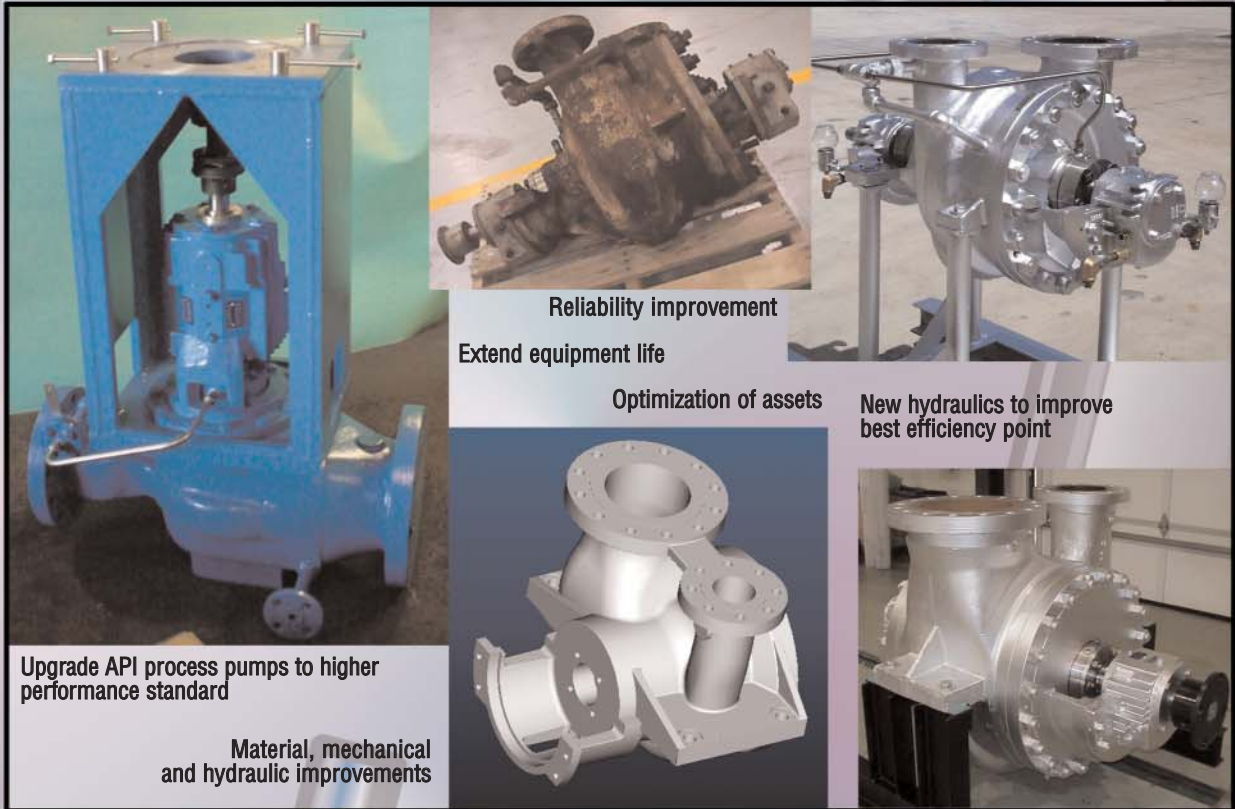




# ITT Upgrades Engineering

A collage of six images showing various industrial pumps and components. The top-left image shows a blue pump assembly. The top-middle image shows a worn, dark-colored pump. The top-right image shows a shiny, silver-colored pump. The bottom-left image shows a blue pump with a hand crank. The bottom-middle image shows a 3D CAD model of a pump component. The bottom-right image shows a silver-colored pump with a motor.

Reliability improvement  
Extend equipment life

Optimization of assets

New hydraulics to improve best efficiency point

Upgrade API process pumps to higher performance standard

Material, mechanical and hydraulic improvements

# Upgrades for Pre-10th Edition Pumps

Upgrade your older style API process pumps to today's high performance standard of API 10th edition. Lower your Total Cost of Ownership on the following pump systems upgrades:

API Overhung Process Pump  
API Vertical In-Line Bearing Pump  
API Between Bearing Process Pump

Upgrades may involve hydraulic modifications and/or bearing bracket and rotor conversions. PRO Services Centers are experienced with all

manufacturers including: Pacific, Worthington, Byron Jackson, United Centrifugal, Wilson Snyder, Sulzer, Peerless, Bingham, Union and Goulds Pumps.

PRO Services Centers provide a thorough AS FOUND report of components and a complete workscope for repairs with a firm price. Also provided is a complete owner's manual at shipment that includes cross sectional drawings of the upgrade, a spare parts sheet, material certifications and an AS SHIPPED report.

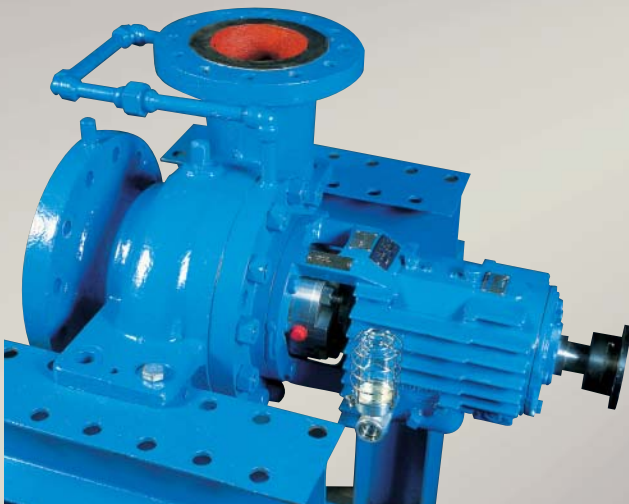
## Consider an API Overhung Process Pump Goulds 10th Edition Retrofit.

*If your API Overhung Process pump has these considerations:*

- Pump has high maintenance (2 or more repairs per year).
- Pump has high vibration
- Pump has chronic bearing or mechanical seal problems
- Current pump's seal chamber dimensions do not allow for installation of a 10th edition seal required to meet LDAR/HRVOC requirements.
- Cast Iron bearing housings need to be replaced.

*Try a Goulds 10th Edition Retrofit with these benefits:*

- Seal Chamber can be modified to meet API 610 10th Edition requirements.
- No Modifications to baseplate or piping are required. **Driver does "NOT" have to be moved.**
- Improved Back to Back Bearing Arrangement.
- New heavy duty cast steel bearing housing.
- Maximized parts interchangeability with Goulds standard line of pumps.
- New product warranty is applied to all retrofits.
- Metallurgy and hydraulics can be improved at same time.
- 90% of the time L3/D4 ratio can be reduced 30-40% resulting in less shaft deflection and longer seal and bearing life.
- Significantly shorter installation & lead-time versus a new pump, one to six weeks depending on scope.

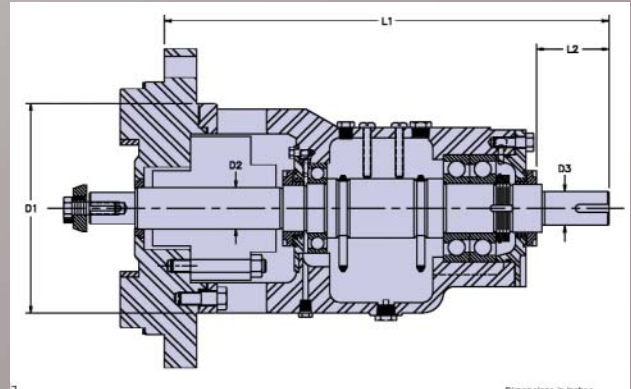


### Applies to all manufacturers

ITT Goulds Pumps	Pacific
Flowserve	IDP
Sulzer-Bingham	Worthington
Union	Byron Jackson
United	Wilson Snyder
Peerless	

# Goulds Frames and API 610 Seal Chamber Sizes

- Cast Steel Finned Bearing Frame “Seven Goulds Frame sizes available for a wider range of adaptability”
- Improved bearing arrangement (back to back)
- Improved seal chamber design allows for API 682 cartridge or lesser seals to be utilized – six API seal chamber sizes available.
- No Modifications to baseplate or piping are required.
- Lower  $L^3/D^4$  ratios in most cases
- Improved reliability —> “Reduction of Total Cost of Ownership of Pumping Systems”



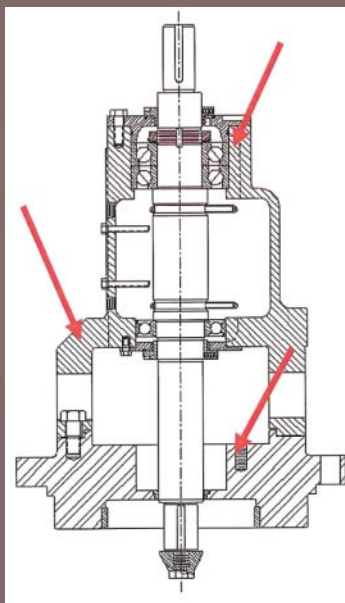
Item	Description	SSA	SA	SX	MA	MX/LAA	LX	XLX
L1**	Powerend length	14.25	18.63	21.13	20.95	23.41	26.85	27.16
L2**	Shaft Extension at coupling end	2.00	3.19	3.79	4.10	4.48	5.96	6.66
D1	Bearing Frame Diameter	7.25	8.75	10.00	11.38	13.00	14.75	18.75
D2	Shaft diameter at mechanical seal	1.188	1.575	1.969	1.969	2.362	2.756	3.150
D3	Shaft diameter at coupling	1.250	1.375	1.625	1.625	1.625	2.125	2.875
	$L^3/D^4$ (Typical)	295	175	72	72	42	26	22
	Maximum Frame Speed (rpm)	3600	3600	4000	4000	4000	4000	2000
	Radial Bearing	6208	6210	6212	6211	6213	6215	6218
	Thrust Bearing	7308	7310	7312	7311	7312	7313	7317
		BECBM	BECBM	BECBM	BECBM	BECBM	BECBM	BECBM
	API 10th Standard Seal Chamber Size	2	3	4	4	5	6	7

\*\*These dimension are for the standard Goulds Model 3700-9 pumps and are to be used as reference only. Actual dimensions will vary to accommodate customer equipment.

## Vertical In-Line Bearing Process

*Goulds 10th Edition Retrofit with these benefits:*

- Cast Steel Finned Bearing Frame “7 Goulds Frame sizes available for a wider range of adaptability”
- Use same bearing frames as our OH2 horizontal retrofits.
- Improved seal chamber design allows for API 682 cartridge or lesser seals to be utilized – 6 API seal chamber sizes available.
- Improved bearing arrangement (back to back)
- Grease or Oil Mist lubrication only available



*Vertical In-Line Bearing Pump Retrofit*



Competitors 6x8-9 1-stage Vertical In-Line



Modified using a Goulds SX Standard Bearing Frame

# Goulds 10th Edition Between Bearings Retrofit

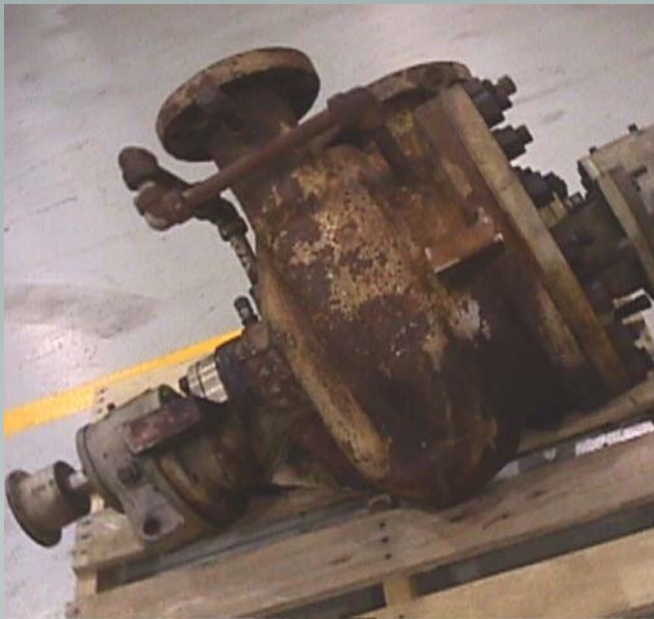
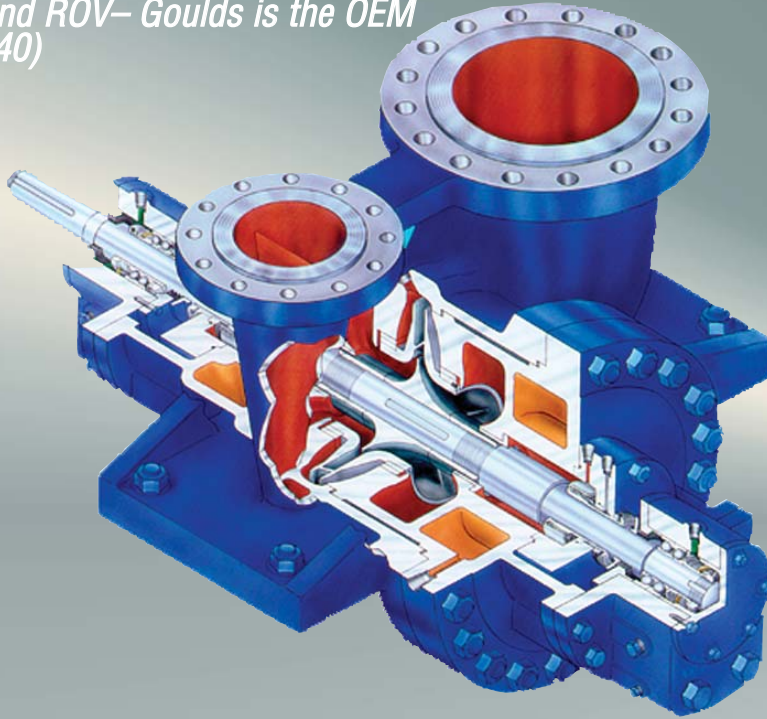
## Benefits

### ■ Casing and head modifications include:

1. Volute change to match hydraulics of new impeller if required
2. Improved seal chamber design to meet 10th edition standard

- New/Larger bearings utilizing Goulds Bearing Housings
- New Shaft designed to meet 10th edition standard
- New Wear Rings & Bushings
- All Original Outline Dimensions Maintained
- L3/D4 ratio is reduced 40-50%

*Pacific HVC and ROV– Goulds is the OEM (3620 and 3640)*

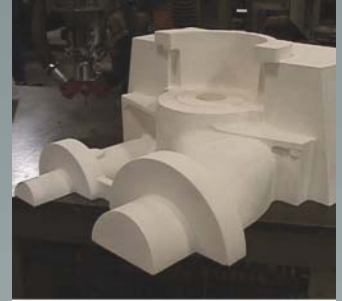
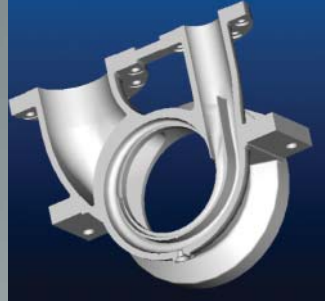
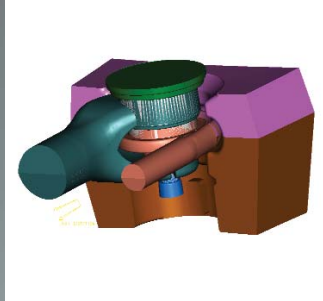


Note: Complete Pump Does “Not” Conform to 10th Edition Criteria”  
“Only Rotor, Seal Chamber and Bearing Housings”

# Custom Drop-in Replacement Pump

- Custom “Drop-In”
  - New custom pump to meet new operating condition.
  - It fits into the existing envelope of old pump.
  - No changes in piping and baseplate.
  - Meets customer’s API 10th Edition or any other spec.
- Infrastructure is proven: Upgrades, PRO Services Centers & ProCast.
- Use Goulds proven hydraulics and overall design.
- Existing pump can be kept as an emergency spare.

## Developing a Product (3D Model) – ProCast



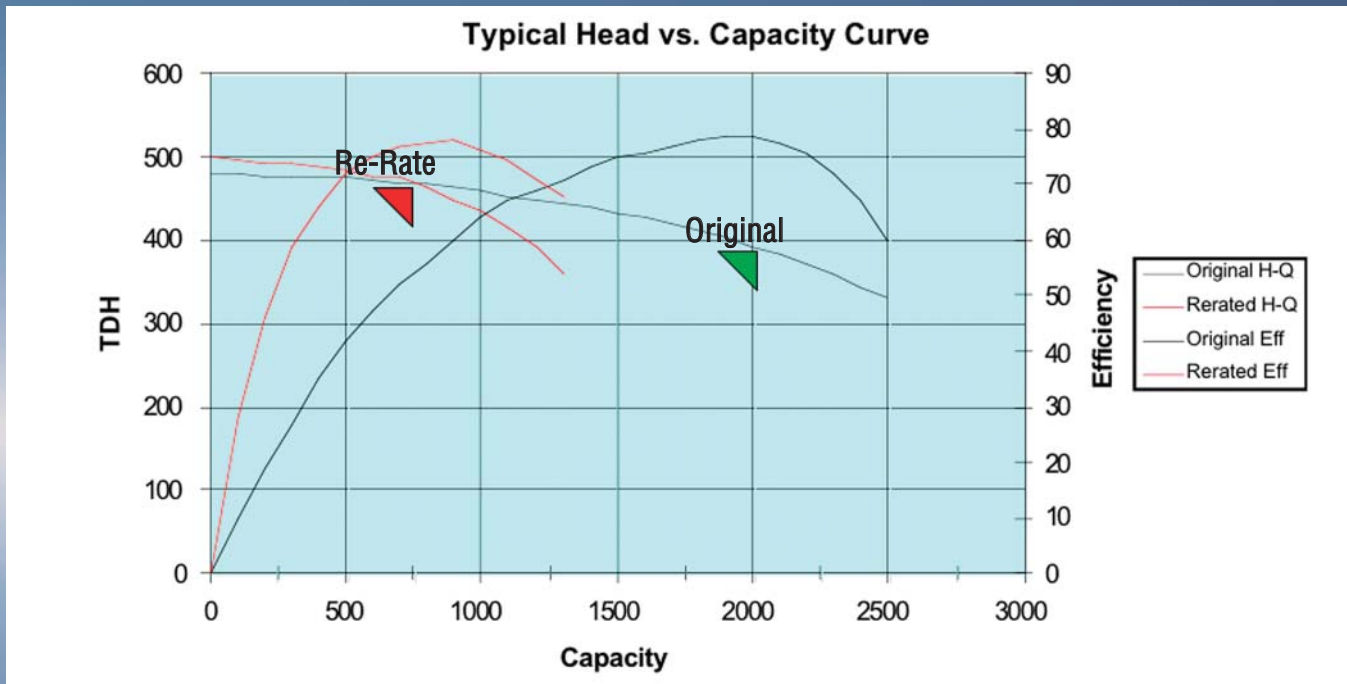
## Final Product in 13 Weeks (vs 26 Weeks for a new pump)



Note: Complete Pump Conforms to 10th Edition Criteria”

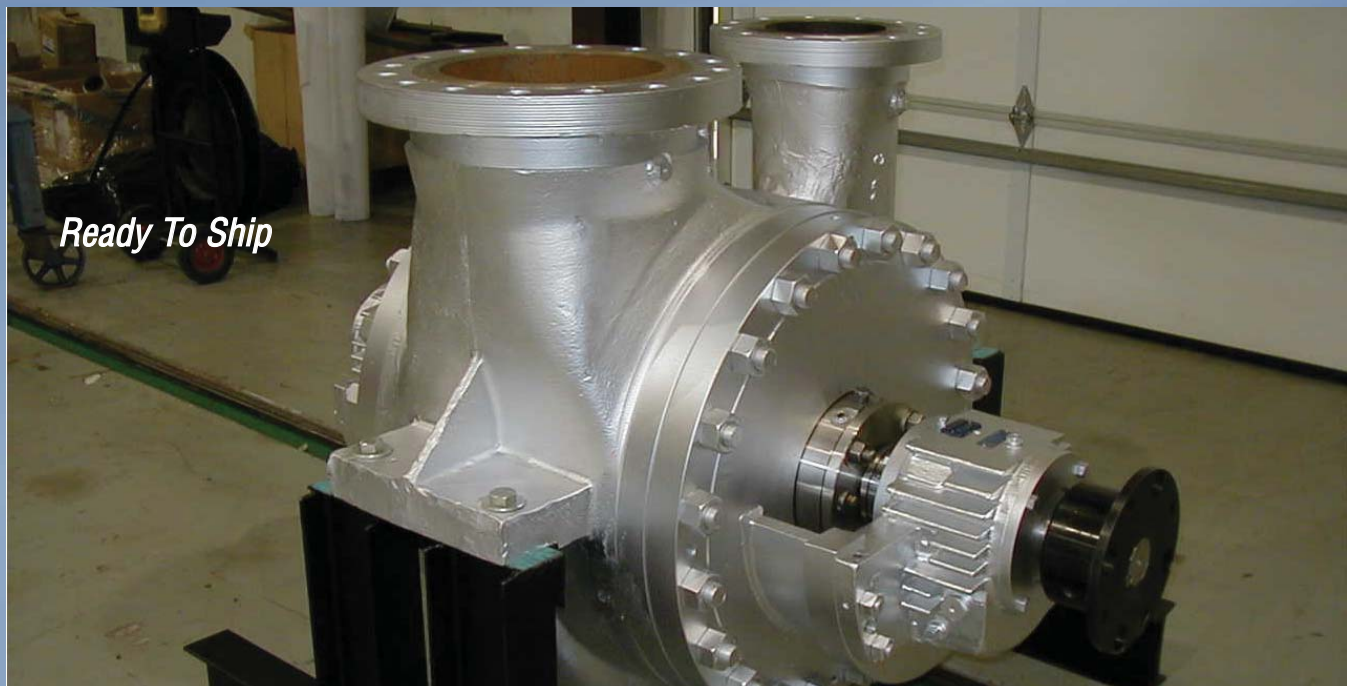
# Hydraulic Re-rate Modifications

Redesign the pump hydraulics to match process requirements



## Hydraulic Re-rate Benefits

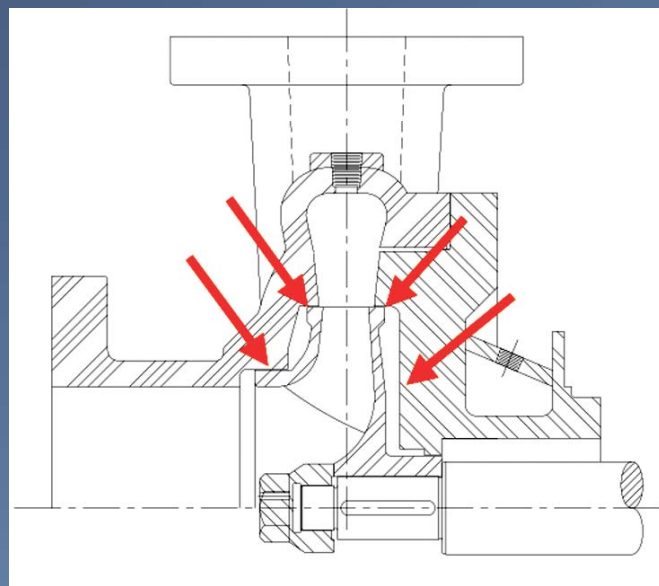
- Pump runs closer to BEP resulting in smoother running pump – less vibration, longer bearing and seal life (MTBR)
- Less energy wasted – lower electrical costs
- Can be performed to existing pump without requiring modifications to piping or baseplate
- Does not require the costs associated with new pump installation – piping, baseplate and foundation
- Hydraulic re-rates performed on OH2, BB1 & BB2 pumps
- Special focus markets include refining and pipeline
- Use Goulds proven hydraulics
- Fit in any API competitors pumps
- Upgrade pump to API 10th edition



# Slurry Pumps – “A” Gap and Metallurgy Upgrades

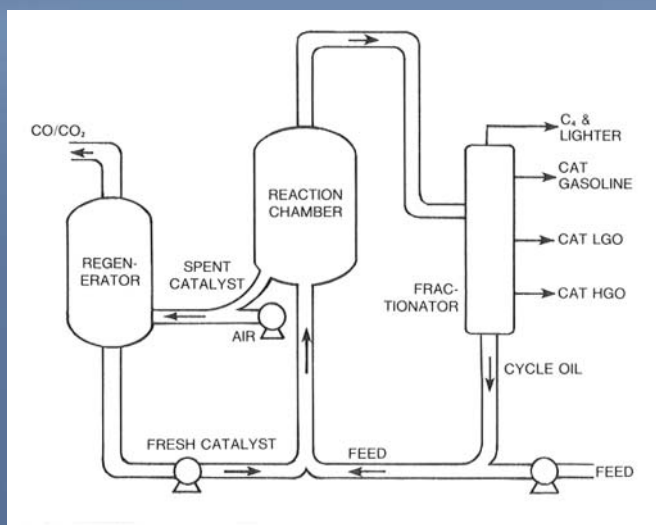
## Benefits of Performing an “A” Gap Modification and Metallurgy Upgrade

- Significantly increases the life of the pump and the mechanical seal.
- Designed specifically to slow down erosion damage by catalyst and abrasives. Greater MTBR (Mean Time Between Repair).
- Changes in the Metallurgy and Geometry improve the pumps performance and decrease downtime. An increase in performance reduces Energy Costs.



“A” Gap Modification

## Types of pumps to Target Erosive Service (Bottoms Pumps)



## Types of Metallurgy Upgrades

- Tungsten Carbide coat all wet areas on the case, cover and impeller.
- Stellite # 6 weld overlay all wet areas on the case and cover. Tungsten carbide coat the impeller.
- Boron Diffusion coat all wet areas on the case, impeller and cover.

# ***How PRO Services® and Upgrade Engineering can help our Customers with Major Projects and Plant Turnarounds.***

## ***Project Management***

- Job site survey for engineering and process development
- Secure long-lead items (castings, motors, special equipment...)
- Secure shop, engineering and field personnel
- Secure required insurance, transportation, and safety training
- Conduct staging of materials
- Conduct field removal of equipment
- Conduct field work such as welding, fabrication, and machining
- Conduct field installation and commissioning of equipment
- Conduct follow-up for software transition

## ***Project Types***

- LDAR/HRVOC
  - Highly Reactive Volatile Organic Compounds (HVROC)
  - HVROC corrections via Leak Detection and Repair (LDAR) projects
  - PRO Services has experience in LDAR/HRVOC projects by Upgrading pumps to fit current API Seal specifications
- Plant Turnarounds
- System Evaluation & Recommendations
- Pump Condition Monitoring and Assessment
- Baseplate Design
- ANSI Pump Upgrades
- Vertical Pump Hydraulic Re-rates and Re-bowl
- Vibration Analysis

***ITT Upgrades Engineering has the combined resources of PRO Services Worldwide Centers (ISO 9001:2000 certified) and Goulds Pumps Engineering and the project management expertise to provide Reliability Improvements through material, mechanical and hydraulics upgrades. Contact us to manage your improvement opportunity.***

**For more information call your nearest PRO Services Center.  
For Service: 800-335-6350 After Hours: 800-446-8537**

