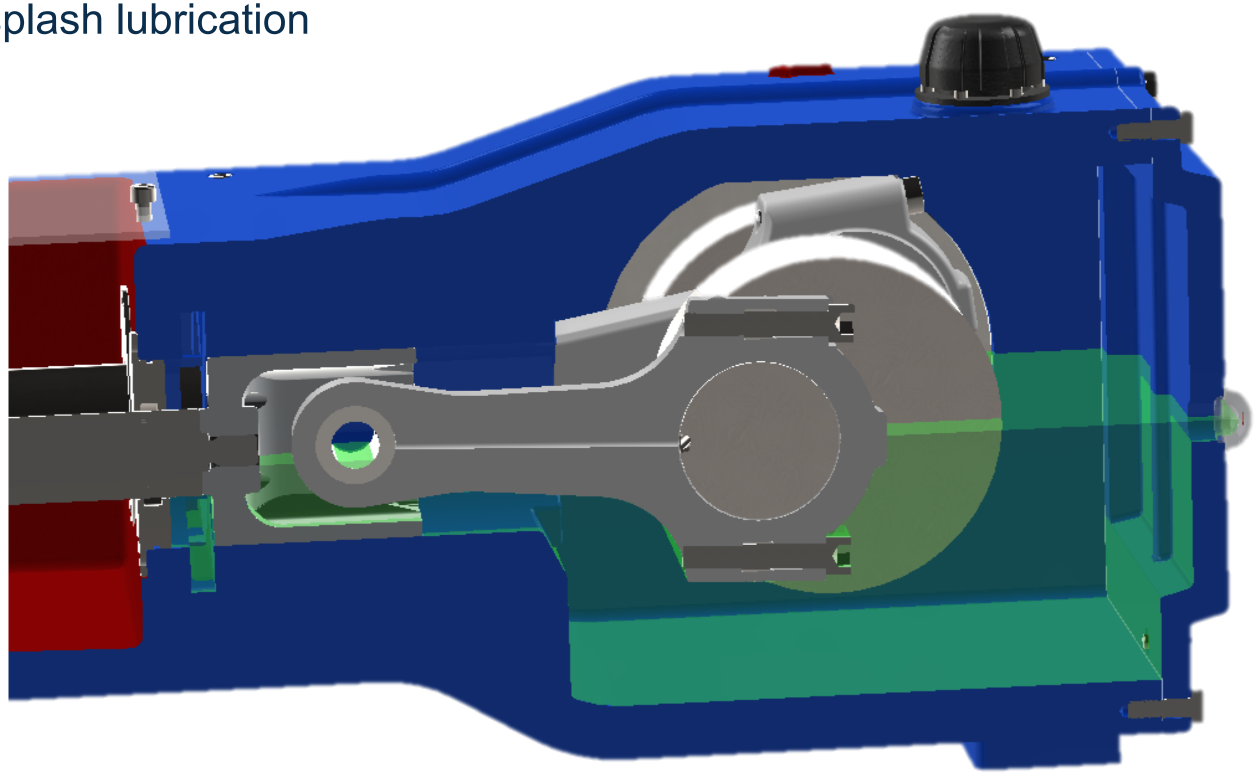




Ambidextrous

Power End Lubrication
Splash

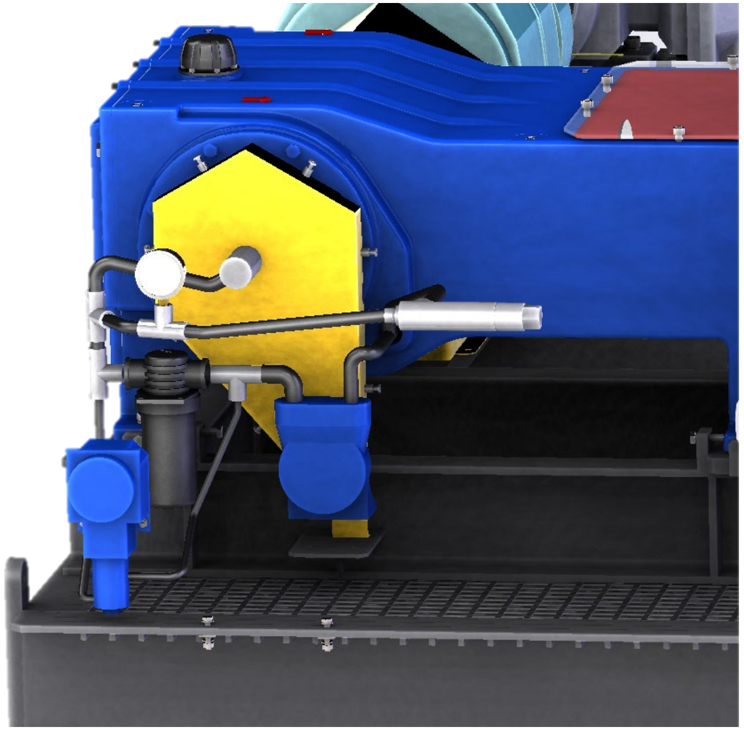
Flooded/splash lubrication



Power End Lubrication
Forced

Optional forced feed lube system

Criteria based on inlet pressure and speed



Fluid Head Types

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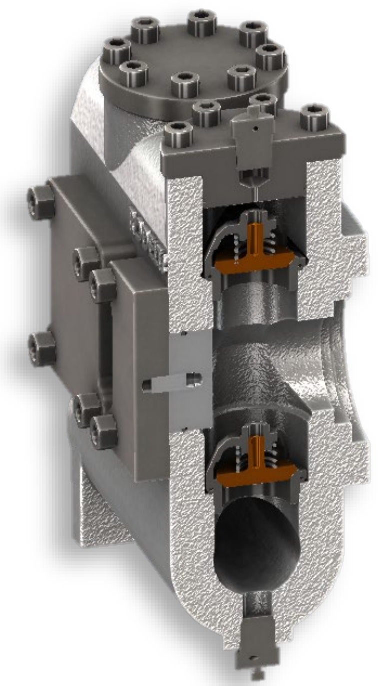
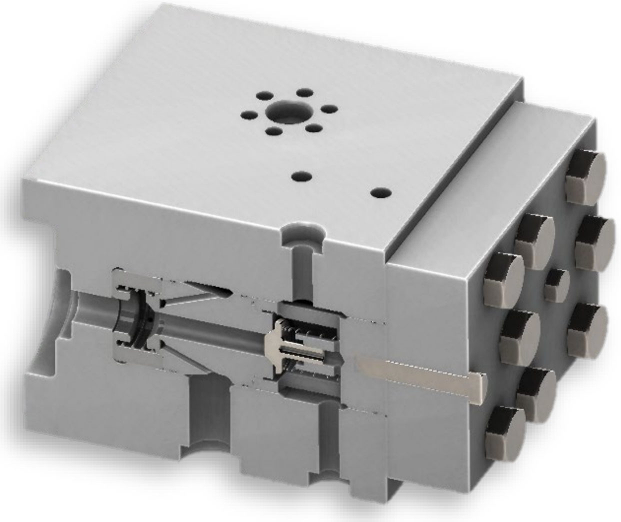
Three types of head designations - Selection depends on material and pressure



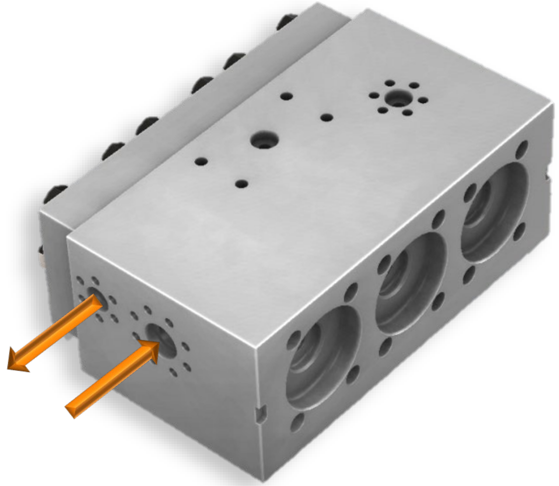
	HC	HP	VHP
Head Material	Max Pressure Bar g		
Carbon	150	300	950
316L	150	300	950
Duplex F53	250	500	1100
Super Duplex F55	250	500	1100
Inconel 625	250	500	1100



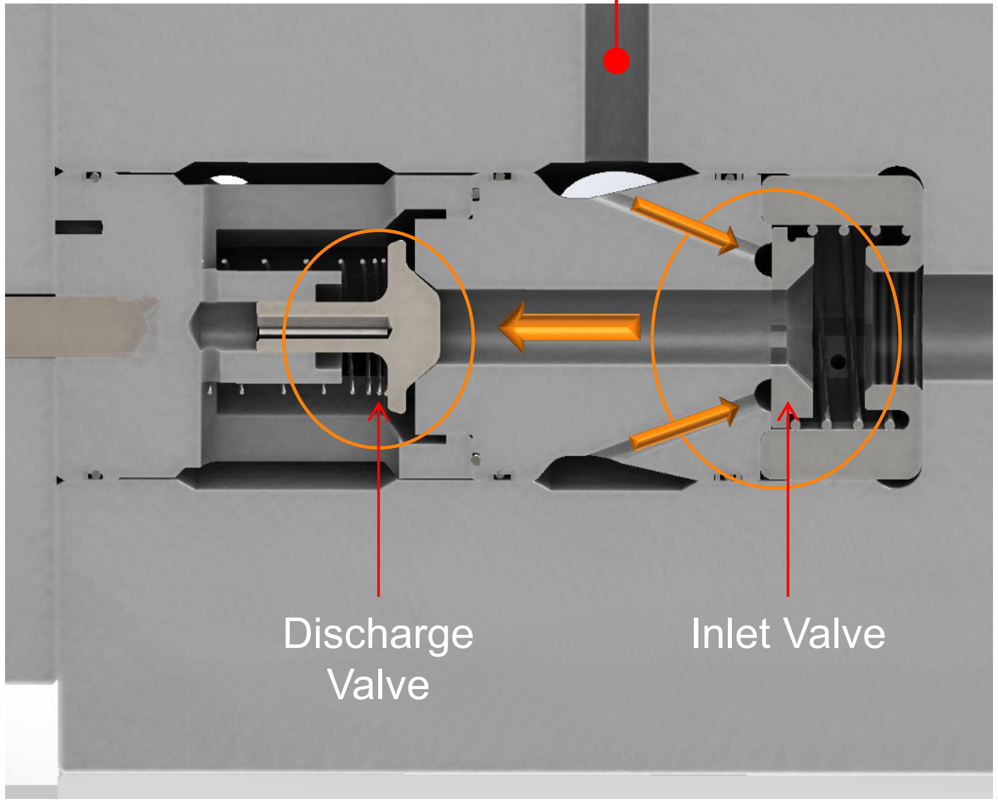
HC High capacity
HP High pressure

VHP Very high pressure

Forged design



Accessories such as Pulsation Dampener



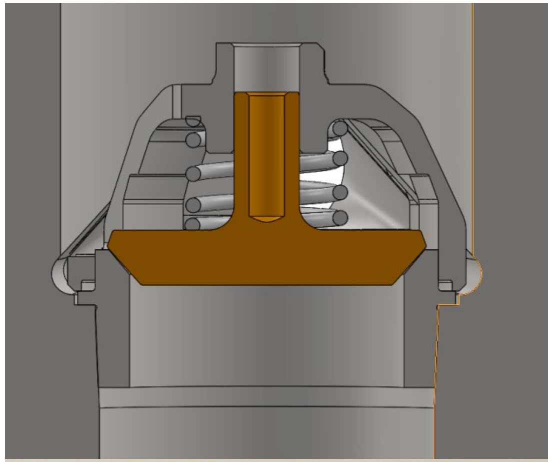
Ruhrpumpen HC, HP Valves

Valve Technology

Top Guided Bevel
- High stability for greater efficiency and lower noise

Tapered seats
- For corrosion and erosion resistance

Ruhrpumpen proprietary valve gives us maximum flexibility from design and manufacturing standpoint

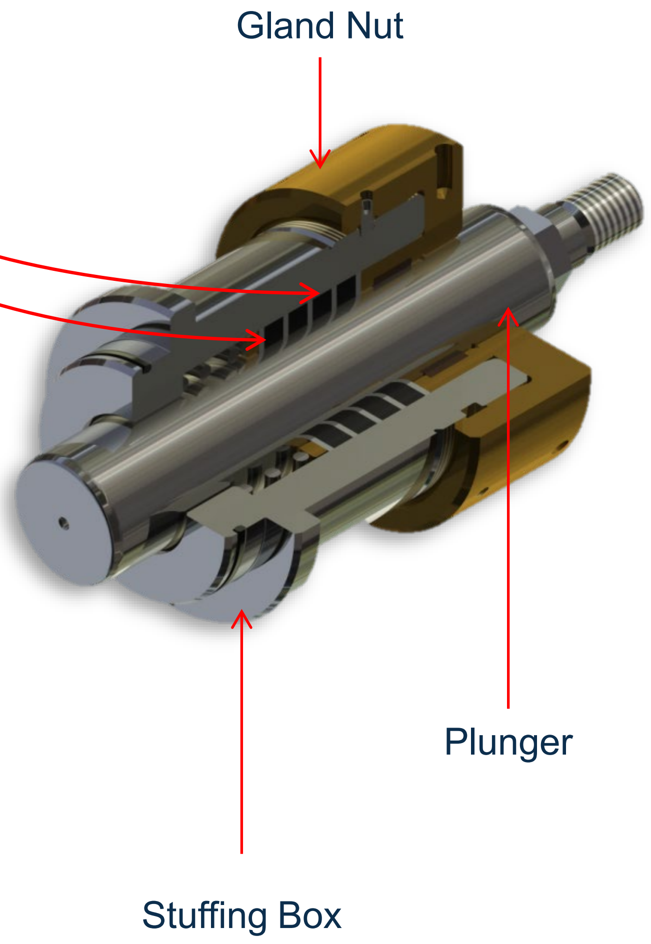


API 674: 6.7.3 Valve Seats

Valve seats shall be replaceable
For corrosive service seats shall be pressed into tapers in the Head

Plunger Sealing Assembly

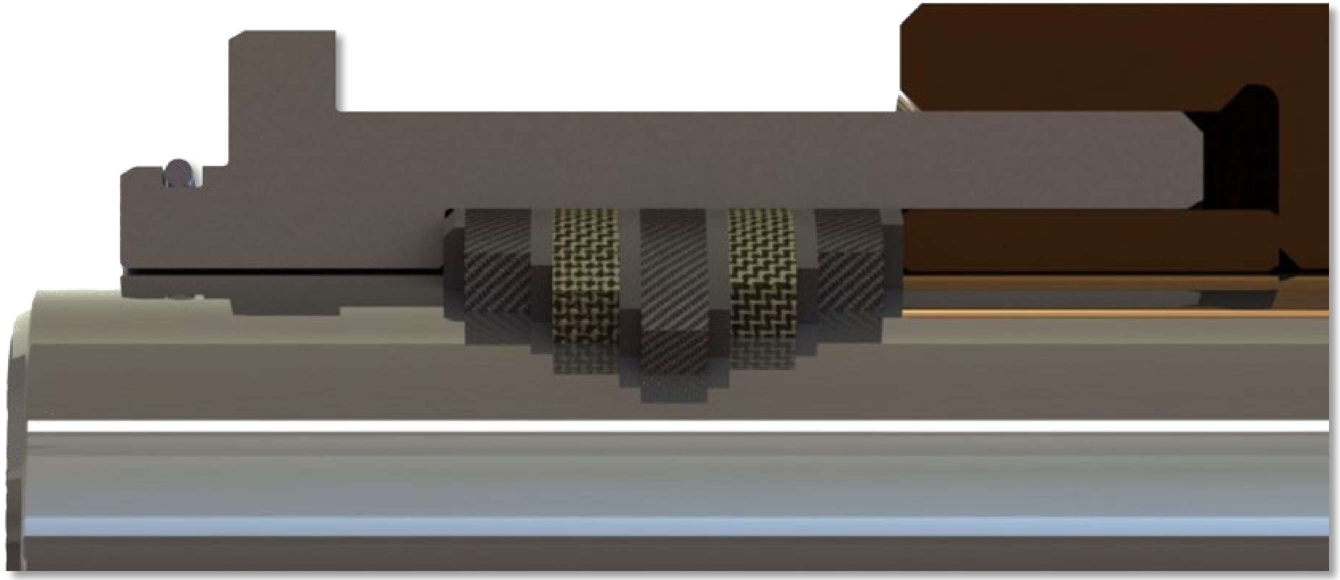
<u>Packing</u>
Type: Braided/Chevron
Adjustment: Manual/Sprung
Lubrication: Product or External



Typical Packing Example

Media	Seal System	Metallic parts	Packing
Caustic solution	Flushed Plan "62"	316	Braided
Closed Drain/ H2s present	Force feed lube sprung loaded Packing	Duplex	Sprung Chevron
Methanol	Force feed lube	316	Braided
Sea Water (RO)	Flushed Plan"13"	Super Duplex	Chevron (Single)
Meg/TEG	Standard 5	316	Braided
Hydrocarbons	Standard 5 OR Force feed lube	316	Braided

Stuffing Box Braided Compression Packing



Standard 5 Layout

3 PTFE & graphite braided

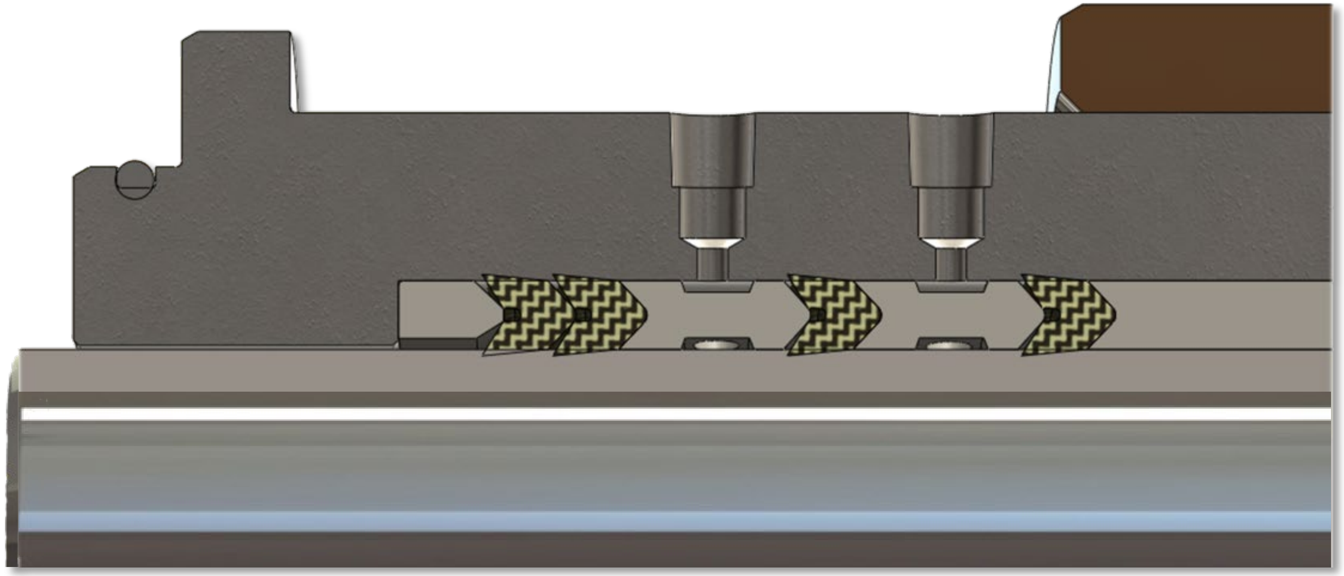
2 PTFE & graphite & aramid braided

6 anti extrusion rings

Simple and effective

Requires regular manual adjustment

Stuffing Box
Chevron Ring

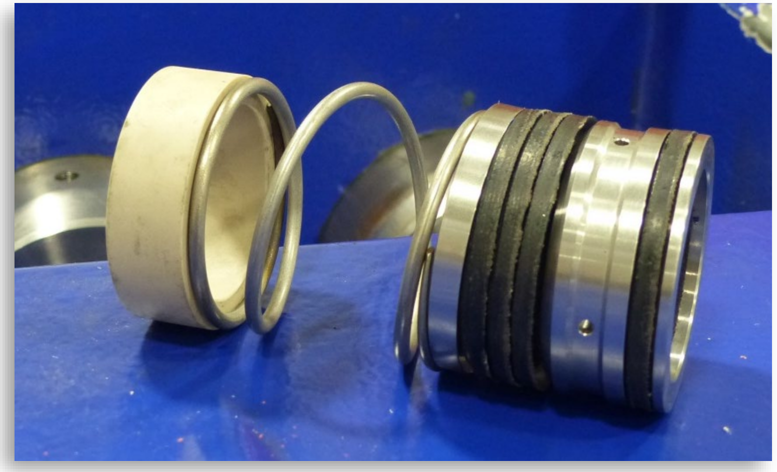


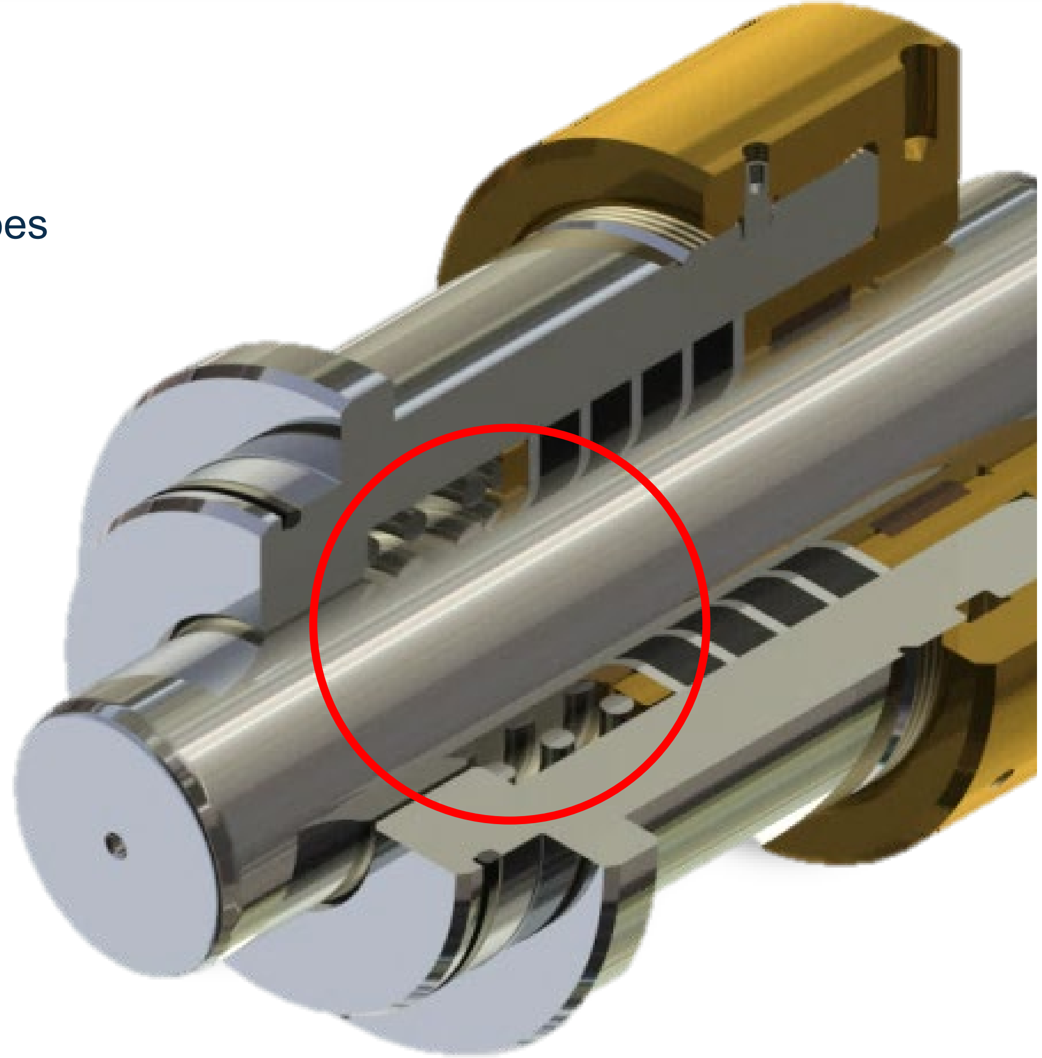
- Multiple packing rings
- Rings are one piece without a break
- No anti extrusion rings
- Little adjusting required
- Fewer parts
- Limited standard sizes

Stuffing Box
Spring Loading

Single spring to preload packing

Can be used with Braided or Chevron types





Lubrication
For Seal Life / For Emission Control

Product Lubrication

Media migrates along packing providing cooling and lubrication between packing and plunger

Flushing

Shop or grey water flushed, by mains pressure, auxiliary pump, gravity or suction line

- Cools packing
- Flushes particulates
- Prevents crystallisation or coking (similar to Plan 62)
- With Reverse Osmosis water is taken from the suction line to flush and cool the rear of the seal (Similar to Plan 13)
- Only single feed
- Used with braided or chevron packing

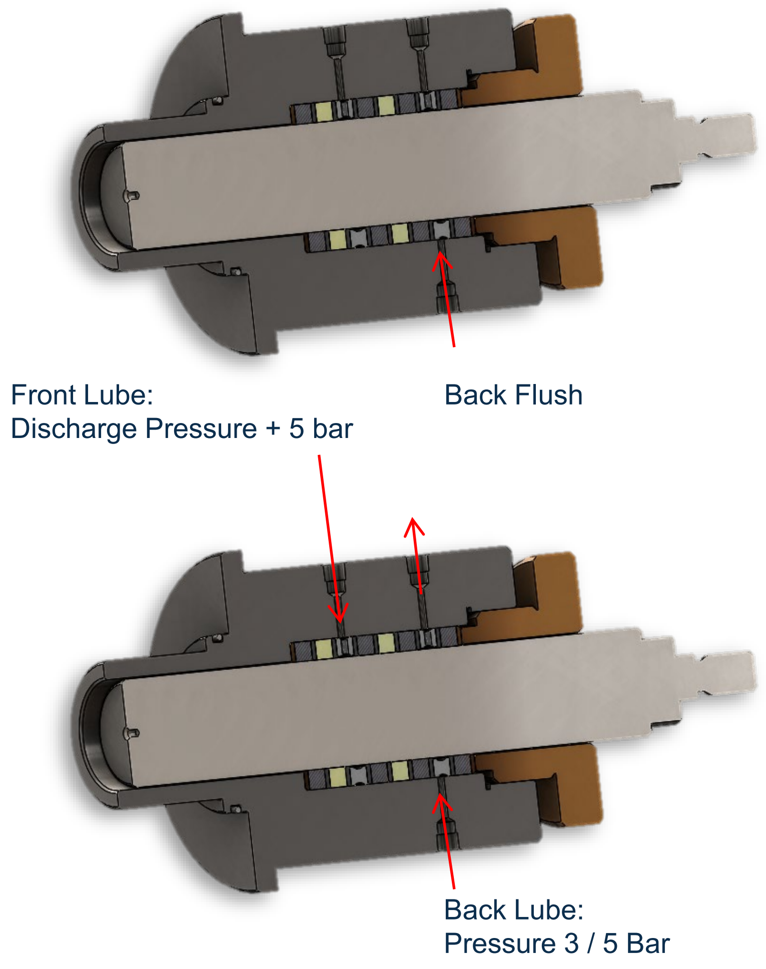
Forced Feed for Lubrication/Cooling

Compatible fluid is pressure fed into the packing by an auxiliary pump driven via power take off shaft extending from the pump crankshaft

- Used with low lubricity solvents e.g. methanol
- Single or double feed
- Used with braided or chevron packing

Forced Feed for Emission Control

Used as a barrier with high toxic media such as closed drains containing H2S.



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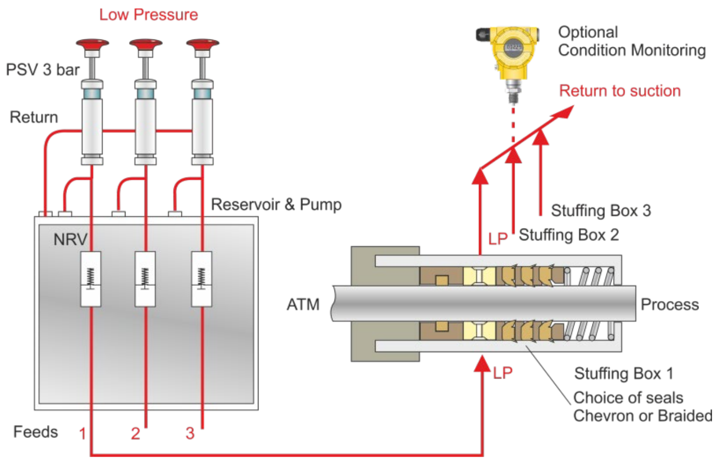
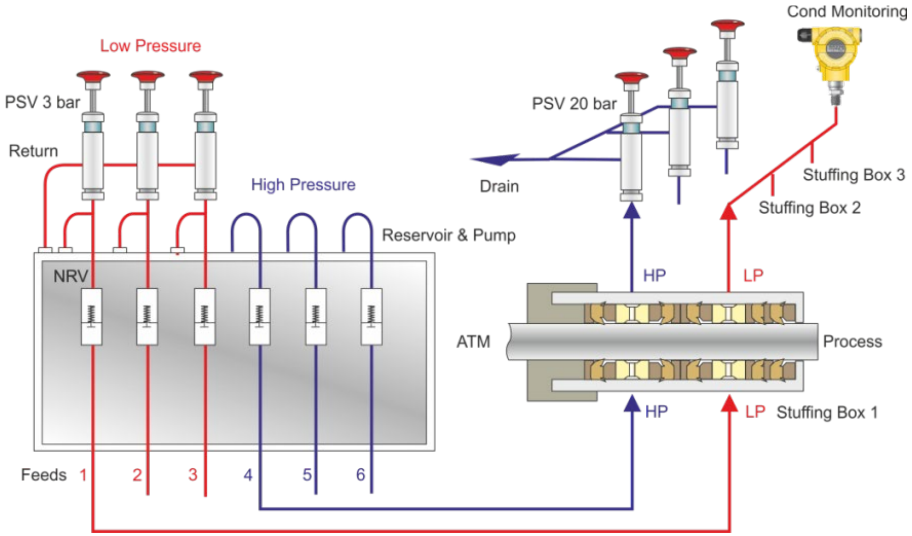
TYPICAL System schematics

TYPICAL 3 FEED SYSTEM



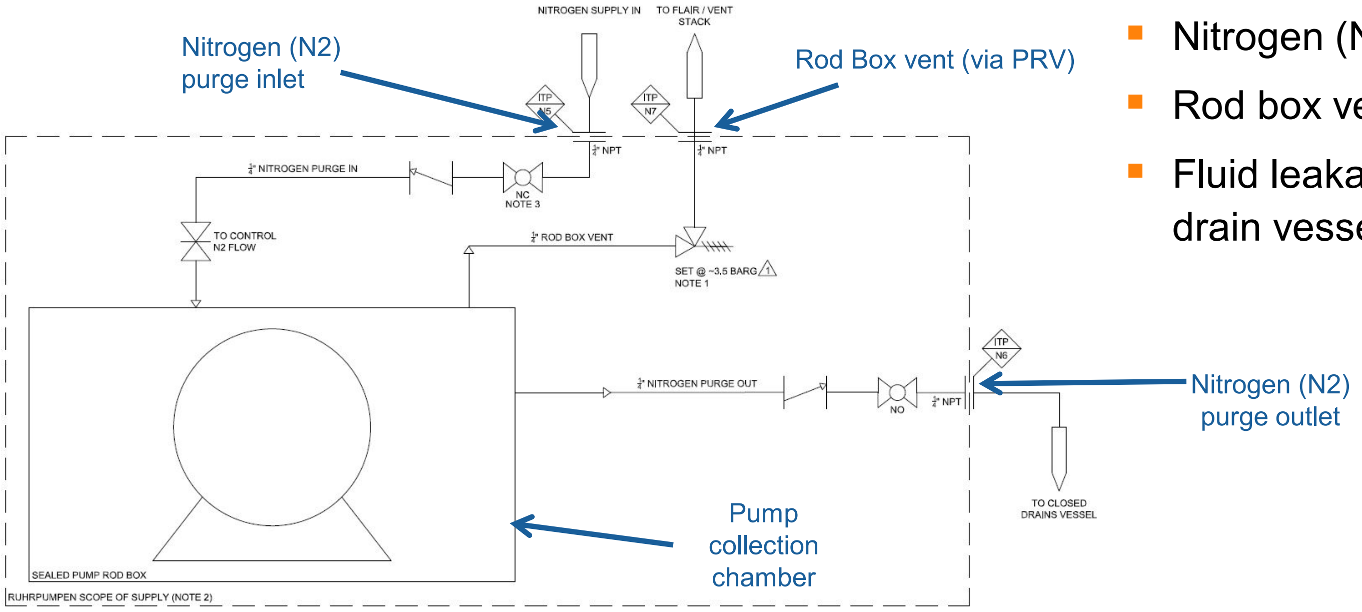
TYPICAL 6 FEED SYSTEM



Sealed Rod Box

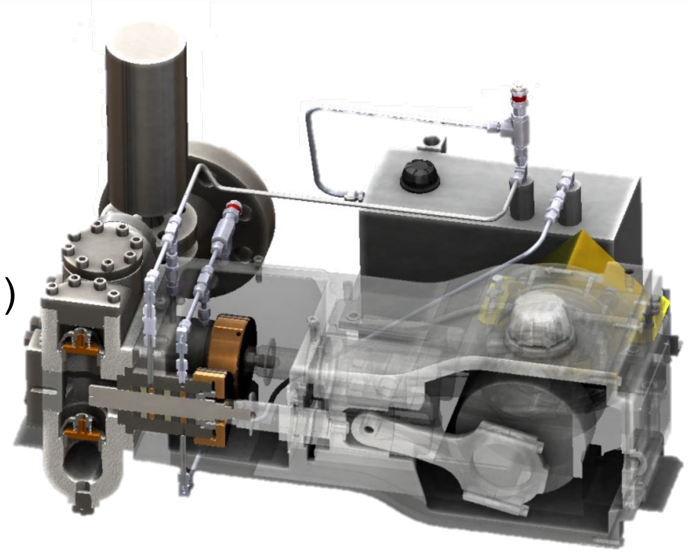
WHEN TO BE USED:

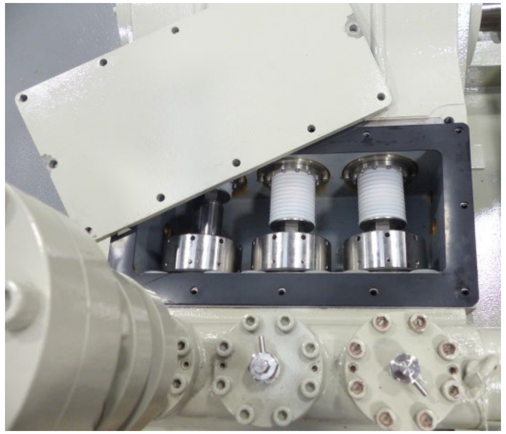
- In addition to stuffing box sealing systems
- To prevent uncontrolled release of toxic or hazardous **gases** contained in pumped media



HOW IT WORKS

- Gas tight sealed distance piece chamber (access cover is vented)
- Gas tight connecting rod with bellow seals
- Nitrogen (N_2) inlet
- Rod box vent (via PRV)
- Fluid leakage outlet (to a closed drain vessel)





Seal Plans

API674 reciprocating pumps do not use seal plans in the same sense as centrifugal products

BUT…

There are some parallels with recognised API 682 seal plans. See table

Title	Similar API682 Plan	Application	Construction	How it works
Standard (Non Lubricated)	-	No concern about duty or media such as toxicity or lubrication.	Comprises a primary seal stack with no seal plan.	-
Forced Lubrication (3 Feed)	-	Media unable to lubricate the seals sufficiently Also used in high pressure and speed applications.	Comprises primary and secondary (unloaded) seal stacks separated by a lantern ring. A Mechanical Lubricator injects low pressure oil into the Lantern Ring to lubricate the seals.	Mineral oil is injected into the lantern ring chamber. Exploiting surface imperfections oil migrates along the plunger. During the suction stroke the packing relaxes and lubricant is drawn into contacting surfaces.
Barrier Fluid	53	RESTRICTS fugitive emissions of toxic media.	Comprises primary, secondary (loaded) and tertiary (unloaded) seal stacks separated by lantern rings. Barrier fluid is circulated through the first lantern ring at a higher pressure than discharge. Barrier fluid will be compatible with the pumped media.	Barrier fluid injection pressure is higher than the discharge stroke. Consequently barrier fluid migrates across the seals towards the front of the stuffing box rather than the rear, thus blocking media escape. Packing condition is critical to this process.
Sealed Rod Box	-	BLOCKS fugitive emissions of toxic media.	The Distance Piece Chamber (containing the stuffing boxes) features a solid metal cover. A gastight gasket with 'O' rings and Flexiseals prevent any media escape to atmosphere. PSV, drain and nitrogen purge connections are provided. Any accumulated fluid leakage is detected by level switch	By sealing the Distance Piece Chamber with static seals ALL gaseous and fluid emissions that occur from the stuffing boxes are fully contained. Any fluid leakage is safely collected and safely piped to plant disposal. A Nitrogen purge facility removes toxic media prior to maintenance.
Return to Suction	13	Directs main leakage to suction where fugitive emissions are of no concern. Also used to feed lubrication to primary seals.	Comprises primary and secondary (unloaded) seal stacks separated by a Lantern Ring. Any leakage escaping the primary seal returns back to suction via the Lantern Ring. A check valve prevents back flow.	Any leakage that migrates past the primary seal stack collects in the lantern ring chamber. As the leakage pressure builds up it relieves into the suction line.

Seal Plans

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API674 reciprocating pumps do not use seal plans in the same sense as centrifugal products

BUT…

There are some parallels with recognised API 682 seal plans. See table

Title	Similar API682 Plan	Application	Construction	How it works
Packing Monitoring	65	Used where packing integrity is critical to reduce emissions. For predictive maintenance in remote applications and/or trigger safe shutdown	Comprises a primary and secondary (unloaded) seal stacks separated by a Lantern Ring. Any leakage escaping the primary seal enters the Lantern Ring and is directed to a drain line. Instruments in this line monitor/report the leakage flow rate.	Should the packing leakage flow rate increase beyond an acceptable level an alert is triggered to indicate that the primary seals are worn and require replacement.
External Flush	32	Media may crystallise where it leaks from the stuffing box.	Comprises primary and secondary (unloaded) seal stacks separated by a Lantern Ring. Clean (plant sourced) media is directed through the Lantern Ring to flush the Stuffing Box, the system includes inlet and discharge connections.	Clean media (normally non saline water) is injected into the Lantern Ring chamber with a high flow rate. Any media migrating past the primary seals is diluted and carried to the discharge of the flush.
Seal Heating/Cooling	-	Cooling: Protects seals in high temperature applications. Reduces cavitation risk of near gas media. Heating: Protects seals in cryogenic applications. Reduces risk of media solidifying.	Comprises a sleeve installed around the stuffing boxes with galleries to accommodate heating/cooling fluid. The system includes Inlet and discharge connections only. External closed loop system and/or heat exchanger are excluded.	Heating/cooling fluid is introduced into the sleeve with a certain flow rate to provide the appropriate heat transfer.
Discharge Flush (piped externally)	11	Used to decrease seal leakage.	Comprises primary and secondary (unloaded) seal stack separated by a Lantern Ring. External piping directs a small amount of discharge media to the Lantern Ring.	Use of primary and secondary seals reduces leakage. The flush from discharge provides extra lubrication and cooling to the secondary seals increasing reliability.
Discharge Flush (Internal galleries)	01	As above but internal galleries easier to heat in cold ambient temperature conditions.	Comprises primary and secondary (unloaded) seal stack separated by a Lantern Ring. Internal galleries direct a small amount of discharge media to the Lantern Ring.	Same as above.

Advantages of the RDP

Meets API 674 (ISO13710) Latest 3rd edition - One of first Pumps to do so

Simple configurable design

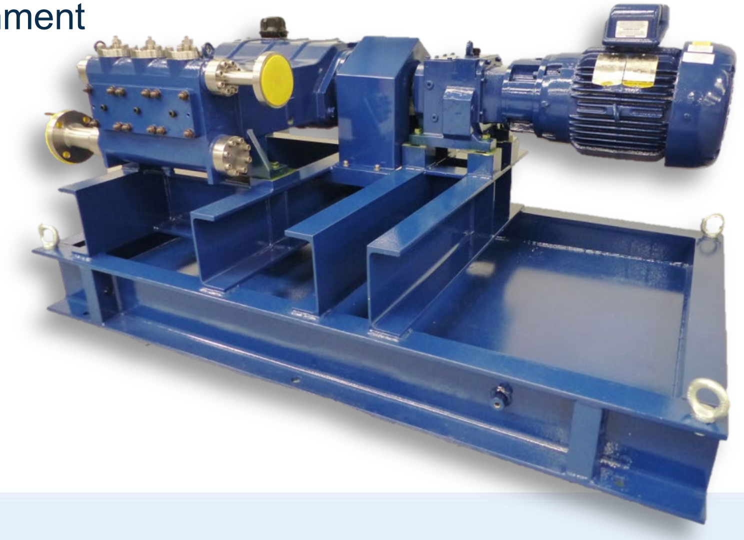
ATEX Compliance – Ex c (constructional safety) Ex cb (control of ignition sources)

Excellent noise characteristics

- Less than 85 dB (A) can be achieved

Low cost of ownership

- In situ servicing of major parts without disturbing plant pipework
- Extended life – Greater wear allowances offer refurbishment
- Extended service intervals for all wear parts



Can meet diverse Oil Industry specifications

- NACE MR01-75, NORSOK, Shell ES135,
  GOST R, GOST K, GGTN

Efficiency meets/exceeds API requirements

- 95% Volumetric
- 90% Mechanical

Section 2 Part 4- TESTING

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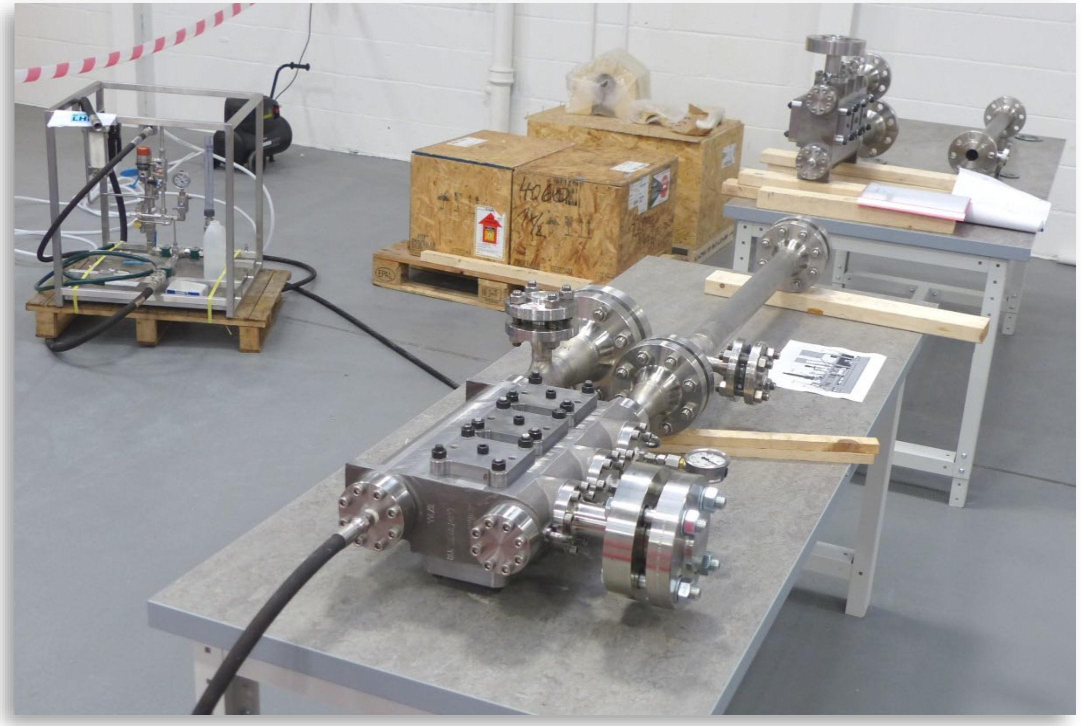
All the normal NDT

- Hydro test
- Mechanical running
- Performance
- Noise
- NPSH

Hydrostatic

1.5 x maximum pressure

Minimum of 30 minutes for API 674



Performance Test

Run at rated pressure and flow

Data taken at different times to ensure repeatability

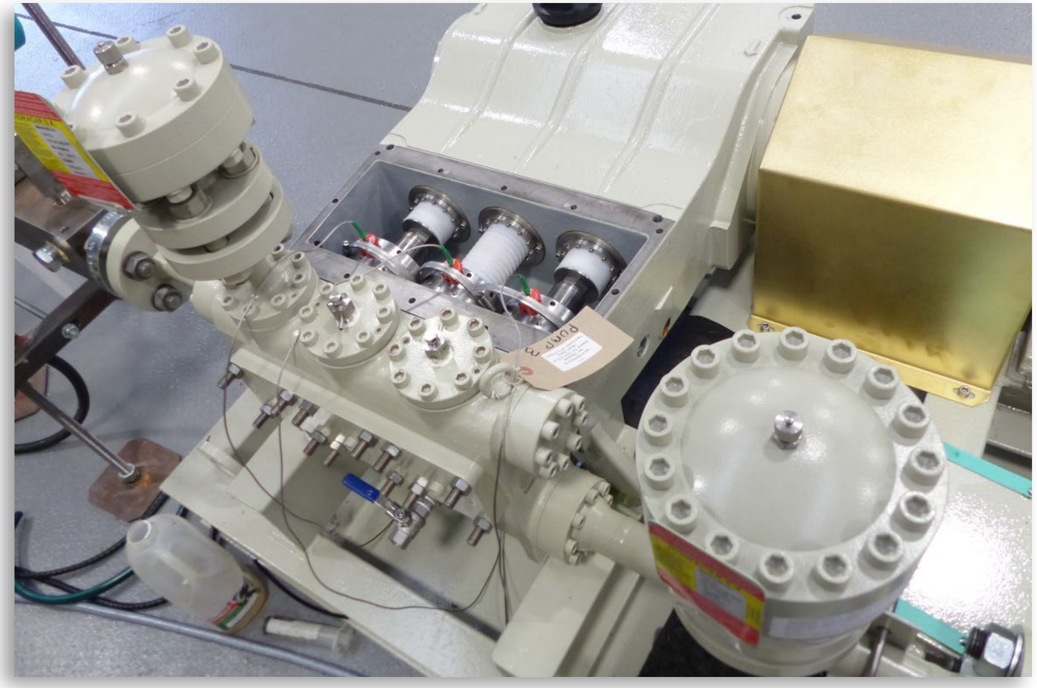
Parameter	Tolerance
Rated capacity	+≤3%, -0%
Rated power	+≤4%

Mechanical Running Test

Four hours at rated flow

Record temperatures:

- Stuffing box
- Power end bearings
- Gearbox



NPIP test

- Pressure plot upstream of any device used to improve inlet flow (pulsation dampener) and compared with the Pv of pumped fluid.

- Acceptance criteria:
  1. pressure spikes with peaks < 300% of average inlet pressure
     OR
  2. pressure spikes with peaks < 110% Pv

NPSH test

- Reduce system NPSHA until 3% drop in flow is seen

- This point defines the NPSHR of the pump

NOTE : Only one of the two tests is required.

RDP 70 Pump on Test

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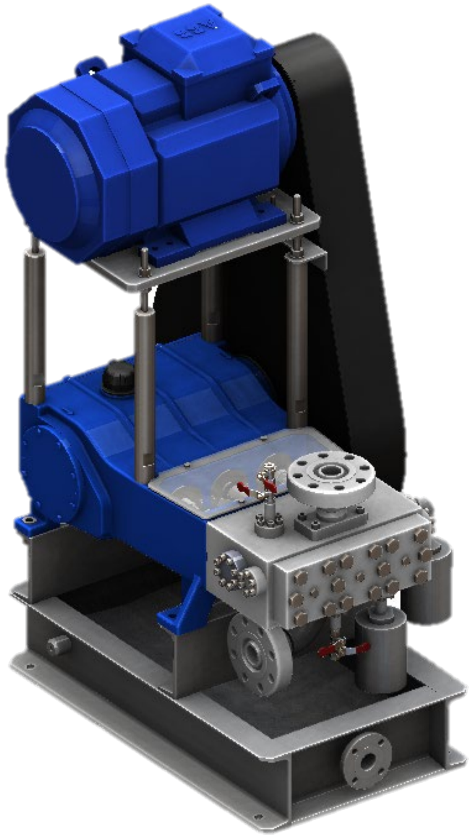
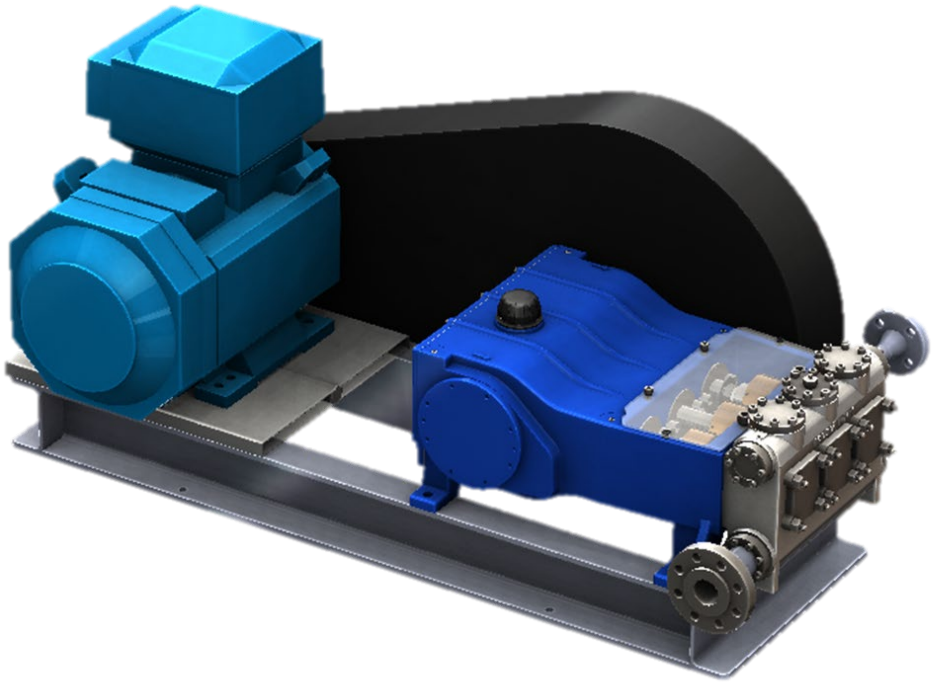
Section 2 Part 5- PACKAGE OPTIONS AND AUXILIARIES

Package Options

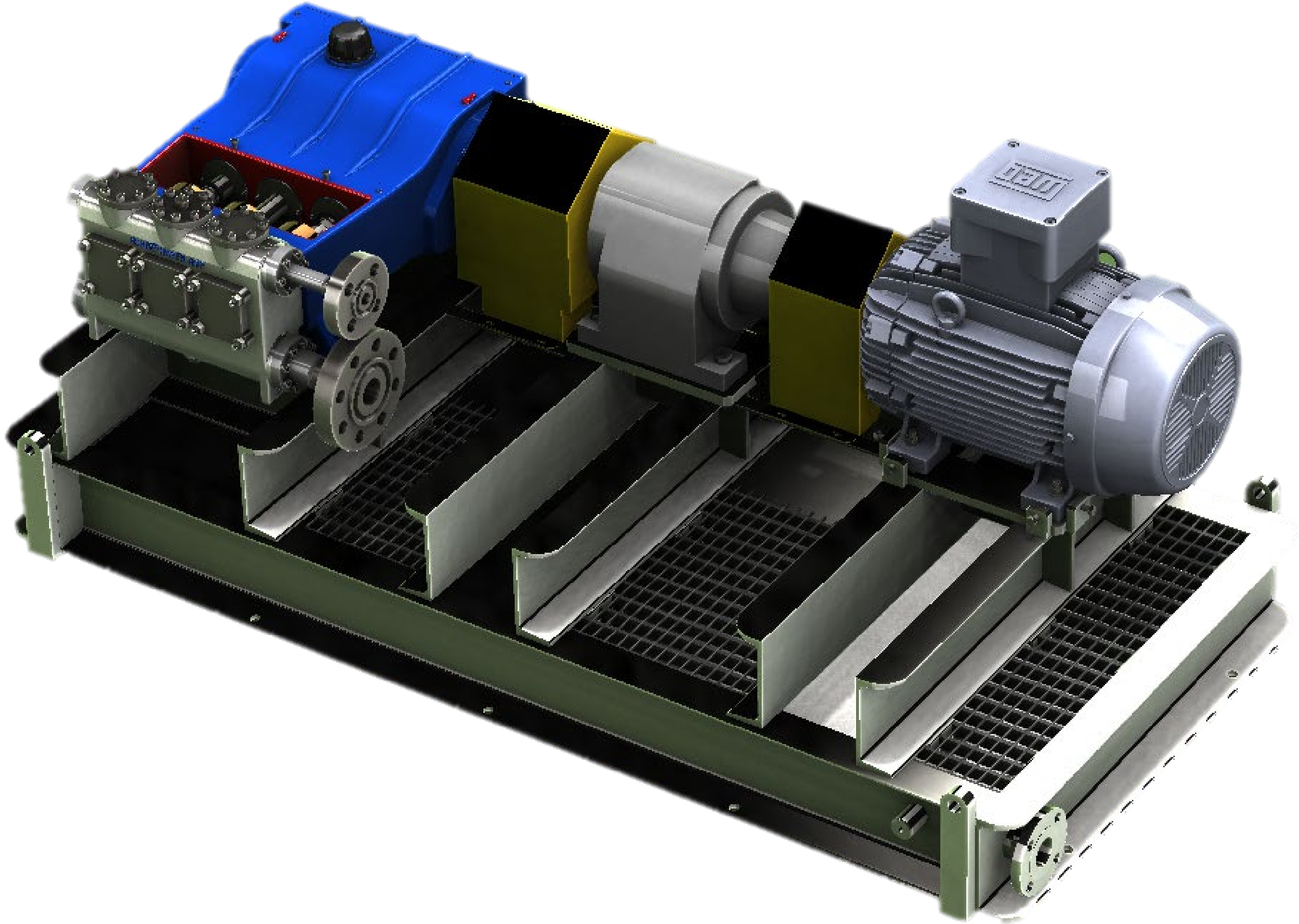
- **Transmission**
  - Gear box
  - Drive belt
  - Hydraulic
- **Motor**
  - Electric
  - Diesel
  - Petrol
  - Hydraulic
  - Turbine
- **Drives**
  - Variable Speed Drive (VFD)
  - Soft Start
- **Dampeners / PSV**
  - Loose
  - Fitted
- **Transmission Guard**
  - Material Selection
- **Transmission Coupling**
  - Close coupled
  - Spacer
  - Direct
- **Base Frame**
  - Jacking pads
  - Grouting
  - Drip tray
  - Grating
  - Earth bonding
- **ATEX**
  - Ex c
  - Ec cb
- **Monitoring equipment**

Belt Drive

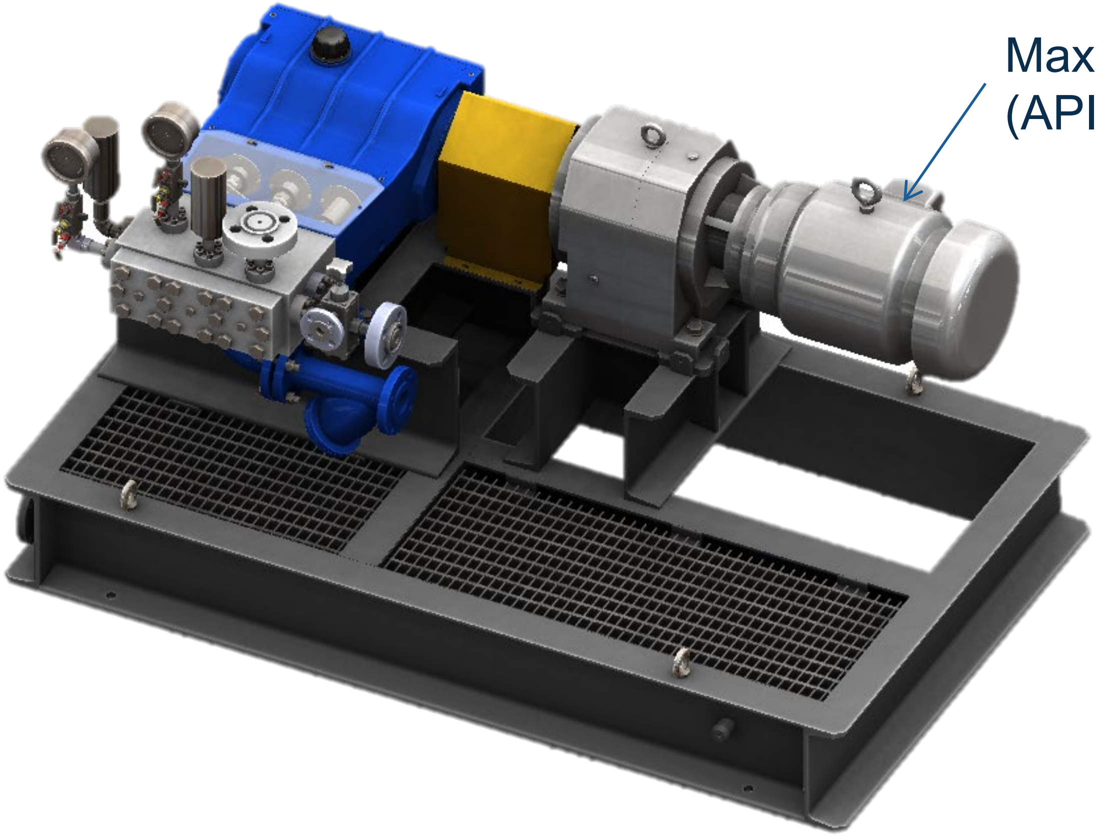




Gearbox Drive

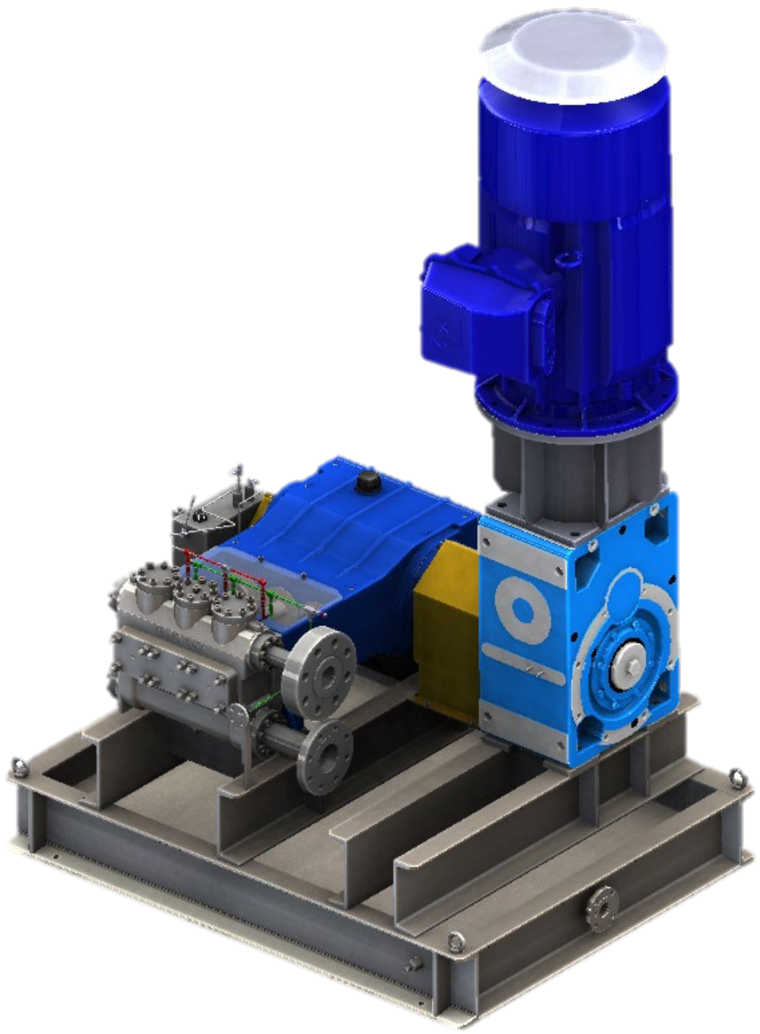


Gearbox Direct Drive

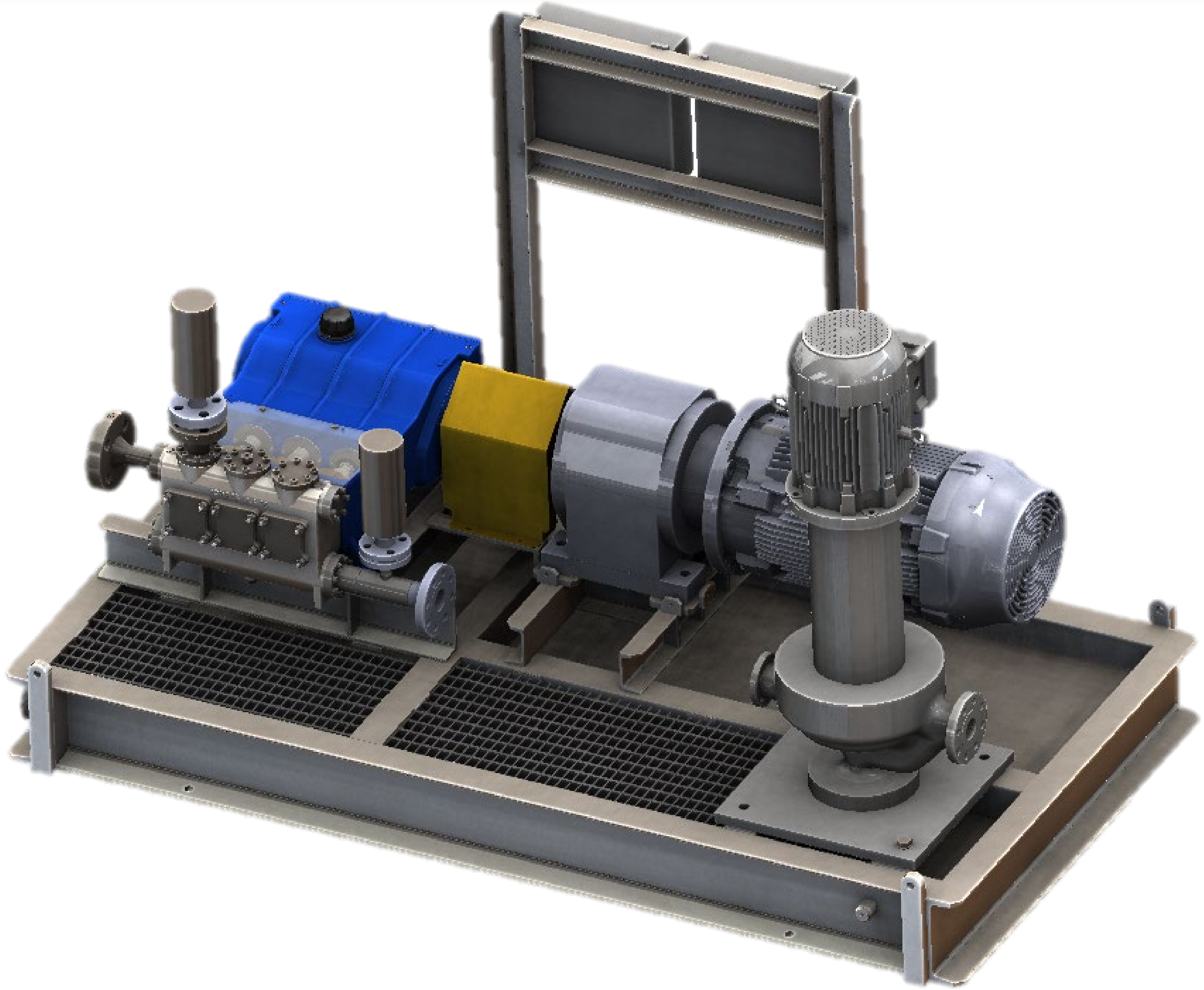


Max 18kW
(API 674 7.1.4)

Gearbox Vertical Drive



Booster Pump on Skid



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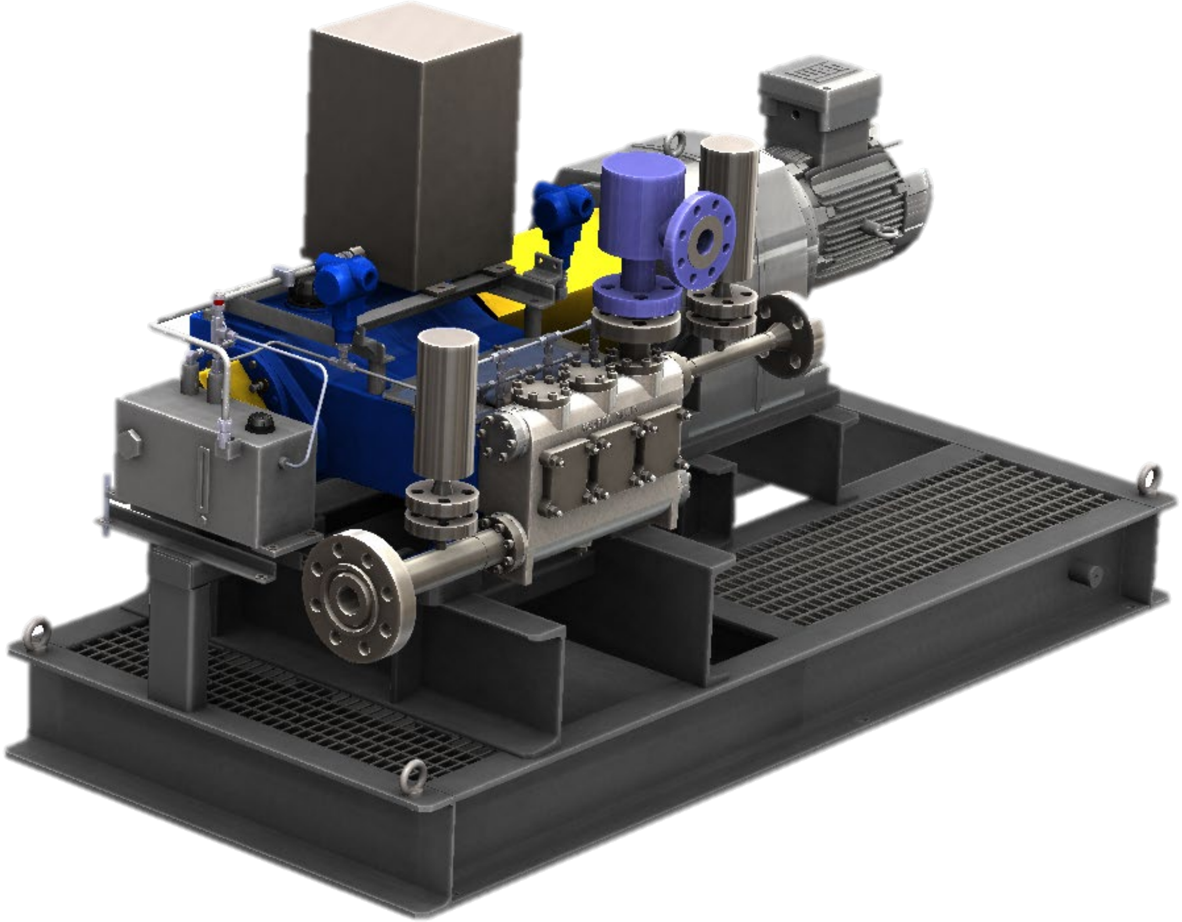
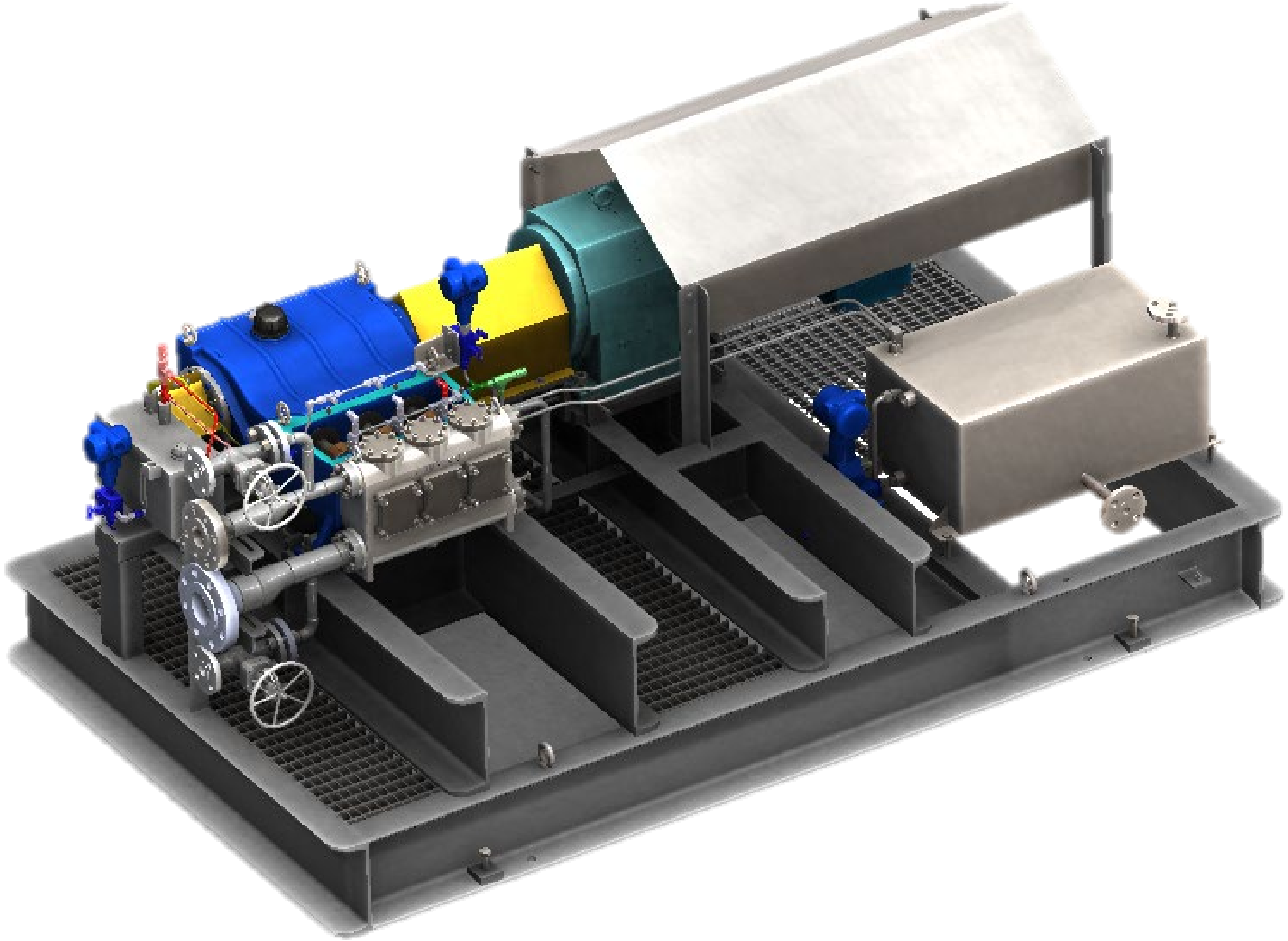


Package options

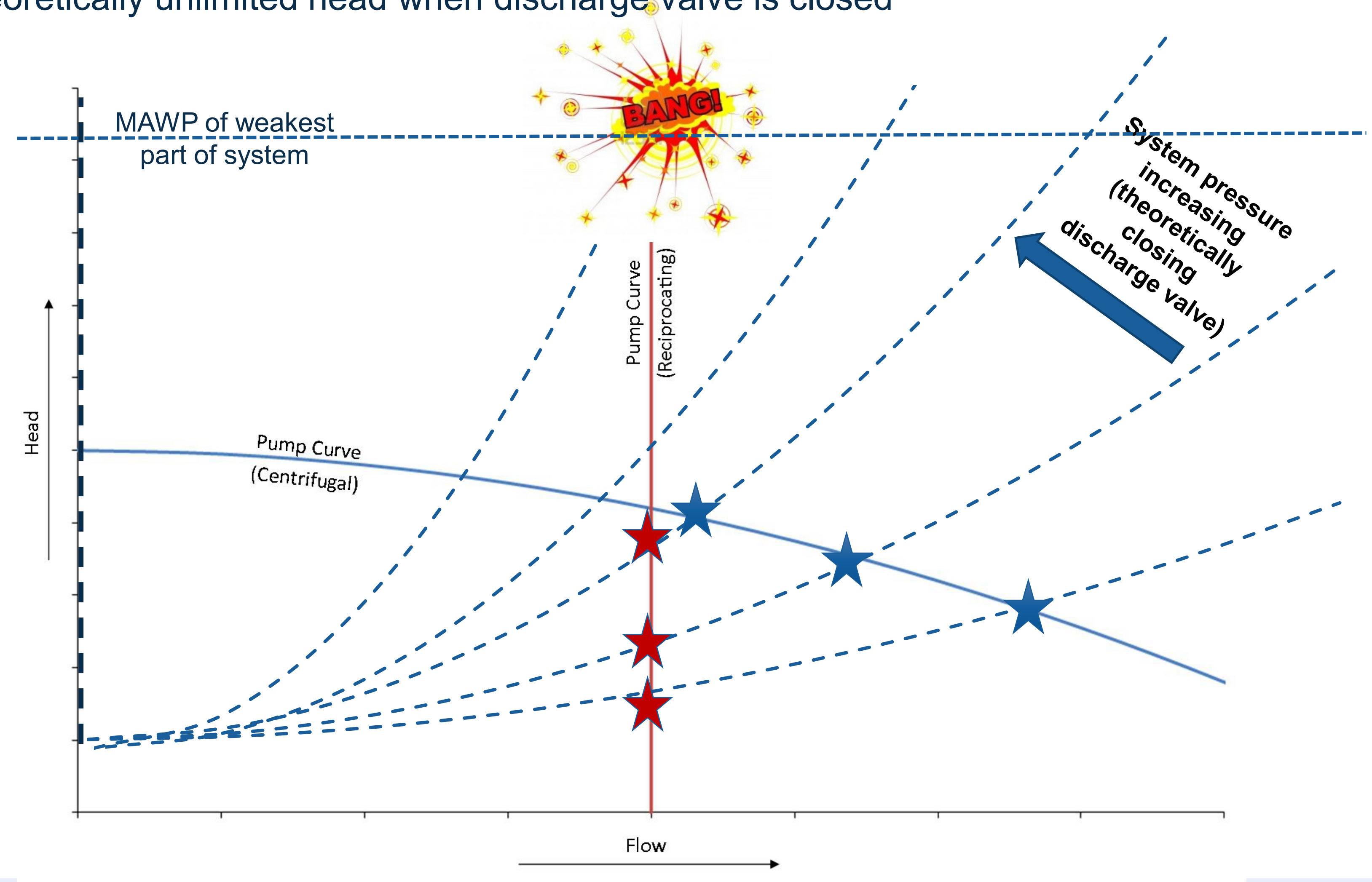


AUXILIARIES

Pressure Safety

REMEMBER THIS ... ?

- Theoretically unlimited head when discharge valve is closed



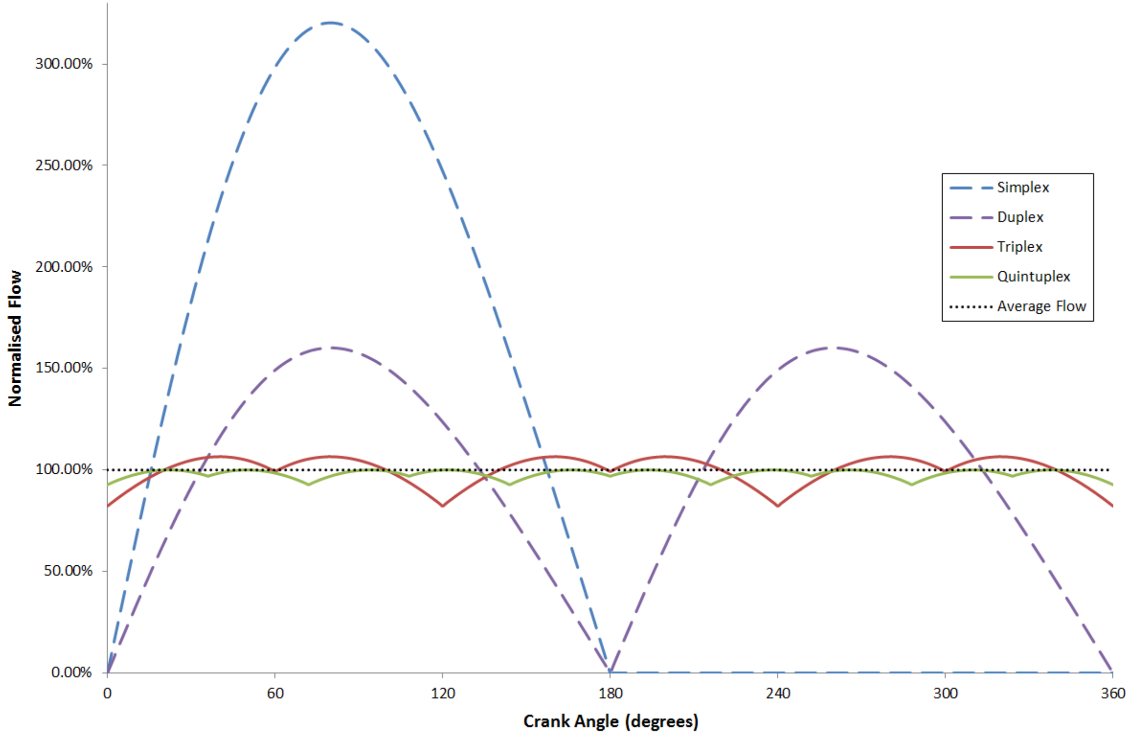
PSV

- Mandatory for reciprocating pumps: pressure spikes
- Fast response
- Must be closest thing to pump without any restrictions
- Can be mounted to pump head or in discharge line
- API 520/526 may be applicable
- Line between PSV and pump must not be prone to blockage
- Relief line should have little to no back pressure in the ideal case
- Relief to atmosphere or supply tank above liquid line
- Relief line should not go back to suction line
- 3 basic types: spring loaded, bellow and pilot – depending on back pressure

Pulsation Control

Pulsation Control

- Due to the nature of reciprocating pump action, flow pulses (unlike a centrifugal pump)
- The result is pulsations which are of different forms depending on number of plungers



Pulsation Dampening – Why?

- Process
  - Pressure pulsations in the process line may be undesirable for the application
- NPSH
  - In low NPSH applications a pressure drop during the suction cycle may cause cavitation
- Acceleration Head (Ha)
  - Reduces energy losses caused by Ha within the piping system.
- Structural
  - Mechanical stresses on pipework and infrastructure undesirable
- Booster Duty
  - Where the reciprocating pump is being boosted by a centrifugal pump, variations in suction flow/pressure are undesirable
- Noise Generation

Dampeners

- Second closest item to pump
- Recommended maximum distance from pump = 1m
- Can be mounted on pump head
- Vertical / horizontal orientation (depending on design)

Types Of Dampener

Bladder Type

Stores excess pressure/flow and expels when needed

- Small: inexpensive
- Moveable parts: maintenance

Acoustic Type

Impedes pressure waves from traversing through system

- Big: Expensive
- No moving parts: little maintenance

Pulsation Limits

Pressure limits set by:

- Design approach 1 – General rules from API
- Design approach 2 – Acoustical simulation

Expensive!

- The customer might actually specify a set of pulsation limits themselves

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AUXILIARY LAYOUT

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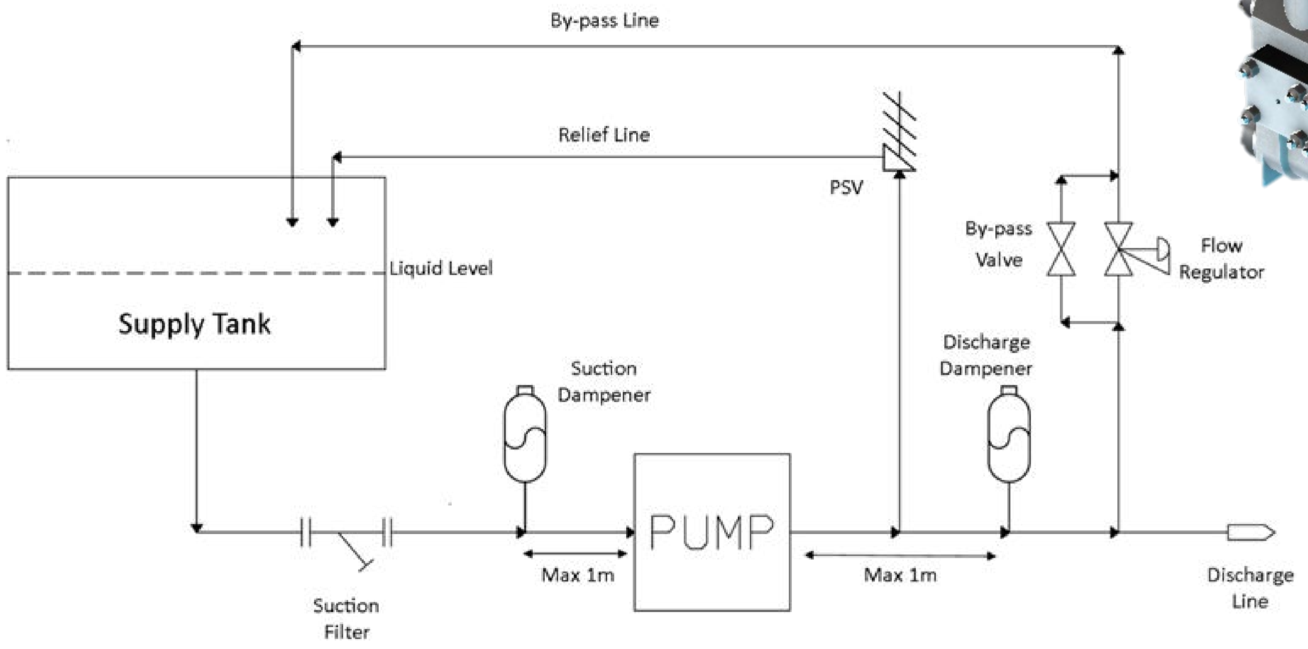

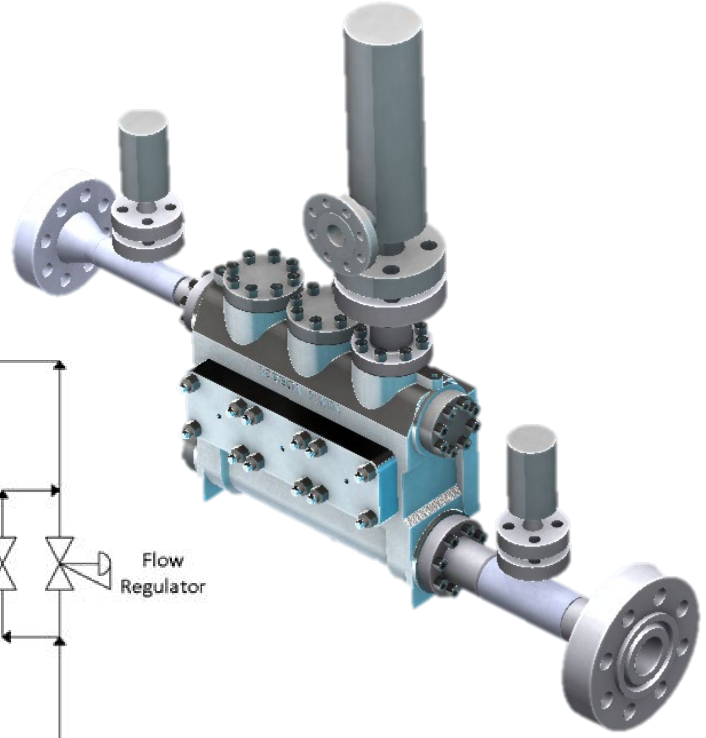

Suction Strainer / Filter

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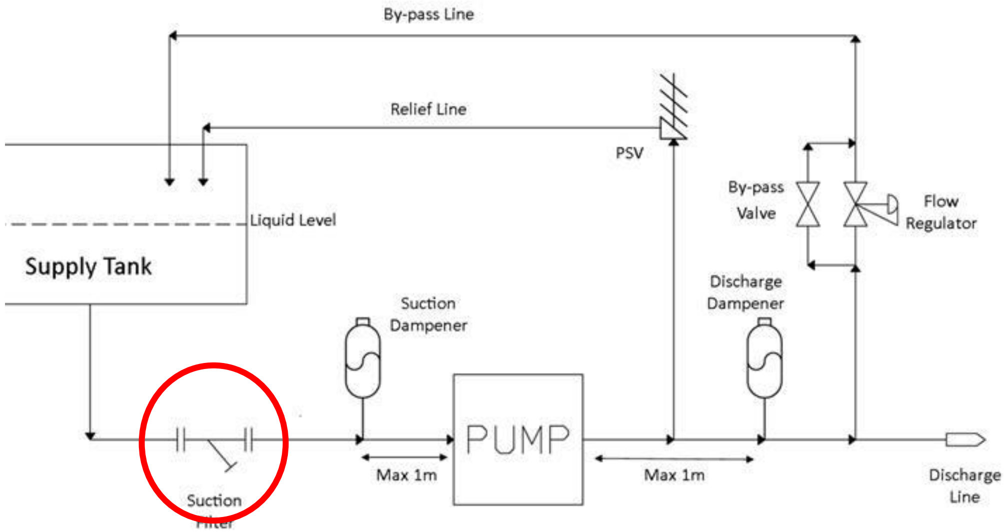
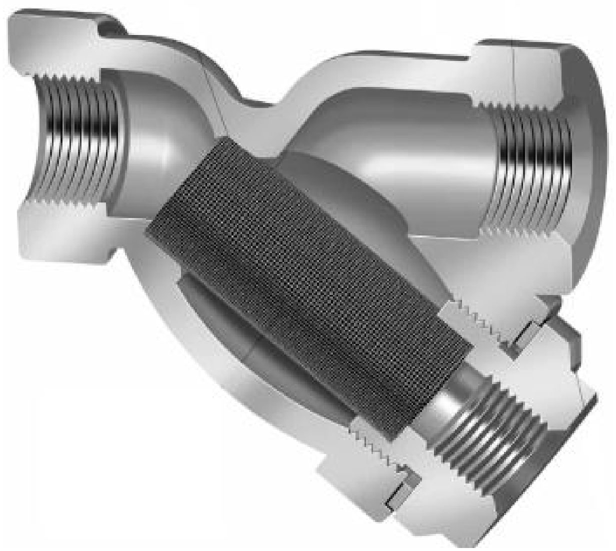
- Use not recommended
- Reduces NPSH and could block => cavitation/ dry running
- However, might be necessary to protect pump from excessive solid content
- Choose coarsest mesh viable
- Ideal to include differential pressure switch over strainer





Project name: Glycol Circulation Pumps

Project number: 387400022

Pump Model	RDPL 50/40 HC
Pump Capacity (in m^3/h)	2.38
Discharge Pressure (in bar.g)	80
Power (in kW)	7.2
End-User	Frames BV for Shell UK
Country where it'll be installed	UK North Sea
Market	Oil & Gas
What will it pump?	Lean Glycol

Project name: TEG Circulation Pumps

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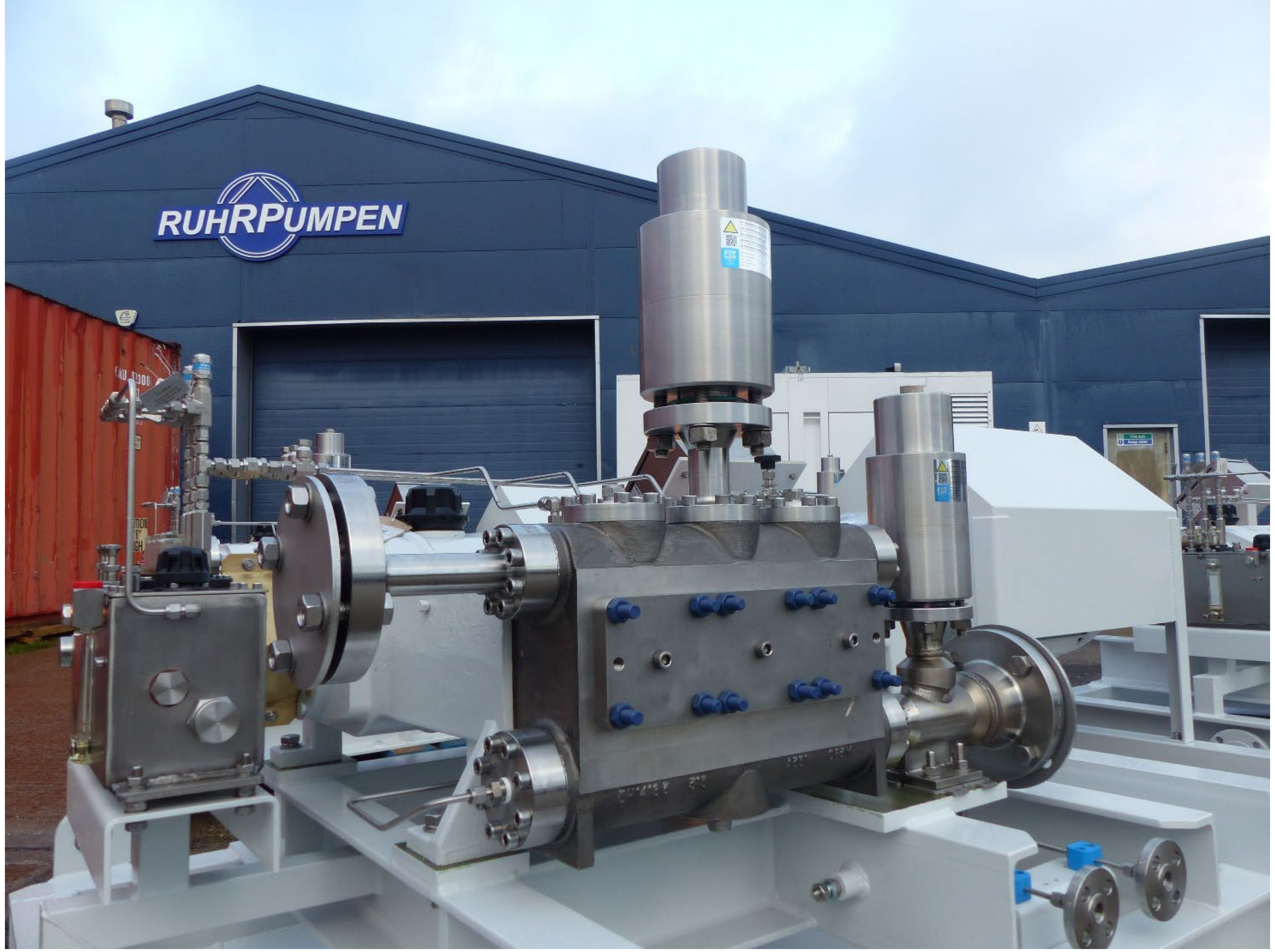
Project number: 387400027

Pump Model	RDP 70/49 HC
Pump Capacity (in m³/h)	5.3
Discharge Pressure (in bar.g)	57
Power (in kW)	9.83
End-User	Oman Oil Company
Country where it'll be installed	Oman
Market	Oil & Gas
What will it pump?	TEG



Project name: Degassed Produced Water

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Project number: 387400029

Pump Model	RDPL 200/96 HP
Pump Capacity (in m^3/h)	44
Discharge Pressure (in bar.g)	231
Power (in kW)	312
End-User	Armon for PEMEX
Country where it'll be installed	FPSO Blue Eagle (Gulf of Campeche)
Market	Oil & Gas
What will it pump?	Degassed Produced Water

This was a challenging pump with stringent DNVGL requirements successfully achieved by RP UK Ltd

Project name: Glycol Circulation pumps

Project number: **107400013**

Pump Model	RDP 70/55 HC
Pump Capacity (in m^3/h)	9.2
Discharge Pressure (in bar.g)	103
Power (in kW)	30
End-User	Fortune Eng - Adma-Opco
Country where it'll be installed	Off shore Platform (Umm Shaif – Abu Dhabi)
Market	Oil & Gas
What will it pump?	Glycol

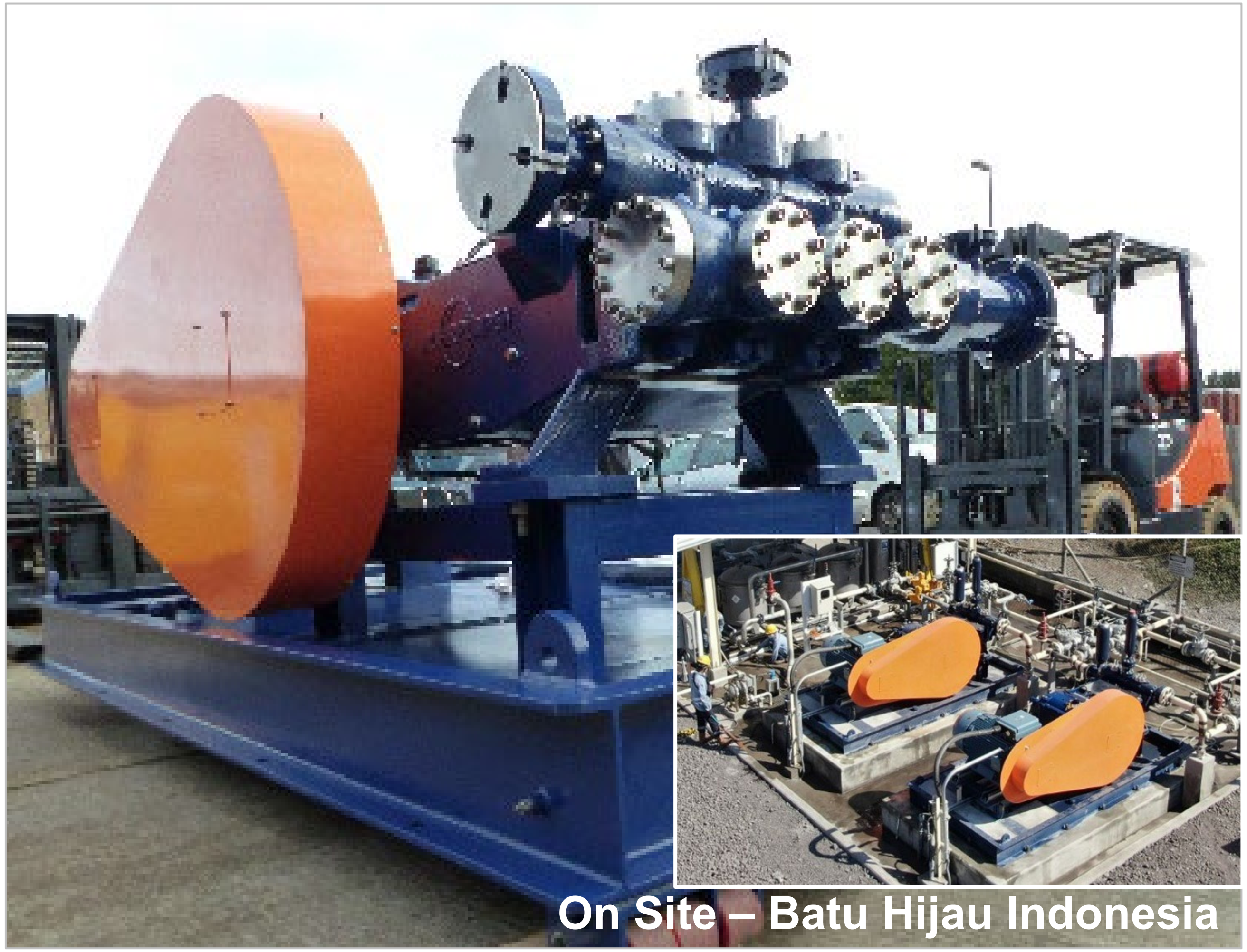
Replacements for an old installation in the UAE, our new RDP pumps had to fit within a very confined space. For that reason the design of the pump packages had to be very compact. Due to the platform location Piping Vibration was a concern so dampeners have been carefully selected following a full acoustical analysis to API 674 design approach 2.

Project name: Diesel Booster Pump

Project number: 387400035

Pump Model	RDPL 150-94 HC
Pump Capacity (m^3/h)	50
Discharge Pressure (bar.g)	97
Power (kW)	Pump 132, Motor 250
End-User	PT Amman Mineral
Country where it'll be installed	Indonesia
Market	Mining
What will it pump?	Bio Diesel, FAME

Proud to support green energy projects around the world, Ruhrpumpen UK are pleased that this RDP 150 pump, designed and built in only 14 weeks, is destined for a Bio Diesel plant in South East Asia. The first of two units, this pump is powered by a 250kW Motor via a V Belt Transmission. Flow will be precisely controlled via a VSD to regulate pump speed.



On Site – Batu Hijau Indonesia

Project name: HCB & Process Water Pump

Project number: 1574000004

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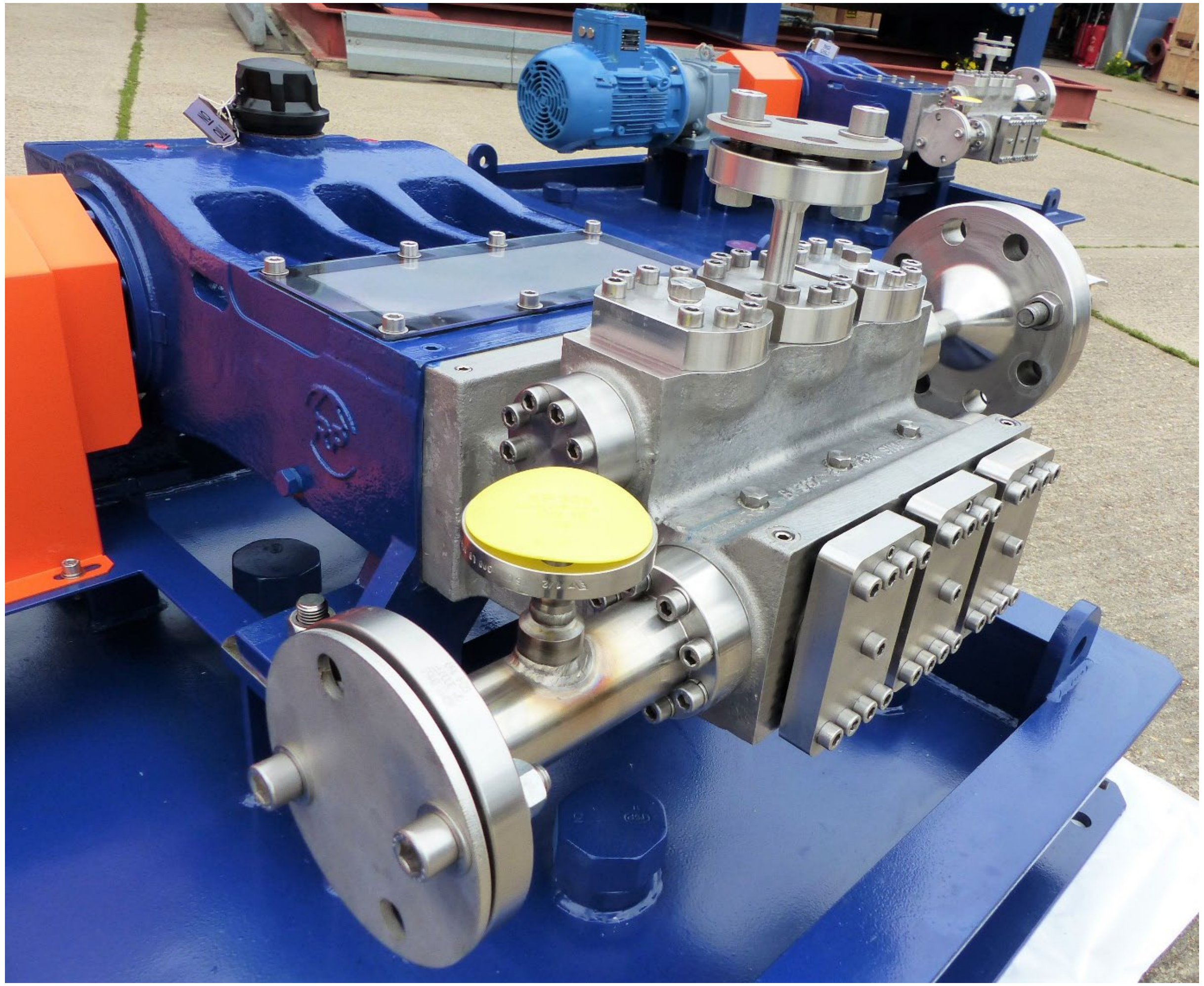
Pump Model	RDPL 50-30 HC
Pump Capacity (m^3/h)	1
Discharge Pressure (bar.g)	96.5
Power (kW)	Pump 2.25, Motor 5
End-User	YPFB Chaco S.A.
Country where it'll be installed	Bolivia
Market	Oil & Gas
What will it pump?	HC Condensate & Water

This RDP 50 unit features a special valve design and was constructed to run as slow as possible (<140 rpm) to meet the challenges posed by the media. Light Hydrocarbons require a particularly low NPSH and can be prone to cavitation. By careful selection and design this unit presents an impressively low NPSHr of 0.7m. Reliability, quality and long service life are key aspects of all Ruhrpumpen UK products and this pump is a perfect example of our philosophy



Project name: Petroleum Liquids Pump

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Project number: 157400003

Pump Model	RDP 150/80 HC
Capacity (m^3/h)	21.2
Discharge Pressure (bar.g)	122.5
Power (kW)	Pump 93
End-User	YPFB
Global location	Bolivia
Market	Oil & Gas
What will it pump?	Diesel & Petroleum Liquid Gas

YPFB was trying to distribute no less than 5 light hydrocarbon products from a challenging high altitude mountainside location. The RDP 150 is the perfect choice and is forgiving of low NPSH applications. In this remote location power was unavailable so the pump features a 153kW hazardous area, CAT gas engine, coupled with a Voith Torque converter for the various speeds required by the different media. Installation is complete with a local control panel/PLC to operate and monitor the pump, torque converter and engine package.

Coming Attractions ☺

“Ten of the Best – Ten of the most important extracts from previous sessions revisited”

Thurs 9th June – 08.00 (UK BST (GMT+1)) (Eastern Hemisphere) &
17.00 (UK BST (GMT+1)) (Western Hemisphere)

We have now been presenting these Short Courses for a year and covered a huge amount of material!

Now is an appropriate time to revisit the previous sessions and extract some of the most important, most critical aspects that we have covered in them.

Some of you may have missed some of the sessions and/or would benefit from a refresher.

Future sessions : TBA