

Zerust® Flange Savers™

EXTENDING THE LIFE OF FLANGES, VALVES & WELDED JOINTS

PRODUCT INFORMATION

THE PROBLEM

Oil, gas, and other product transmission pipeline segments are connected by flanges and welded joints of varying sizes, designs and materials. These connection points often quickly corrode under aggressive industrial environments and harsh operating conditions thereby causing significant operational and safety problems that can cost companies millions of dollars annually.

Conventional mitigation of external corrosion consists of painting the flanges, valves and welded joints. Painting is then often augmented with bands, shields, tape, foam, and cups containing grease. However, all of these methods have proven to be both inadequate with high failure rates, and expensive once material cost and application labor have been properly allocated.

Standard maintenance programs typically stipulate some surface preparation and reapplying of paint regularly over areas showing corrosion. However, corrosion damage underneath multiple layers of paint continues. Flange bolts and nuts need to be replaced every 1-2 years and, over time, the corrosion progresses to the point that the flanges need to be cut off and replaced. Installations like offshore oil platforms, refineries, process chemical facilities, and water treatment plants commonly face these kinds of corrosion problems.

OPERATIONAL LINES SHOWING ADVANCED CORROSION



Crevice corrosion and weakened welds can lead to product leakage, while frozen fasteners will require time consuming maintenance

INEFFECTIVE CORROSION MITIGATION SOLUTIONS

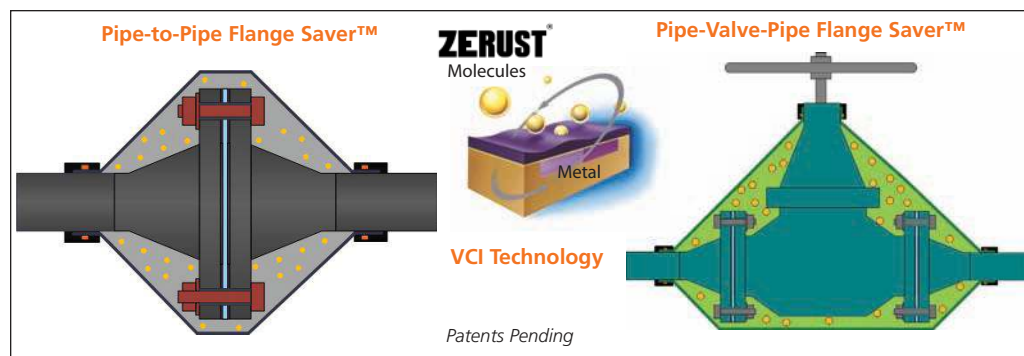


Taping does not protect the nuts and bolts or welded necks

Painting usually just hides the extent of the problem

THE ZERUST® SOLUTION

For over 30 years Zerust® vapor corrosion inhibiting products have successfully protected metal substrates across numerous industries. The newly-designed Zerust® Flange Savers™ are specially designed covers that have been impregnated with proprietary Zerust® inhibitor formulations that provide superlative corrosion protection for flanges, valves, and welded joints.



Zerust® Flange Savers™ are available in various sizes to accommodate different pipe diameters, pressure ratings and international standards for pipeline valves and flanges. Custom shapes and sizes can be manufactured based on client requirements. Flange Savers™ can be applied in various process chemical industry facilities like refineries, offshore platforms, oil terminals, chemical plants, water treatment facilities, etc.

NTIC'S OIL & GAS CLIENTS

- Petrobras, Brazil
- Emirates Petroleum Products Company (EPPCO), UAE
- Conoco-Philips, USA
- Shell, Malaysia
- Shell, Philippines
- Exxon-Mobil, USA
- Baker-Hughes, USA
- Halliburton, USA
- Schlumberger, Malaysia

FLANGE SAVERS™ KEY BENEFITS

- Maintenance time is significantly reduced
- Maintenance costs can be more than halved*
- Quick and easy installation & replacement
- No electrical devices or heating equipment required
- No special training or certification required for installation
- Effective life of 1-2 years before replacement (depending on client requirements)
- Available in colors to match process pipelines
- VCI vapors are U.S.-FDA approved and therefore non-toxic
- Resistant to UV and harsh climatic conditions.

*Individual client results may vary

ZERUST®
OIL & GAS

INSTALLATION EXAMPLES



Inland Terminal - Oil Lines



Offshore Platform - Fire Water Line



Coastal Terminal - Oil line with Gate Valve



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IMPACT TO OPERATIONS

Flange failure due to corrosion can lead to product leakage resulting in fires, explosions and severe environmental damage. In order to prevent such problems, companies spend millions of dollars on maintenance and inspection programs that include shutting down and purging of lines, cleaning, surface preparation, priming and painting. The material and labor costs for such activities may seem small on a per unit basis, but with thousands of flanges in a given facility and the opportunity costs of lost operations, the costs quickly add up.

Hard Dollar Losses

- Labor and management resources expended for maintenance and replacement
- Cost of current preventative methods
- Cost of replacement parts

Intangible Costs

- Opportunity cost of lost production during maintenance/failure downtime
- Risk of failure of critical valves and/or pipelines
- Cost of potential environmental clean up
- Worker safety costs and potential litigation

Assumptions:

- Average 6" diameter pipeline and API 6A Class 150 flange pair at cost = \$150
- Approximately 7 years to flange failure due to crevice corrosion
- 8 sets of nuts and bolts for this pipe-to-pipe flange @ \$3 per set replaced every 3 years
- Hourly labor rate = \$80.00/hour
- Flanges frozen due to corrosion need to be cut & replaced every 5 years
- Costs do not include losses from shutdown maintenance time, leaks, failures, lawsuits, etc.

Annual Direct Material Costs		
#	Type of Cost	Estimated Value (USD)
1	Cost of replacement flange	\$21.40
2	Cost of nuts and bolts	\$8.00
3	Cost of paint	\$4.00

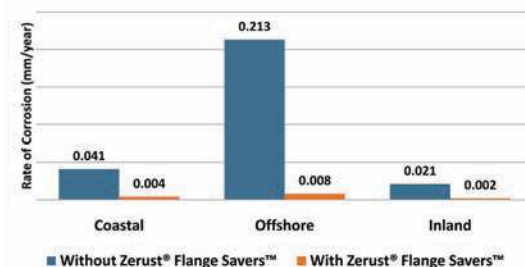
Annual Direct Labor Costs		
#	Type of Cost	Estimated Value (USD)
1	Prepping, priming & painting	\$20.00
2	Scheduled flange replacement	\$32.00
3	Cutting, welding bolts/flanges	\$64.00

Estimated Annual Cost Per Flange = \$149.40

SOLUTION EFFECTIVENESS

Zerust® Flange Savers™ are the result of several years of testing in harsh laboratory environments and also in field applications on offshore oil platforms, coastal oil terminals and inland refineries.

- **Temperature:** 20°C - 55°C
- **Relative Humidity:** up to 100%
- **Application Durations:** 1-2 years depending on environment
- **Flange Material:** Carbon Steel
- **Corrosive Industrial Environment:** Presence of Cl⁻, H₂S, SO₂ and CO₂



ORDER SPECIFICATIONS

Zerust® Flange Savers™ are available in sizes compatible with international standards. A selection of sizes is shown in the table below:

Part Number	Type of Cover	FLANGE SAVER™ COMPATIBILITY DATA						SERVICE LIFE	MOQ
		ASME / ANSI B16.5		DIN 2501		JIS B2220 / KS B1503			
		OD (inches)	Pressure Class (PSI)	OD (mm)	Pressure Class (bar)	OD (mm)	Pressure Class (kg/cm ²)		
875-F-00001	Pipe-to-pipe Flange (PTP)			40	10, 16, 25, 40			1 yr	20
		2	150						
		1.5	300						
875-F-00002	Pipe-to-pipe Flange (PTP)			50	10, 16, 25, 40	50	10, 16, 20	1 yr	20
		2	300						
				65	6	65	5		
875-F-00003	Pipe-to-pipe Flange (PTP)	4	150	100	10, 16	100	16, 20	1 yr	20
875-F-00004	Pipe-to-pipe Flange (PTP)	4	300			100	40	1 yr	20
		5	150	125	10, 16	125	10		
875-F-00005	Pipe-to-pipe Flange (PTP)			125	25, 40	125	16, 20, 30	1 yr	20
		6	150			150	10		
875-F-00006	Pipe-to-pipe Flange (PTP)	6	300			150	16, 20	1 yr	20
				175	10, 16				
875-F-00007	Valve + Flanges (PVF)	2	150					1 yr	10
875-F-00008	Valve + Flanges (PVF)	4	150					1 yr	10

*MOQ – Minimum order quantity (includes sealing tape, zip ties, tie gun, maintenance labels, etc.). MOQ is subject to change without advanced notice.

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