



ACIDPIPING
TECHNOLOGY

www.acidpiping.com

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**Innovative
Solutions For
The Global
Sulfuric
Acid Industry**

- Quality Products
- Experience
- Service

APT EXPERIENCE

APT's Experience and Commitment to Quality Delivers the Most Cost-Effective Piping Systems Available

MONDI™ Piping Systems—Proven Performance

MONDI, a special alloy of ductile iron with unique metallurgy was developed to handle 92-99% sulfuric acid at temperatures up to 300° F (149° C), as well as oleum applications.

Acid Piping Technology's MONDI systems offer you unique improvements in:

- MONDI metallurgy
- Heavy wall thickness
- Fitting design
- Flange face finish
- Step Ring Fawn Gylon™ gasket

Superior Performance

These features result in superior piping systems that will provide 30 plus years of excellent service:

- Superior ductility eliminates the catastrophic failure and breakage that can occur with brittle gray cast iron.
- Pipe and fittings have durable heavy wall construction.
- Most patterns for fittings have been improved to eliminate chaplets.
- Special flange face finish has serrated spiral grooves with a pointed profile that bites into the gasket for a tight seal.

- APT's special step gasket is made of Fawn Gylon. It provides an excellent seal in the critical sealing area at the pipe inside diameter.



MONDI piping is used worldwide in recirculation systems for drying and absorbing towers

MONDI's Benefits Improve Plant Reliability

Proven Technology

MONDI has been the industry standard for reliable performance in sulfuric acid plants since 1983. APT has supplied over 900 MONDI systems in North America, South America, Australia, Africa and Asia since 1991.

Long Operating Life

Reduced maintenance with a service life up to four times the life of standard metallurgy ductile iron.

Operating Safety

Excellent ductility and durable construction provides safe, trouble-free operation.

Environmental

Special flange face finish and step ring gasket provides a tight leak-free seal at the pipe I.D. These Fawn Gylon step ring gaskets have excellent recovery to thermal cycling over years of operation and excellent resistance to hot concentrated acid.

Resistance to Concentration Changes

A tough sulfate film provides corrosion resistance when weaker acid is formed due to process upset or shutdown conditions.

Cost-Effective and Easy To Retrofit

APT's piping systems are the most economical systems providing very reliable performance. MONDI piping can be used to retrofit existing systems.

MONDI™ is a trademark of Monsanto Company. Meehanite™ is a trademark of Meehanite Worldwide. Gylon™ is a trademark of Garlock Sealing Technologies.

Acid Piping Technology Products include:

MONDI Flanged Piping

- Pipe Spools
- Fittings
- Special Bossed Fittings
- Sleeves and Nozzle Liners
- Tower Distributor Components
- Reducing Flanges
- Spacers
- Thermowells

Gaskets

- Step Ring

Tower Internals

- MONDI Distributors
- Troughs and Downcomers
- Spargers
- Drilled Pipes
- Ceramic Packing Saddles and Supports
- Aludur Beams
- Quartz Rock

Converter Internals

- Grids
- Division Plates
- Support Columns

Piping

- Pipe and Fittings
- Bolts
- Pipe Hangers
- PTFE Lined, 310 SS, Titanium

Valves and Instrumentation

- Valves
- Instrumentation
- Valve Actuation
- Gauge Filling
- Gas Duct Valves and Dampers
- Orifice Plates

APT RELIABILITY

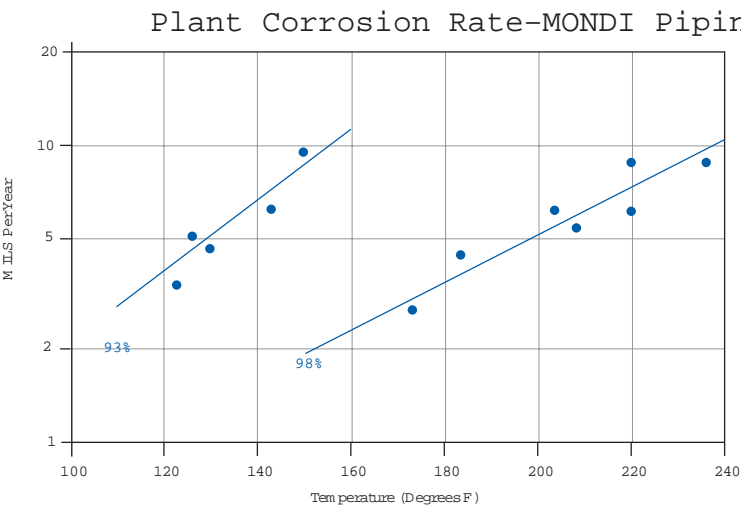
MONDI's Corrosion Resistance Provides Reliability

MONDI Corrosion Resistance

Reliability, economical cost, long service life and demonstrated performance are very important criteria for sulfuric acid piping systems. MONDI piping meets all of these criteria and has demonstrated low corrosion rates in acid plants since 1983.

Measured corrosion rates from many years of actual plant operation are the true measure of MONDI performance. The initial corrosion of MONDI is higher as the tough sulfate film is formed on the surface. After formation, this sulfate film remains to protect the surface and corrosion rate is greatly reduced. The resulting low corrosion rate provides piping system reliability, long service life and excellent performance.

Sometime during the operation of an acid plant, the acid concentration in the drying or absorbing systems will experience a weaker acid excursion due to process upset or equipment malfunction. Weaker acid excursions below 96% will accelerate corrosion to austenitic stainless steel piping and decrease its service life. Many plants have reported that their MONDI piping systems with 93-99% have operated through weaker acid excursions. These plants also reported that the MONDI piping did not show significant corrosion after the excursions. MONDI piping is very forgiving and provides reliable system performance.



The following is a comparison of MONDI piping and Austenitic Stainless Steel piping systems.

	MONDI	Stainless Steel System
System	Flanged	Welded
Maintenance Requirements	Simple Skills Basic Hand Tools	Special Welding Technique with High End Equipment
(Available Corrosion Allowance)	(Half of Original Wall Thickness)	1/32" = (0.03125")
Velocity Feet/Second	6-8.5	8-10
Wall Thickness 14" Size Pipe Fittings	0.66" 0.89"	.188"-.234" .188"-.234"
Corrosion Rate MILS/Year	5-10	3-5
Cost	Economical	3 - 5 Times Higher
Availability	Large Inventory 3 Locations	??

The APT Assurance of Quality

Our personal assurance of quality backs up every product we make. The principals of Acid Piping Technology have over 80 years combined experience in providing products to the sulfuric acid industry. There is not a product which leaves our plant, or a service delivered to you, that does not carry our personal guarantee.

You have our word on it.

Ed Knoll
President

Quality Assurance. All APT cast pipe and fittings are produced in state-of-the-art foundries. Chemical and physical tests are performed on each foundry heat with material certification for traceability.

Testing. All MONDI pipe is hydrostatically tested to 500 psi and ultrasonic thickness tests are performed in close increments when manufactured. Flanged pipe spools are air tested under water at 50 psi to ensure thread seal and pipe integrity.

Inspection. Materials are subjected to rigorous 100% inspection for quality, workmanship, dimensions and review of pertinent material certifications. Additional testing includes hardness tests and cross sectional examination of random castings.

Our quality control process is your assurance that APT products will provide years of excellent performance.

Our inventory
is the world's largest.

Extensive Stock and Quick Turnaround Assures Exceptional Service

APT's inventory availability will minimize your downtime. Our extensive stock of MONDI pipe and standard fittings is the largest inventory in the world. Whether your needs are routine or emergency, you can count on APT to have what you need when you need it.

APT stocks 3" through 36" size in pipe and flanges and 2" through 36" size in fittings. We stock approximately 2000 fittings with a full range of sizes in standard elbows, tees and reducers available for same day shipment. This stock can replace the complete piping systems in two 3000 T/D acid plants.

Special fittings, tower distributors, converter internals and other products are cast to order and are shipped in a timely schedule to meet your requirements. This reduces downtime and provides the correct repair for your plant.

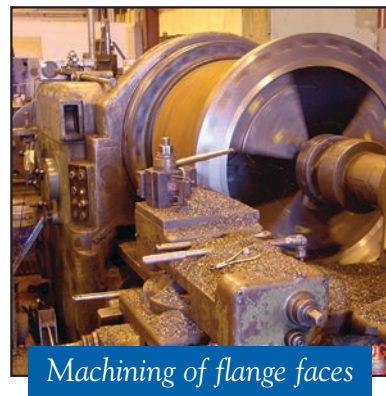
Periodic visits by APT professionals provide support to your plant personnel for our products.



APT AVAILABILITY

MONDI's Pipe and Fittings Have Special Heavy Wall Thickness

Flanged Pipe Spools Are Machined For Leak-Free Seal

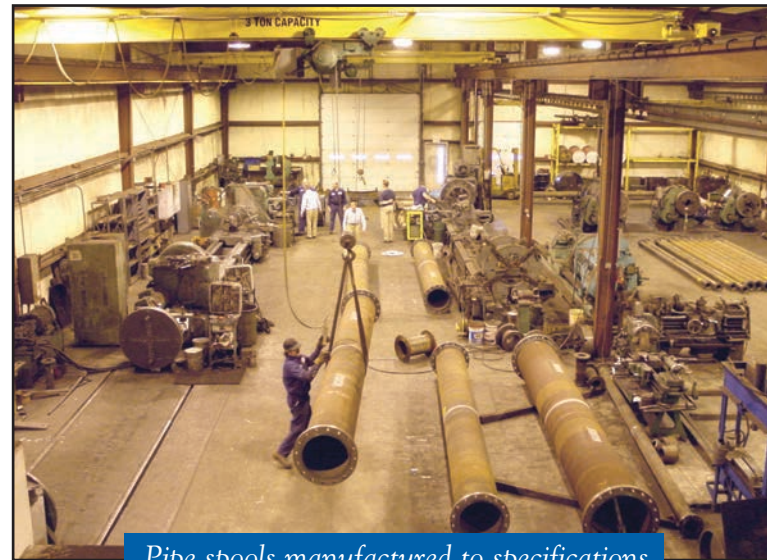


All APT pipe spools are manufactured of centrifugally cast MONDI pipe with the proper heavy wall thickness and special Hi-Hub threaded flanges. Spools are manufactured in accordance with ANSI standards A21.51 and A21.15.

Maximum spool lengths for 3" (80mm) through 14" (365 mm) size is 18 feet (5486mm). 16" (406mm) through 30" (762 mm) sizes have a maximum length of 17.5 feet (5334 mm). Flanges have ANSI 125 psi bolt patterns or other standard patterns.

Pipe is cut to the required length and threaded to exacting tolerances to match each flange thread and taper. Flanges are tightened to a specific torque for leak-free pipe-flange thread seal. Flange centerlines and bolt holes are aligned to proper position in our custom machine. Spools with special flange rotation are aligned in this machine which eliminates errors.

Flange faces and end of pipe are machined flat and perpendicular to the pipe barrel with a special phonographic finish. Flange faces are protected with rust preventative and flange covers.



Flanged Fittings With Heavy Wall Thickness For Long Life

MONDI fittings are cast in special patterns with heavy wall thickness for large corrosion allowance needed in the acid industry. These patterns have thicker wall than 250 psi ductile iron patterns. See wall thickness by size for our pipe and fittings. For example – a 14" 90° MONDI elbow has a wall thickness of 0.82" and weight of 330 pounds versus a wall thickness of 0.66" for 250 psi ductile iron and weight of 290 pounds used in the water industry.

Center to face dimensions meet ANSI/AWWA C110/A21.10 standards. The inside diameter of the fittings matches the inside diameter of the pipe. Flanges have ANSI 125 psi bolt drilling or other bolt drilling if required. Bossed fittings and other special fittings are available.

Patterns for fittings are designed to virtually eliminate all chaplets. When a chaplet must be used, it is made of MONDI with a special finned design which fuses into the fitting. APT fittings have both the MONDI metallurgy and heavy wall thickness for superior performance.

Flange faces have the special phonographic finish which bites into the gasket for a proper seal. Flanges faces are protected with rust preventative and flange covers.



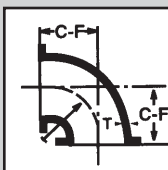

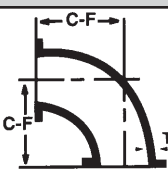

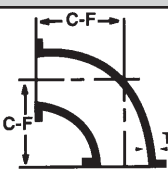
APT SPECS

All APT Products Are Manufactured To Stringent Quality Specifications

FLANGED PIPE SPOOLS

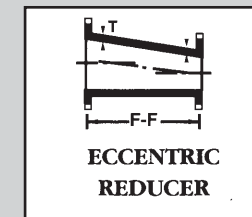
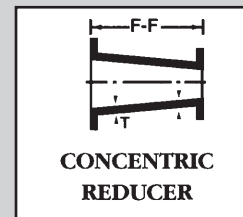
SIZE IN.	PIPE CLASS	WALL THICK IN.	WEIGHT LB./FT.	FLANGE O.D. IN.	BOLT CIRCLE IN.	FLANGE THICK IN.	BOLT HOLE IN.	BOLT DIA. IN.	NO. BOLTS	GASKET I.D. IN.	GASKET O.D. IN.
3	54	0.34	12.2	7.50	6.00	0.75	0.75	0.63	4	3.25	5.37
4	56	0.41	17.8	9.00	7.50	0.94	0.75	0.63	8	4.00	6.87
6	58	0.49	31.1	11.00	9.50	1.00	0.87	0.75	8	6.00	8.75
8	58	0.51	43.4	13.50	11.75	1.12	0.87	0.75	8	8.00	11.00
10	59	0.56	58.6	16.00	14.25	1.19	1.00	0.87	12	10.00	13.37
12	60	0.61	76.7	19.00	17.00	1.25	1.00	0.87	12	12.00	16.12
14	61	0.66	96.5	21.00	18.75	1.37	1.12	1.00	12	14.00	17.75
16	62	0.70	116.8	23.50	21.25	1.43	1.12	1.00	16	16.00	20.25
18	63	0.74	139.3	25.00	22.75	1.56	1.25	1.12	16	18.00	21.63
20	65	0.81	167.8	27.50	25.00	1.68	1.25	1.12	20	20.00	23.87
24	67	0.89	220.7	32.00	29.50	1.87	1.37	1.25	20	24.00	28.25
30	69	1.15	372.5	38.75	36.00	2.12	1.37	1.25	28	29.75	34.75

FLANGED ELBOWS

SIZE IN.	SHORT RADIUS DIMENSIONS-IN.			SHORT RADIUS WEIGHT-LB.		LONG RADIUS 90°			
	T	90°	45°	90°	45°	DIM.-IN. C-F	WEIGHT LB.		90° SHORT RADIUS
		C-F	C-F						
3	0.48	5.5	3.0	25	20	7.75	28		
4	0.52	6.5	4.0	45	40	9.00	48		
6	0.55	8.0	5.0	65	55	11.50	85		
8	0.60	9.0	5.5	105	90	14.00	145		
10	0.68	11.0	6.5	165	130	16.50	230		
12	0.75	12.0	7.5	235	195	19.00	350		
14	0.82	14.0	7.5	330	245	21.50	470		
16	0.89	15.0	8.0	430	315	24.00	670		
18	0.96	16.5	8.5	530	375	26.50	840		
20	1.03	18.0	9.5	685	485	29.00	1080		
24	1.16	22.0	11.0	1085	730	34.00	1640		
30	1.37	25.0	15.0	1755	1335	41.50	2700		

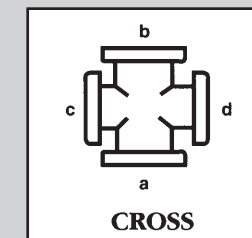
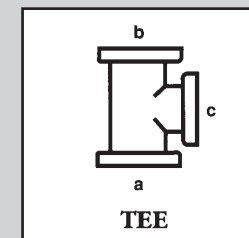
FLANGED CONCENTRIC AND ECCENTRIC REDUCERS

SIZE-IN.		DIMENSIONS-IN.		WEIGHT
LG.	SM.	T	LENGTH F-F	LB.
3	2	0.48	6.0	16
4	3	0.52	7.0	28
6	4	0.55	9.0	47
8	6	0.60	11.0	77
10	8	0.68	12.0	120
12	10	0.75	14.0	180
14	12	0.82	16.0	235
16	14	0.89	18.0	315
18	16	0.96	19.0	388
20	18	1.03	20.0	470
24	20	1.16	24.0	695
30	24	1.37	30.0	1155



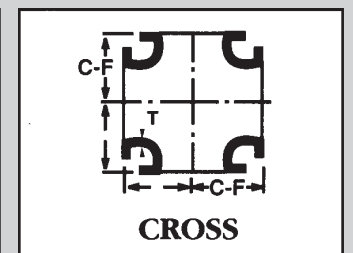
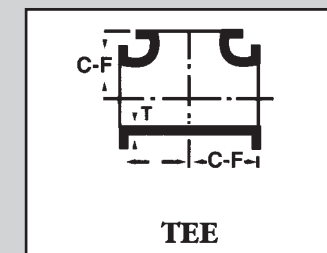
HOW TO ORDER

When ordering reducing fittings, give size of each opening by sequence of the letters a, b, c and d.



FLANGED TEES AND CROSSES

SIZE-IN. RUN	BRANCH	DIMENSIONS-IN.			TEE	WEIGHT-LB. CROSS
		T	T	C-F		
3	3	0.48	0.48	5.5	38	48
4	4	0.52	0.52	6.5	65	82
4	3	0.52	0.52	6.5	58	68
6	6	0.55	0.55	8.0	105	135
6	4	0.55	0.55	8.0	96	115
8	8	0.60	0.60	9.0	165	210
8	6	0.60	0.60	9.0	150	190
10	10	0.68	0.68	11.0	270	330
10	8	0.68	0.68	11.0	250	300
12	12	0.75	0.75	12.0	380	470
12	10	0.75	0.75	12.0	360	420
14	14	0.82	0.82	14.0	500	595
14	12	0.82	0.82	14.0	470	555
16	16	0.89	0.89	15.0	635	755
16	14	0.89	0.89	15.0	610	700
18	18	0.96	0.96	16.5	785	915
18	16	0.96	0.96	16.5	760	880
20	20	1.03	1.03	18.0	1005	1175
20	18	1.03	1.03	18.0	965	1100
24	24	1.16	1.16	22.0	1585	1850
24	20	1.16	1.16	22.0	1510	1695
30	30	1.37	1.37	25.0	2615	2980
30	24	1.37	1.37	25.0	2540	2780



APTSPECS

Reduce System Cost With MONDI Piping

Multi-Purpose Bossed Fittings Reduce System Costs and Save Space

Bossed MONDI fittings are used for flanged connections of:

- thermowell
- pressure sensor
- drain line
- vent line
- sample line
- side stream

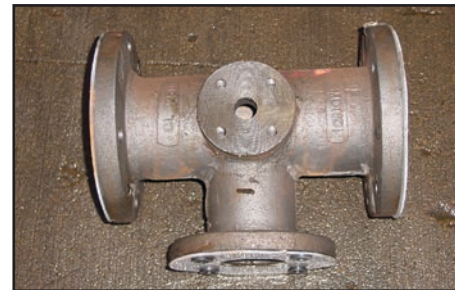
Bosses are added to the outside wall of the fitting and do not reduce the wall thickness or service life of the fitting.

Using a boss will make the fitting multi-purpose and can simplify a piping system to reduce costs. Bosses are typically used on elbows and tees and can be placed at different locations. The diameter of the boss matches the outside diameter of the connecting flange. The face of the boss is drilled and tapped for stud bolts and machined for a good gasket surface. Bosses are used for 1/2" to 12" size flanged connections.

See the information for boss location and sizes available. Contact APT for boss locations on other types of fittings if required.

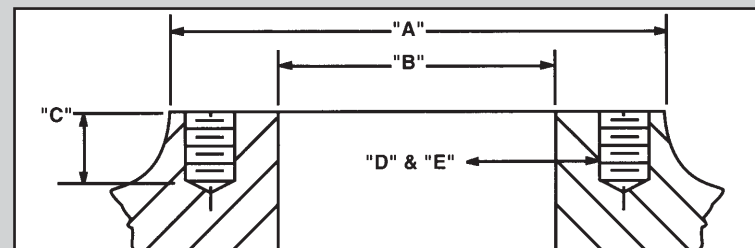
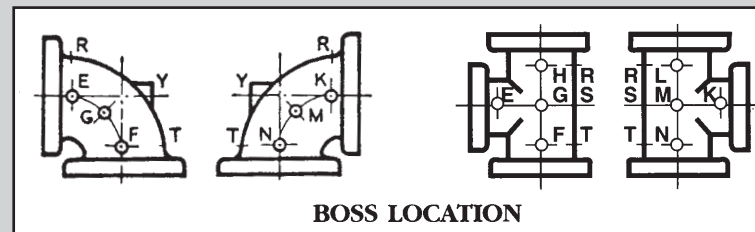


Boss on 90° elbow and Tee for sample or instrument connections at location "Y" and "G"



BOSS DETAILS

DIA. HOLE	O.D BOSS	TAPPED STUD DEPTH	NO. OF HOLES	DIA. STUDS
B-IN.	A-IN.	C-IN.	D	E-IN.
0.50	3.50	0.75	4	0.50
0.75	3.87	0.75	4	0.50
1.00	4.25	0.75	4	0.50
1.50	5.00	0.75	4	0.50
2.00	6.00	0.87	4	0.63
3.00	7.50	0.87	4	0.63
4.00	9.00	0.87	8	0.63
6.00	11.00	1.00	8	0.75
8.00	13.50	1.00	8	0.75
10.00	16.00	1.12	12	0.87
12.00	19.00	1.12	12	0.87



Spacers assist in installation of the piping system. We recommend that a spacer be used in each horizontal and vertical run of piping to adjust for dimensional differences. Spacers are available as filler flanges and ring spacers. Spacers can be machined in the field during system fit-up. This is important for existing piping systems where dimensions may have changed due to settling of foundations over the years.

Filler flanges are full face with drilled bolt holes and spiral groove phonographic finish on both sides for a good gasket surface. They match the pipe inside diameter and flange outside diameter. They are available in sizes 3" through 30" and thickness as required for system. We maintain a stock of 1/2", 1", 2", 3 1/2" and 4" thick filler flanges in the different pipe sizes.

During field fit-up, tapered filler flanges can be used if mating flanges are not parallel.

Ring spacers match the pipe inside diameter and fit inside the flange bolt circle. They are available in 3" through 30" sizes in specific thicknesses or in a standard 12" length. The standard 12" length can be cut to the required thickness and machined with a gasket surface.

Retrofit MONDI Systems To Metric Systems

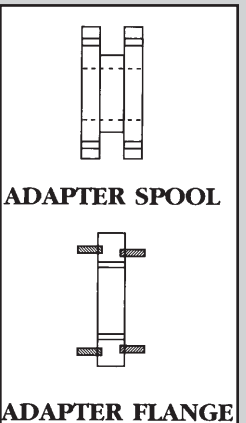
MONDI piping with ANSI 125 PSI flanges and center to face dimensions utilize the available fittings patterns and pipe sizes at an economical cost. Any differences between center to face dimensions of ANSI fittings and metric fittings can be adjusted by length of the spools. Piping elevations and length of pipe runs can be easily maintained.

Metric or other Asian, European or South American standard connections can be joined at the tie-in points with an adapter spool or adapter flange as shown. For adapter spools one flange is drilled for ANSI bolting and one flange is drilled for the other standard bolting. With an adapter flange one side is drilled and tapped for ANSI stud bolts and one side is drilled and tapped for the other standard stud bolts.

Use of adapters permits all plants to utilize MONDI piping to improve reliability of acid plant piping systems. MONDI piping systems are operating in many countries and plants designed to other piping standards.

ADAPTERS

PIPE SIZE	MIN. F-F SPOOL	PIPE SIZE	MIN. F-F SPOOL
3"	5"	14"	7"
4"	5"	16"	7"
6"	5"	18"	8"
8"	6"	20"	8"
10"	6"	24"	8"
12"	6"	30"	10"



APT PRODUCTS

Gaskets

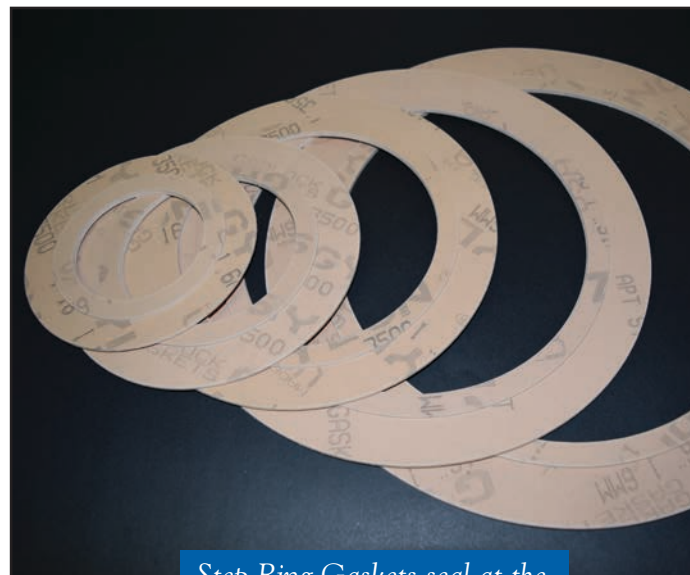
Step Ring Gaskets For Leak-Free Seal In Hot Acid

The APT Step Ring Gasket is an improved gasket design which has been used in MONDI piping since 1985. It has provided excellent service for many acid producers. Acid piping systems are subject to thermal cycling through years of operation. It is important to use the proper gasket.

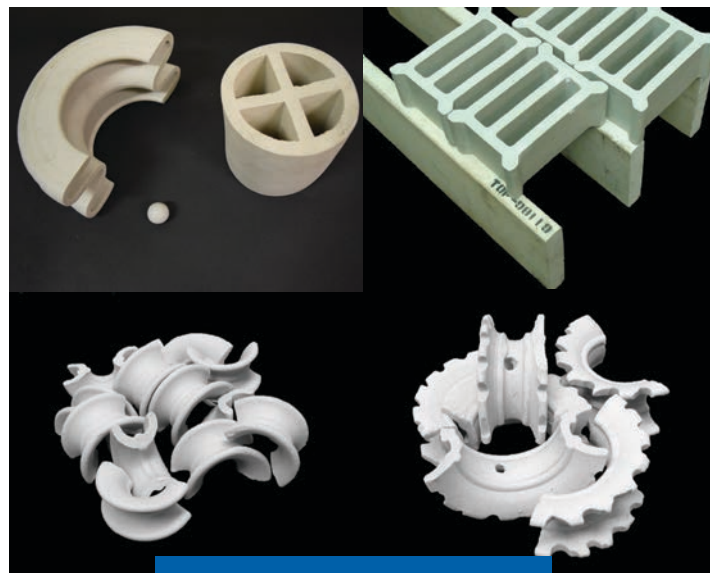
APT Step Ring Gaskets are made of Fawn Gylon. Fawn Gylon has excellent resistance to sulfuric acid, mechanical strength and recovery properties that maintain the seal with thermal cycling. Excellent recovery eliminates the need for bolt retightening. Fawn Gylon will not cold flow into the pipe ID or outside the flange OD like other materials.

This gasket consists of a 1/16" thick standard ring section plus a 1/16" thick inner ring section. Both sections are bonded together. The standard ring section is for locating and centering within the bolt circle. The inner ring section is for sealing. Total thickness at the inside diameter is 1/8" (3 mm) in the critical sealing area.

There is a limit to bolt loading for each size flange. For the Step Ring Gasket, compression is concentrated over the smaller area of the inner ring, allowing the grooves in the flange face to bite into the gasket. This provides a tight seal with proper torquing of the bolts. This gasket works on the same principle as a raised face flange. The Step Ring Gasket's superior seal prevents acid migration from inside the pipe and corrosion of the flange face which shortens the life of piping systems.



Step Ring Gaskets seal at the pipe-fitting inside diameter.



30,000 cu. ft. of ceramic productions stocked in 2 locations

Tower and Converter Internals

Tower Internals

Tower Distribution Systems

Various types of tower distributors are supplied in MONDI to meet your demanding requirements. The distributors include troughs and downspouts, spargers and drilled pipes.

MONDI troughs and downspouts are not subject to pluggage like pipe type or trough type with small diameter tubes. Our troughs and downspouts provide 15 plus years of reliable, maintenance-free service. MONDI and the tough sulfate film is resistant to weaker acid concentrations from process upset and shutdown conditions.

Replacement parts or complete distributors are provided for your towers. If required, complete distributor systems can be assembled in the shop and match-marked to assure tower fit.

Ceramic Packing and Supports for Towers

APT's ceramic products are made of chemical porcelain which provides superior performance in sulfuric acid plants to products made of chemical stoneware. Chemical porcelain has excellent chemical resistance, high mechanical strength, low iron content and low porosity. Our ceramic products are produced by China's leading ceramics factory to our specifications.

Our products are the highest quality and include 1/2", 3/4", 1", 1-1/2", 2" and 3" saddles, 6" cross partition rings and grid block supports. They have provided low pressure drop, reduced breakage and high efficiency performance in many drying and absorbing towers since 1994. APT ceramic products provide many years of excellent performance in acid plant service.

We maintain a large inventory of the various size saddles and supports for routine or emergency requirements.

MEEHANITE™ Converter Internals

We supply grids, division plates and support columns in Meehanite alloys. These are made in Meehanite HS and GE 30 for the passes in your converter to the dimensions required. Most patterns are available for existing converter designs.

Meehanite HS is used for temperatures up to 1800° F (981° C). We recommend Meehanite HS grids and columns for Pass 1 conditions to minimize heat scaling, warping and bending.

Our converter internals provide many years of excellent service at the operating temperatures and SO₂ - SO₃ gas conditions in each of the converter passes. This results in reduced maintenance and improved plant operation. Converter internals are made to order at an economical cost and within a timely schedule.



Meehanite converter grids



MONDI troughs

APT PRODUCTS

Piping

Alloy Bolts, Pipe and Fittings

Heavy hex head machine bolts, stud bolts and heavy hex nuts are provided in ASTM and metric sizes. These are supplied in Carbon Steel, Stainless Steel, Alloy 20 and Hastelloys.

Alloy 20 and Stainless Steel pipe and fittings are supplied for 2" and smaller piping systems. This piping is used for equipment drain lines, instrument and sample lines. It is available in seamless and welded construction-Schedule 10 through 160.

Chrome Moly Steel pipe and fittings are supplied in many sizes for steam systems. This piping is available in standard weight through double extra heavy.



Alloy piping

Lined Piping and Valves

APT works closely with a leading supplier of Teflon lined pipe, fittings and accessories for application in the chemical and petro-chemical industries. The linings of PFA, PTFE, PVDF and Polypropylene are available for these processes. These accessory products include various strainers, check valves, sight glasses and gaskets and special Teflon parts.



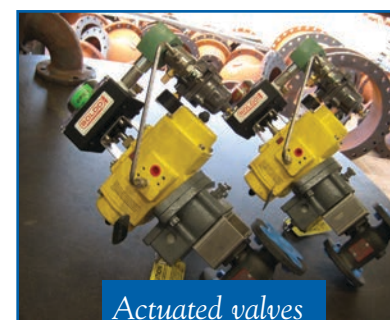
Lined Valves and Accessories



Lined Pipe & Fittings

Flow Control

Valves and Instrumentation



Actuated valves

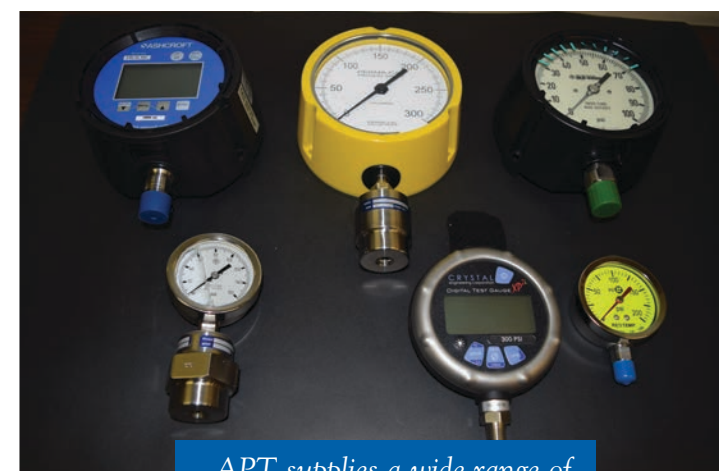
APT supplies a wide range of valves and instrumentation. Valve types are gate, globe, check, plug, ball and butterfly. These valves are available in iron, bronze, forged steel, cast steel, stainless steels - 304, 316 and 310, Alloy 20, Hastelloys, Chrome Moly, Titanium and Monel. Lined valves are with PTFE, PFA and PVDF. End connections include flanged, threaded, socketweld and buttweld in classes 125 psi through 2500 psi.

APT has a complete automation facility for valve actuation. We routinely supply the complete automated valve package. It will include an actuator, limit switch or positioner, solenoid valve and air filter. The package is assembled, pre-wired and cycle tested before shipping. We can fabricate custom mounting kits and supply any specific components to meet your requirements.

Our instrumentation products include thermocouples, RTD, thermowells, orifice plates, pressure and temperature gauges.

Valve and instrumentation applications are used in many chemical processes, steam systems and seawater cooling systems.

Engineered dampers and valves, butterfly, gate and jug styles available in sizes from 6"-120" (152mm-3048mm)



APT supplies a wide range of valves and instrumentation



S02/S03 Damper Valves

Other Products

APT supplies many other products for acid plants. These products include various gaskets, special Teflon parts, Teflon lined spargers and piping, jacketed piping, pipe hangers, flange shields and strainers.