Tube vs. Pipe Tech Talk

Swagelok Process Solutions Awareness
Presented by: Jeff Allen, Swagelok Trainer

What is tube vs. pipe?

- It's usually called **Tube vs. Pipe** or **Small-Bore** conversions

  Today many *existing and new process systems* up to 2" are being retrofitted and built using all tubing systems vs. screwed, welded and or flanged pipe to reduce the number of components needed, reduction of the number of potential leak points at a lower total installed cost, while improving your flow characteristics.

Leaks are unsafe and waste energy

Tubing Solutions Awareness

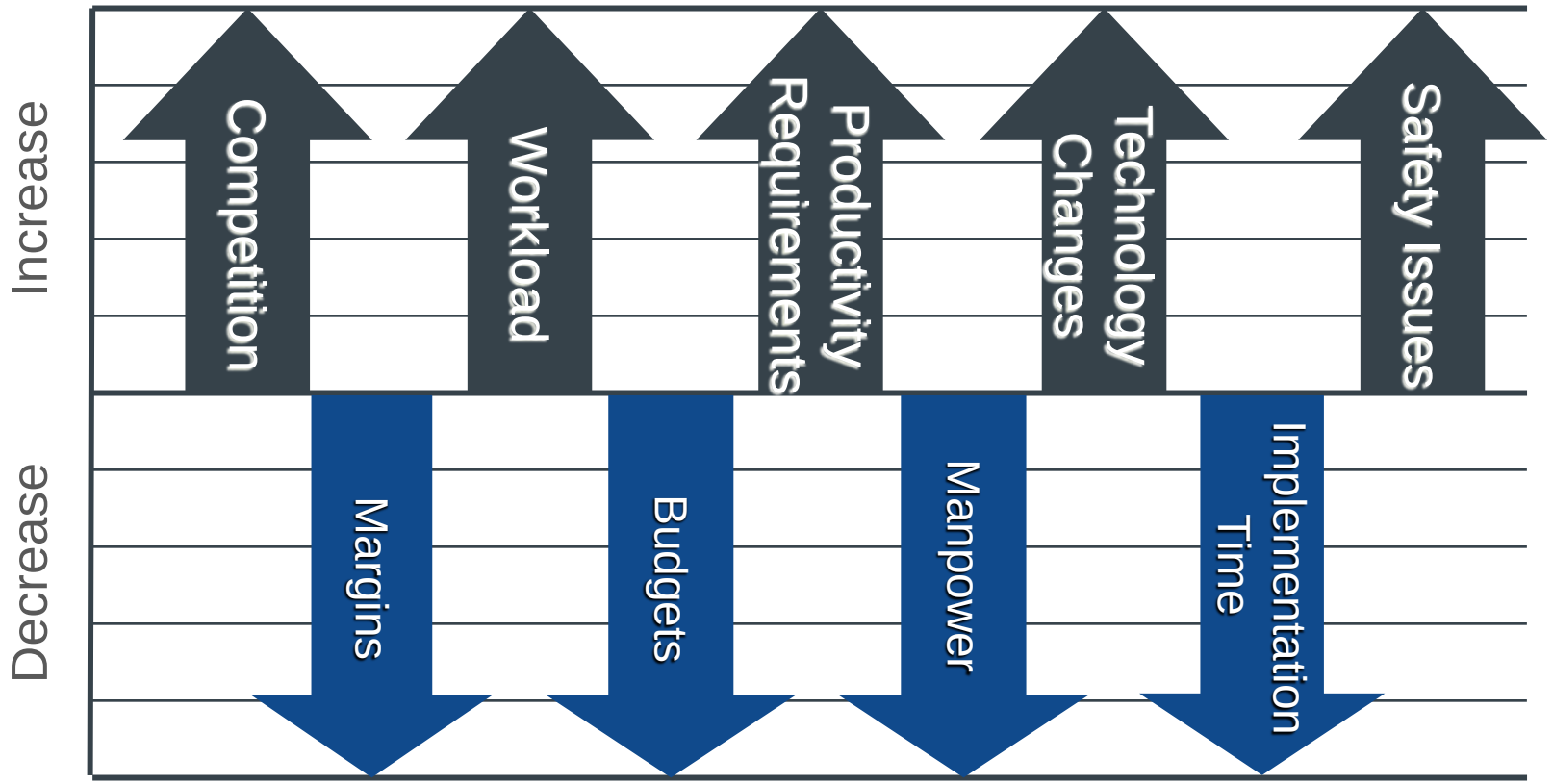
- Tubing is used in both instrumentation and Process Systems up to 2” in diameter.
- Typically instrumentation systems use **1/8” to 1/2”** tubing.
- Typically process systems use **5/8” to 2”** screwed, welded and flanged pipe.

Tubing Solutions Awareness

- Any connection: fitting, welded, screwed and flanged piping or tubing systems has the ***potential to leak*** if an approved installation procedure is not followed.
- Tubing systems (GOAL) is to reduce as many connections as possible thus **reducing as many potential leak points as possible** by bending versus using tubing elbows.

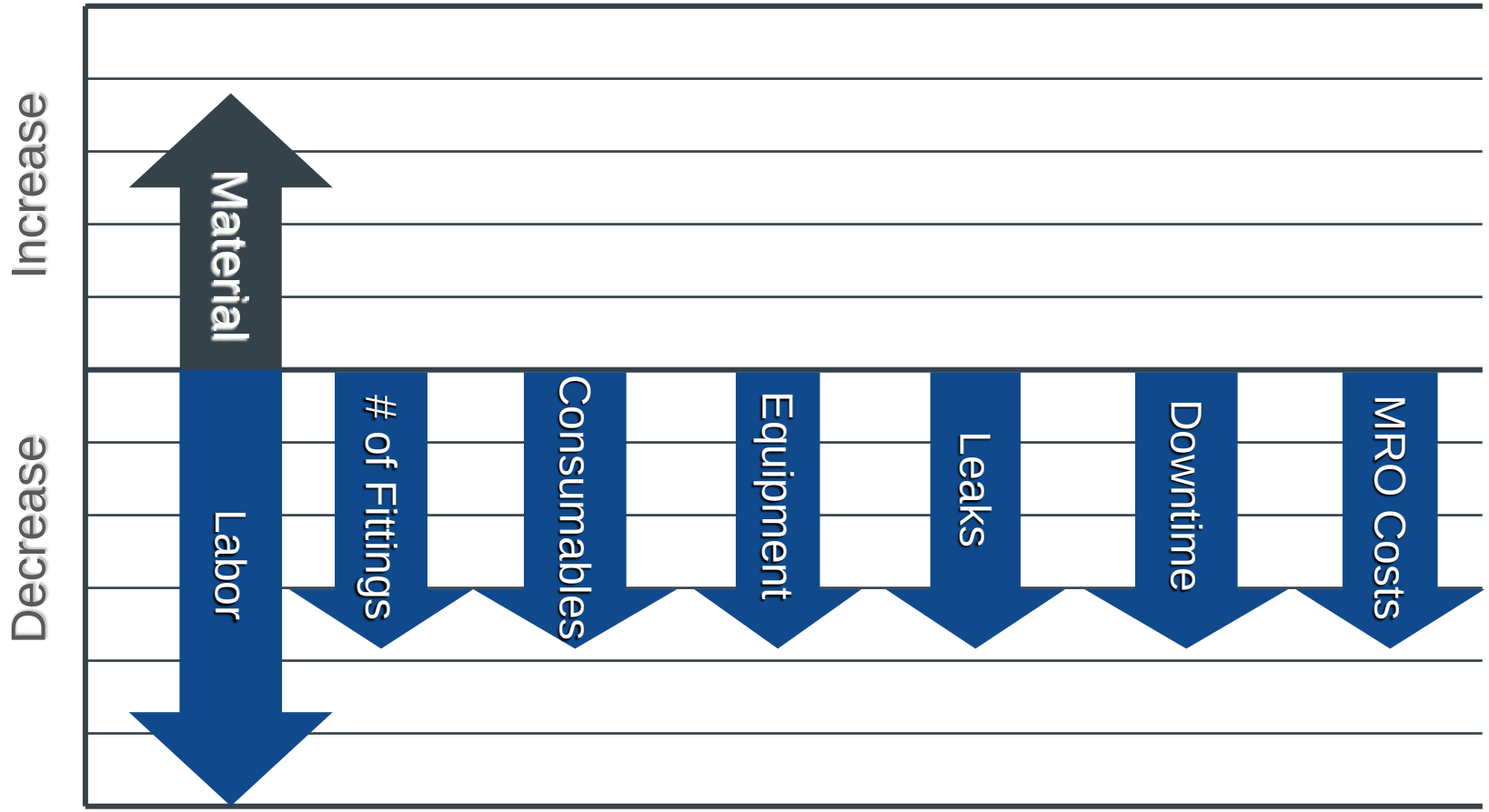
- Today we will show how you can ***reduce potential leaks with fewer fitting components*** by 50% or greater, thus improving the reliability of your system with ***less installation time at the lowest installed cost.***

Today’s Changing World



Our customers tell us they must *do more, faster with less personnel and money*

Where Swagelok Process Solutions Saves



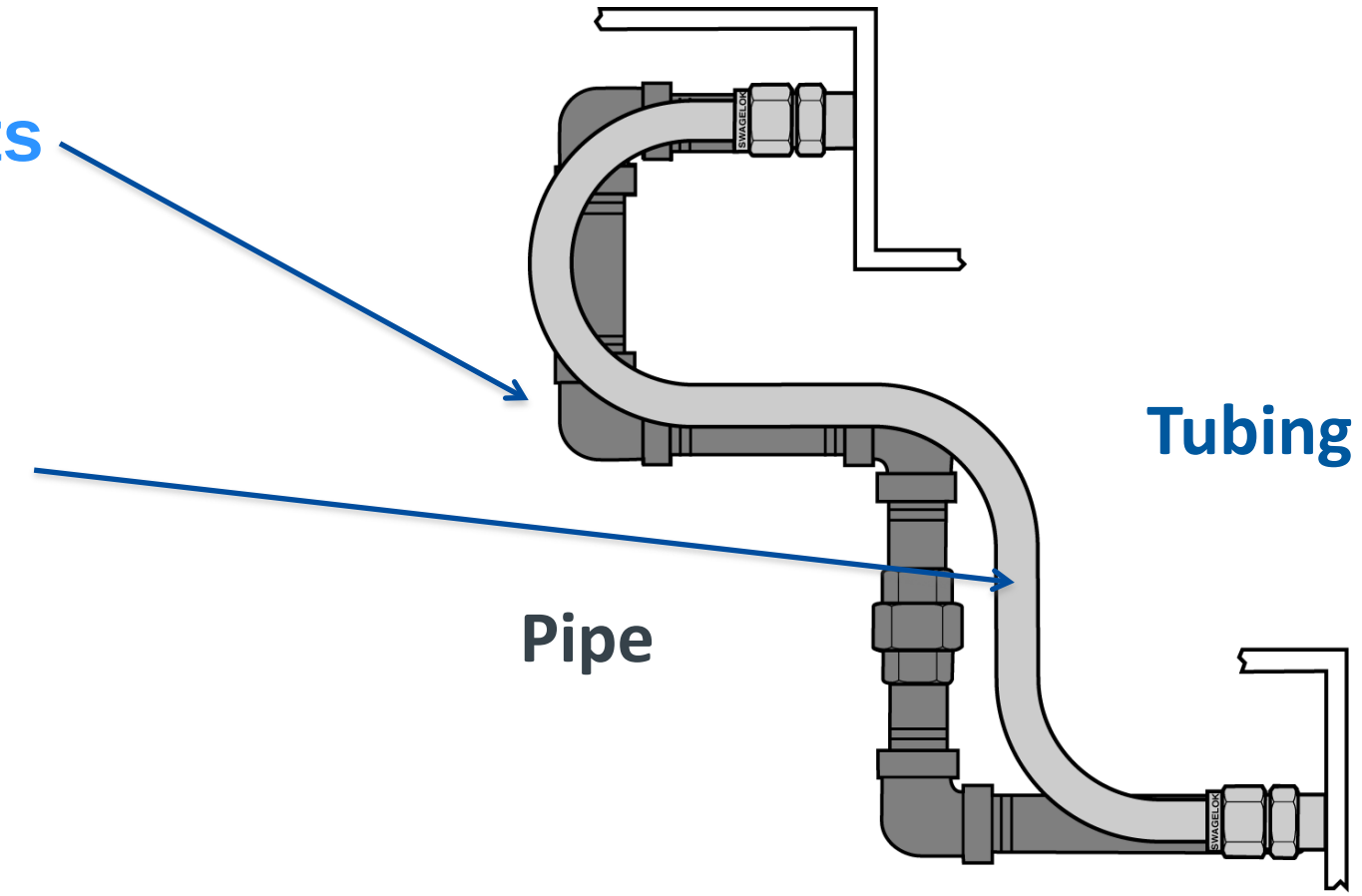
Advantages of tubing versus pipe

- Piping system

13 potential leak points

- Tubing system

4 potential leak points



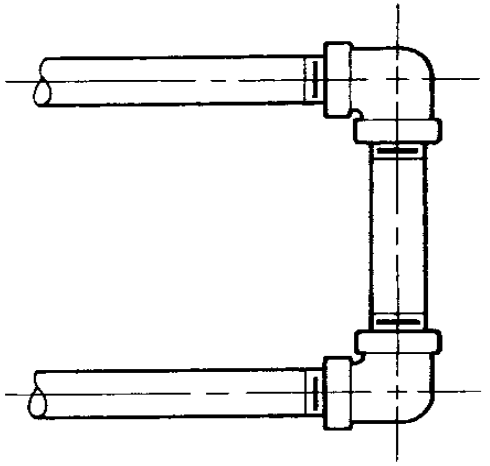
Potential leak points tube vs. pipe

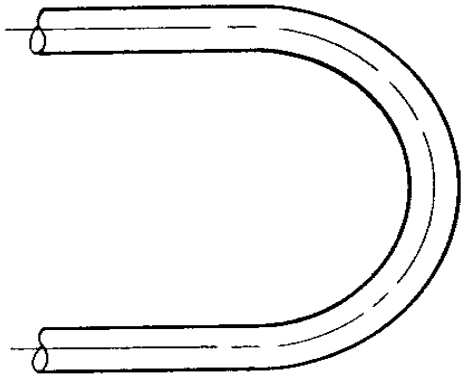
3 pipe unions = **12 potential leak points**

Tubing & tube ended valve = **3 potential leak points**

Advantages of Tubing

- Can be easily bent
- Higher strength to weight ratio
- Fewer potential leak points
- Smooth transition of flow
- Eliminates connections
- Reduces the overall cost of the installed system

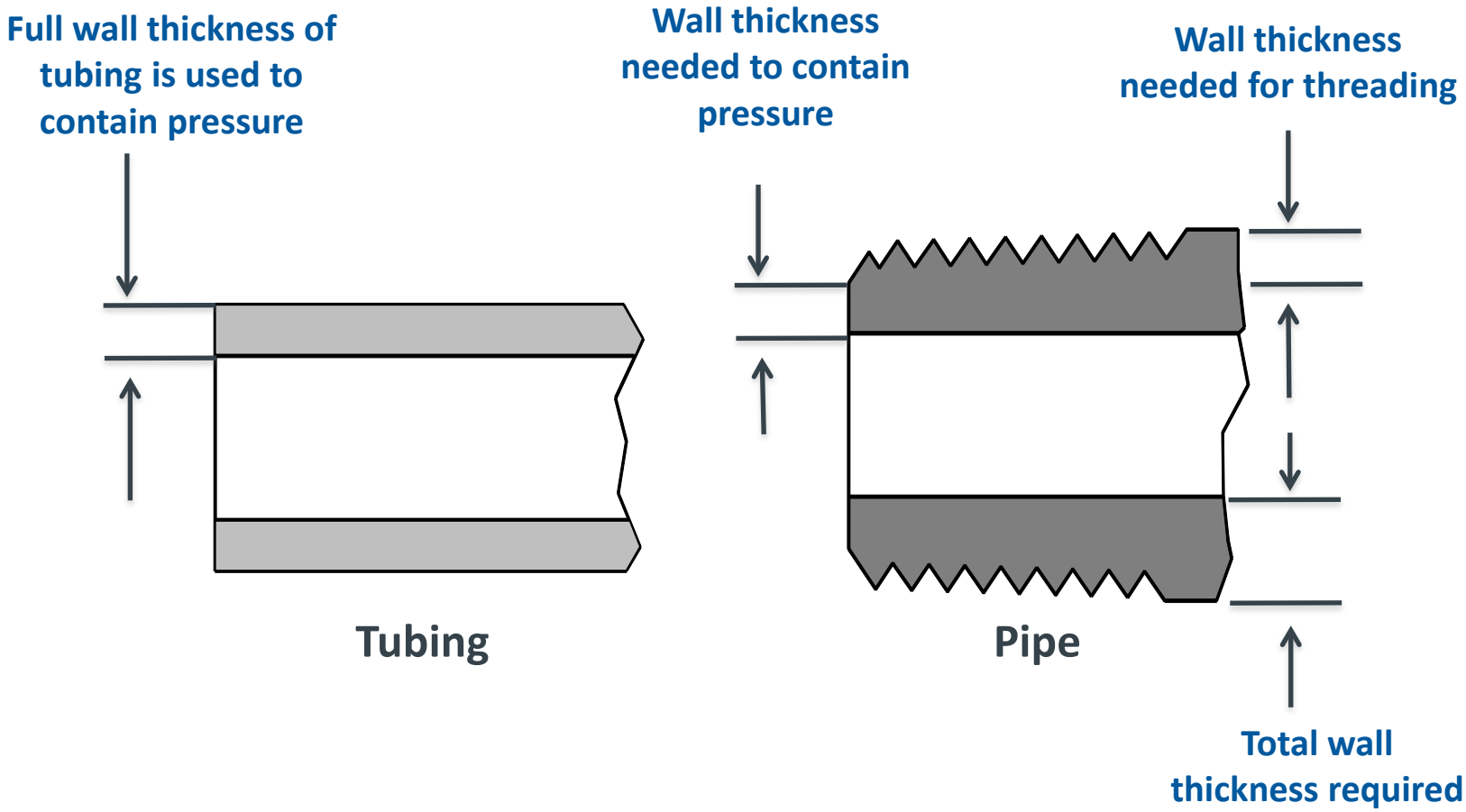




Limitations of Threaded Pipe

- Requires more material and labor
- Leak-free seals are more difficult
- Requires use of a thread sealant
- Relatively heavy
- Requires more support
- Cannot be easily bent
- Requires threading equipment

Better Strength to Weight Ratio tube vs. pipe



Tube vs. Pipe pressure ratings @ 100 F

- **Tubing**
- ½” x .049 wall 3700 PSI
- ¾” x .065 wall 3300 PSI
- 1” x .083 wall 3100 PSI
- 1 ½” x .134 wall 3400 PSI
- **Weight**
- ½” = .236 lbs. per foot
- ¾” = .475 lbs. per foot
- 1” = .812 lbs. per foot
- 1 ½” = 1.973 lbs. per foot

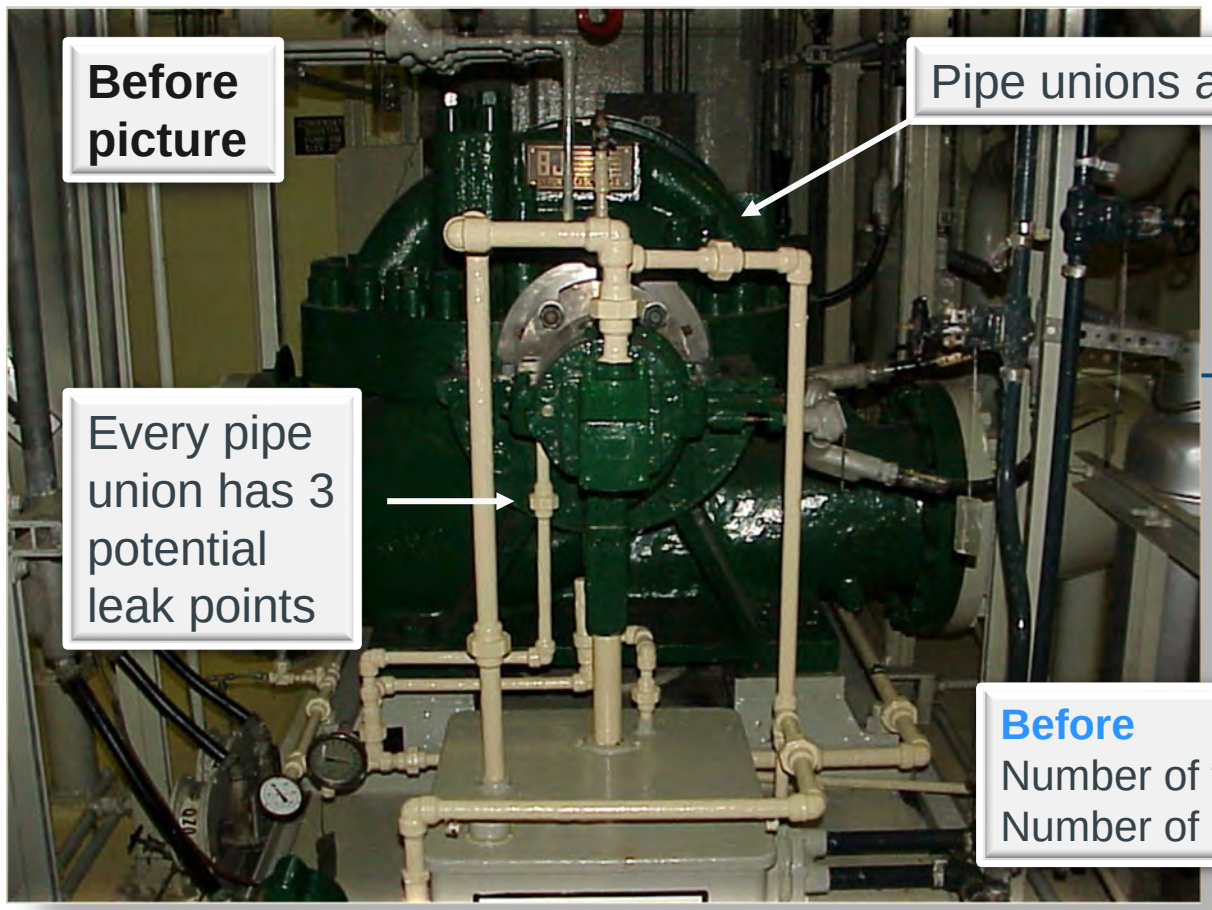
- **Pipe (welded, sch 80)**
- ½” x .146 wall 4092 PSI
- ¾” x .153 wall 3429 PSI
- 1” x .179 wall 3183 PSI
- 1 ½” x .200 wall 2461
- **Weight**
- ½” = 1.10 lbs. per foot
- ¾” = 1.49 lbs. per foot
- 1” = 2.19 lbs. per foot
- 1 ½” = 3.67 lbs. per foot

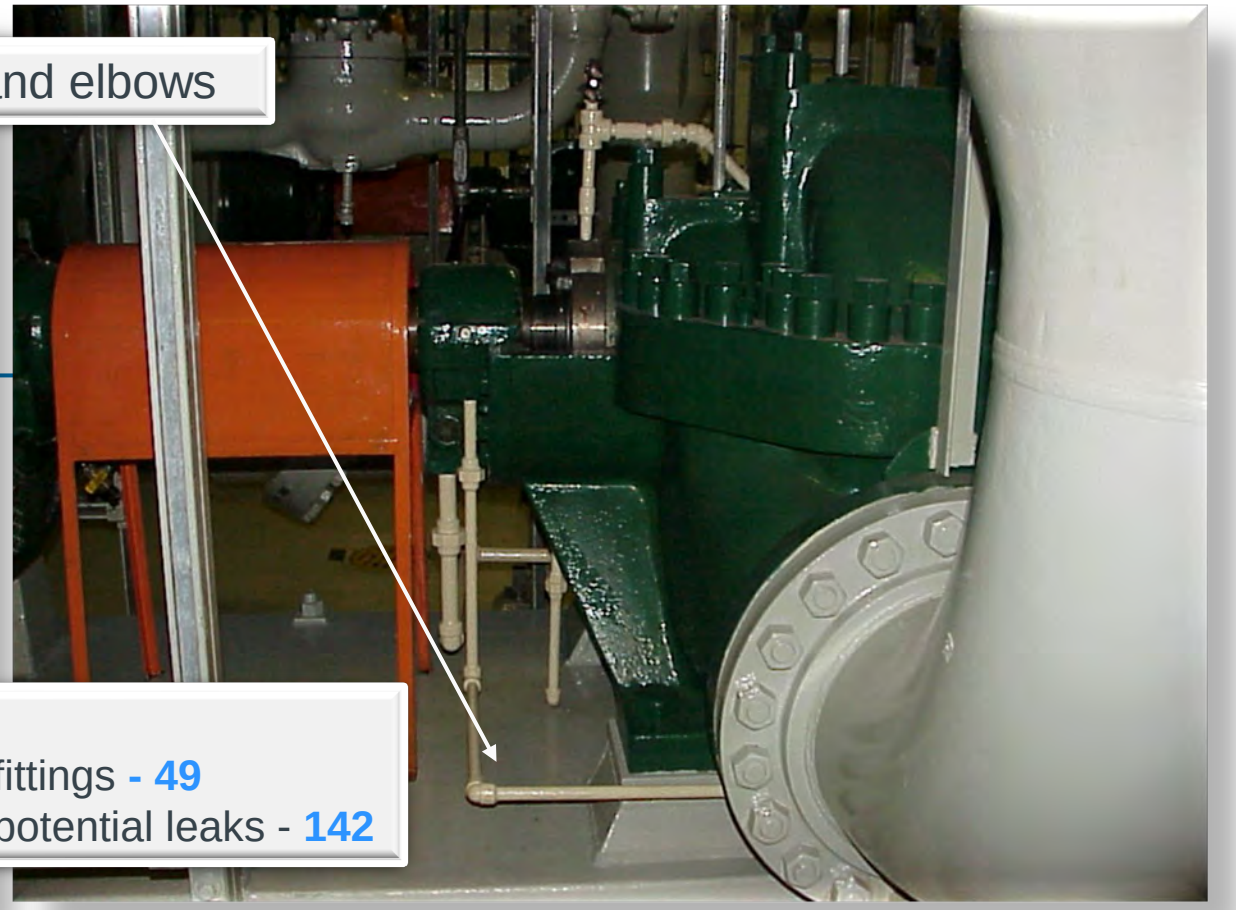
“WHAT IF…”

The next time you plan to install or repair your screwed or welded piping system, ask yourself **“WHAT IF…”**

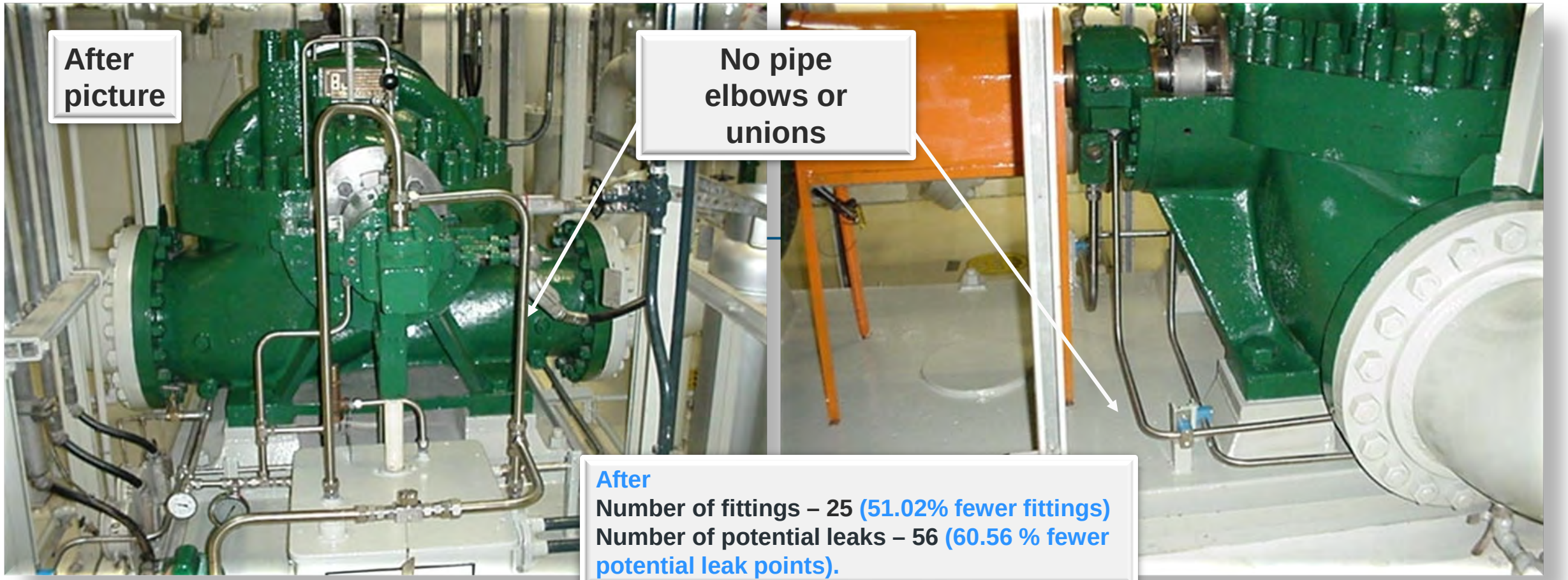
- You could install a **leak free tubing system** for less money?
- Your tubing system came with a **lifetime warranty**?
- **Safety and installation training** was available?
- A pre-startup **energy survey** could be performed?
- **CAD drawings** of Swagelok products existed to facilitate system design and layout?

Example: replacing all threaded pipe to tubing – 1”



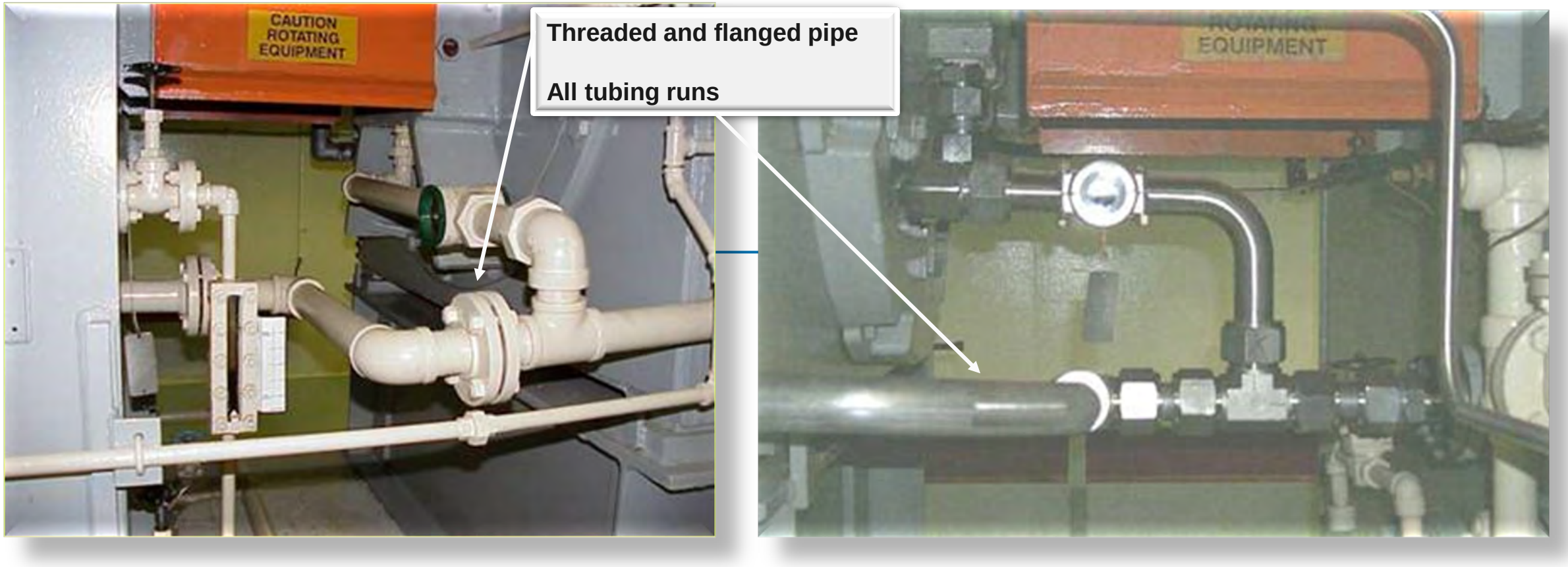


Example: replacing all threaded pipe to tubing – 1”

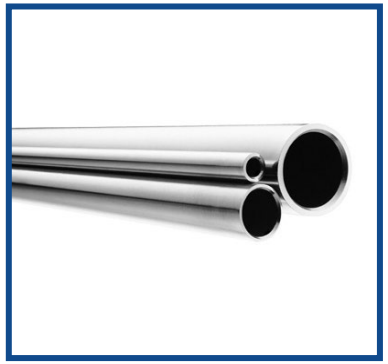


Every Swagelok connection acts as a union, for easy maintenance or modifications.

Example: replacing threaded pipe & flanges – 2”



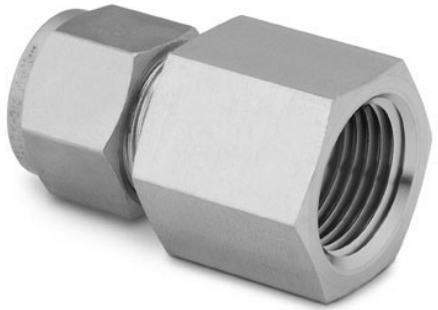
Swagelok Solutions to Support Total Process Installations (up to 2”)




Ability to source Third Party Products as Needed

Ability to Transition from Current Piping System (Threaded & Welded)?



Tubing Solution Advantages vs. Pipe Benefits

- Simpler
- Safer
- Faster
- More reliable

Reduce the costs to:

- Install
- Operate
- Maintain

Tubing Solution Advantages

Simpler

Field routing

- Bends to any angle up to 180°
- Offset bends
- Reduces fitting count

Fewer connections

- **Less Potential LEAK points**

- Conserve's space
- Solves construction problems

Tubing Solution Advantages

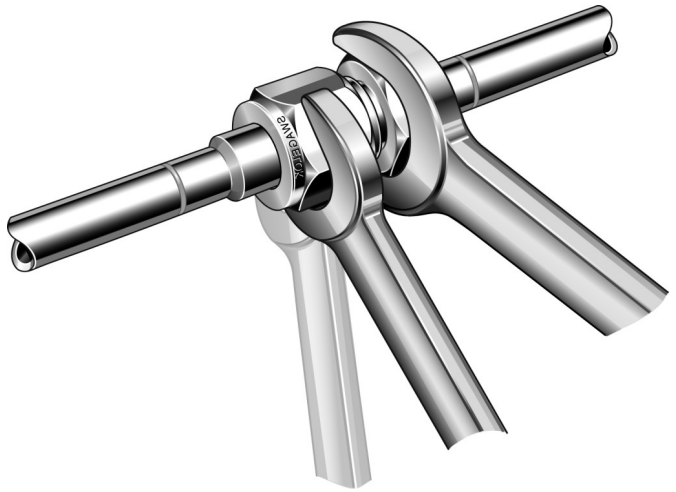
Safer vs. welded

- No hot work permits
- No welding gases
- No welding fumes
- No cutting oils
- Fewer metal shavings
- Safer in confined spaces
- Applicable to both B31.1 and B31.3 applications
- No fire watch

Tubing Solution Advantages

Faster

- **Tube benders**
- **Standard tools**
- Easy to use
  - Bends up to 180°
  - Multiple directions in a single tube
  - Fast, repeatable bends
  - Memory function
- Bends 3/4 in. to 2 in. and 18 mm to 50 mm
- Training



Tubing Solution Advantages

Reliable

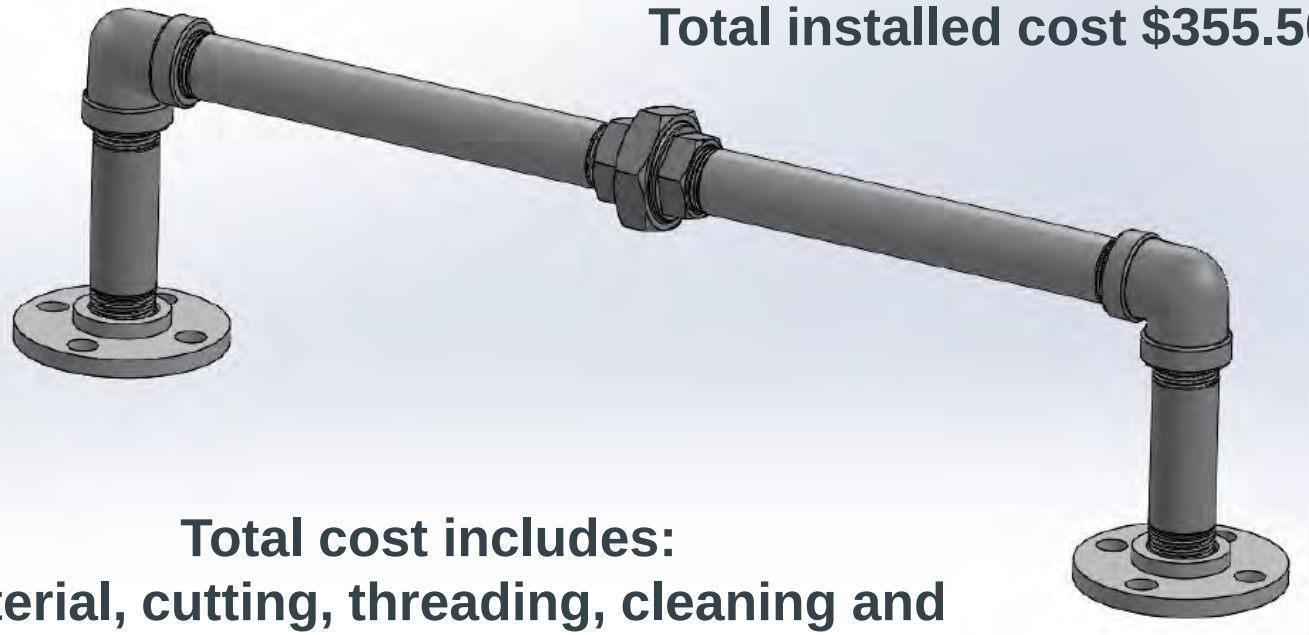
- Burst test
- Tube fittings
- Grips beyond the burst pressure of the tubing
- Stainless steel tubing
- 1 1/2 in. □ 0.188 wall
- Working pressure:
- **4900 psig** (337 bar)
- Actual burst:
- **21 000 psig** (1448 bar)

Screwed Pipe – Installed Costs

- Material Cost –$28.00
- Labor (Burdened) Cost Hourly – $45.00
- Installation Time per connection – 45 minutes
- Total Installed Cost (Matl. Cost + (Labor cost X Install. Time)
- **Total Cost - $95.50**
- Potential Leaks - 2

Source: local contractor labor and time rates

Threaded Pipe Assembly



1” stainless steel loop
9 potential leak points
Total installed cost $355.50

Total cost includes:
Material, cutting, threading, cleaning and Installing the above assembly

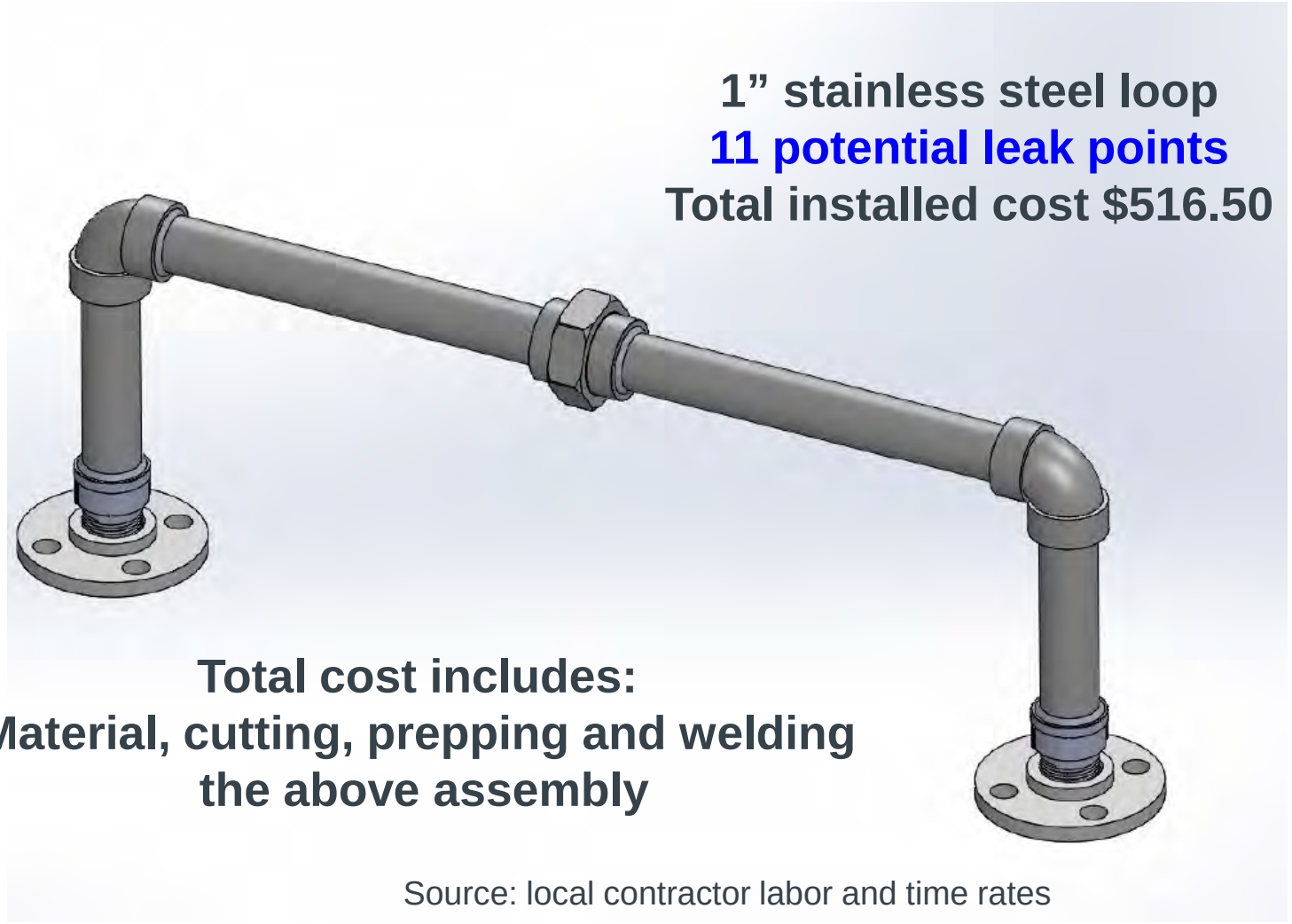
Source: local contractor labor and time rates

Welded Elbow – Installed Costs

- Material Cost – $28.00
- Labor (Burden) Cost Hourly – $45.00
- Installation Time per 1 hour per connection –
- Total Installed Cost (Matl. Cost + (Labor cost X Install. Time)
- **Total Cost – $118.00**
- Potential Leaks – 2
- * Helper and fire watch not included

Source: local contractor labor and time rates

Socket Welded Pipe Assembly



Source: local contractor labor and time rates

Swagelok Tube Fitting Elbow – Installed Costs

- Material Cost – $112.00
- Labor (Burden) Cost Hourly – $45.00
- Installation Time per connection – 15 minutes
- Total Installed Cost (Matl. Cost + (Labor cost X Install. Time)
- **Total Cost - $134.50**
- Potential Leaks 2

Source: local contractor labor and time rates

Tube Fitting Assembly

1” stainless steel loop
8 potential leak points
Total installed cost $423.50

Total cost includes:
Material, cutting, de-burring and swaging the above assembly

Source: local contractor labor and time rates

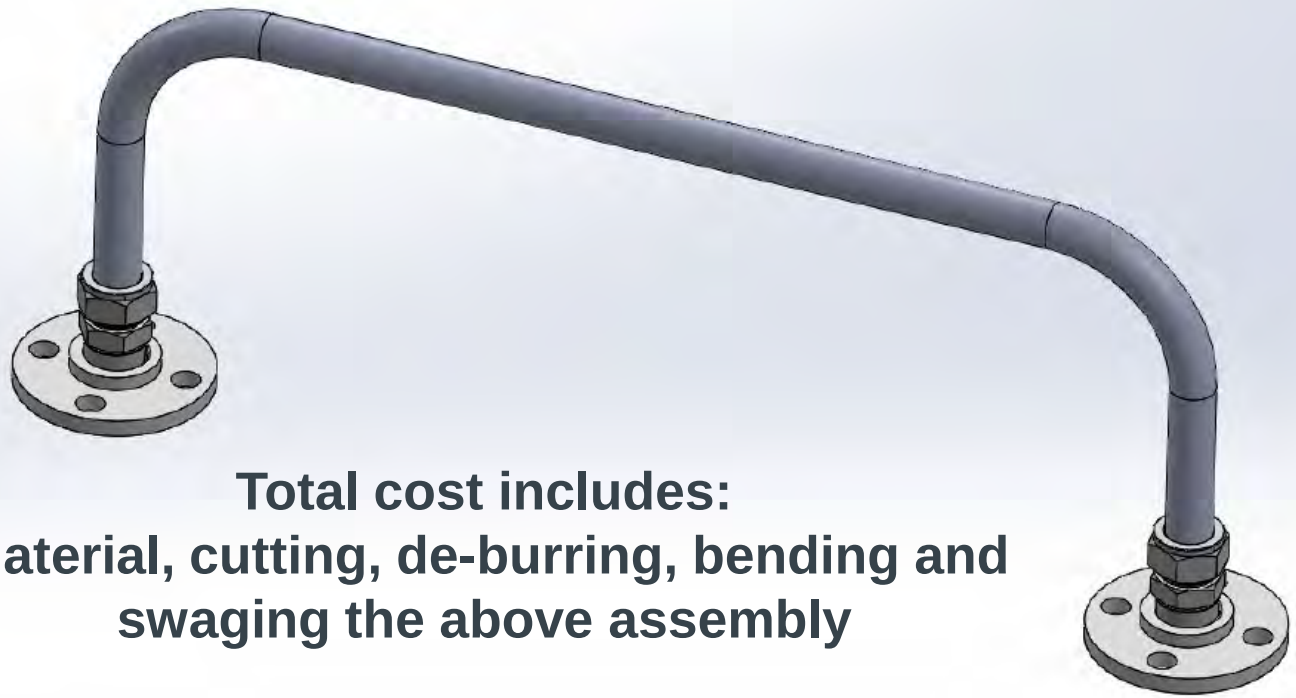
Tube Bend – Installed Costs

- Material Cost – $14.00
- Labor (Burden) Cost Hourly – $45.00
- Installation Time per connection – 15 minutes
- Total Installed Cost (Matl. Cost + (Labor cost X Install. Time)
- Total Cost - $25.25
- Potential Leaks - 0

Source: local contractor labor and time rates

Tube Bending Assembly

1” stainless steel loop
4 potential leak points
Total installed cost $177.00



Total cost includes:
Material, cutting, de-burring, bending and swaging the above assembly

Source: local contractor labor and time rates

	Total installed costs
Tubing system with Bent tubing	$177.00
Tubing system with Tubing elbows	$423.50
Orbital welded system With VCR union	$479.09
Screwed pipe system With pipe union	$355.50
Socket welded system With weld union	$516.50

Source: local contractor labor and time rates

Swagelok vs. Welded Pipe

Steam Heating System		
Cost	**Welded Pipe**	**Swagelok**
Material	$3 613.17	$11,397.20
Number of fittings	149	91
Total number of joints	320	196
Welder hours	480	32
Rate	$45.00	$45.00
Pipe fitter hours	720	204
Rate	$30.00	$30.00
Total labor costs	$43,200.00	$7,560.00
Total project	**$46,813.17**	**$18,957.20**

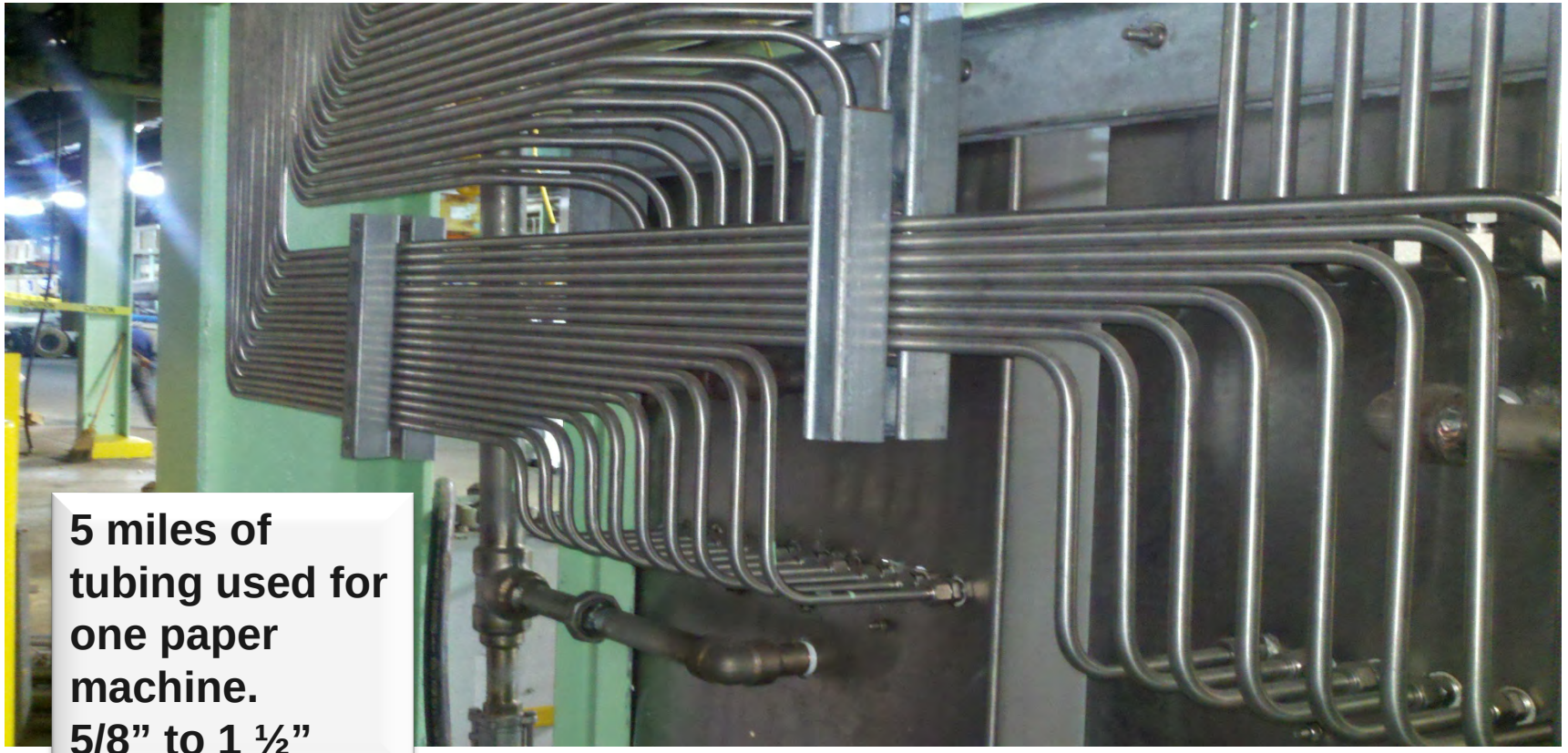
Reducing Installation Costs – 1” System with Bent Tubing vs. Welded/Threaded Pipe

Swagelok Process Solution

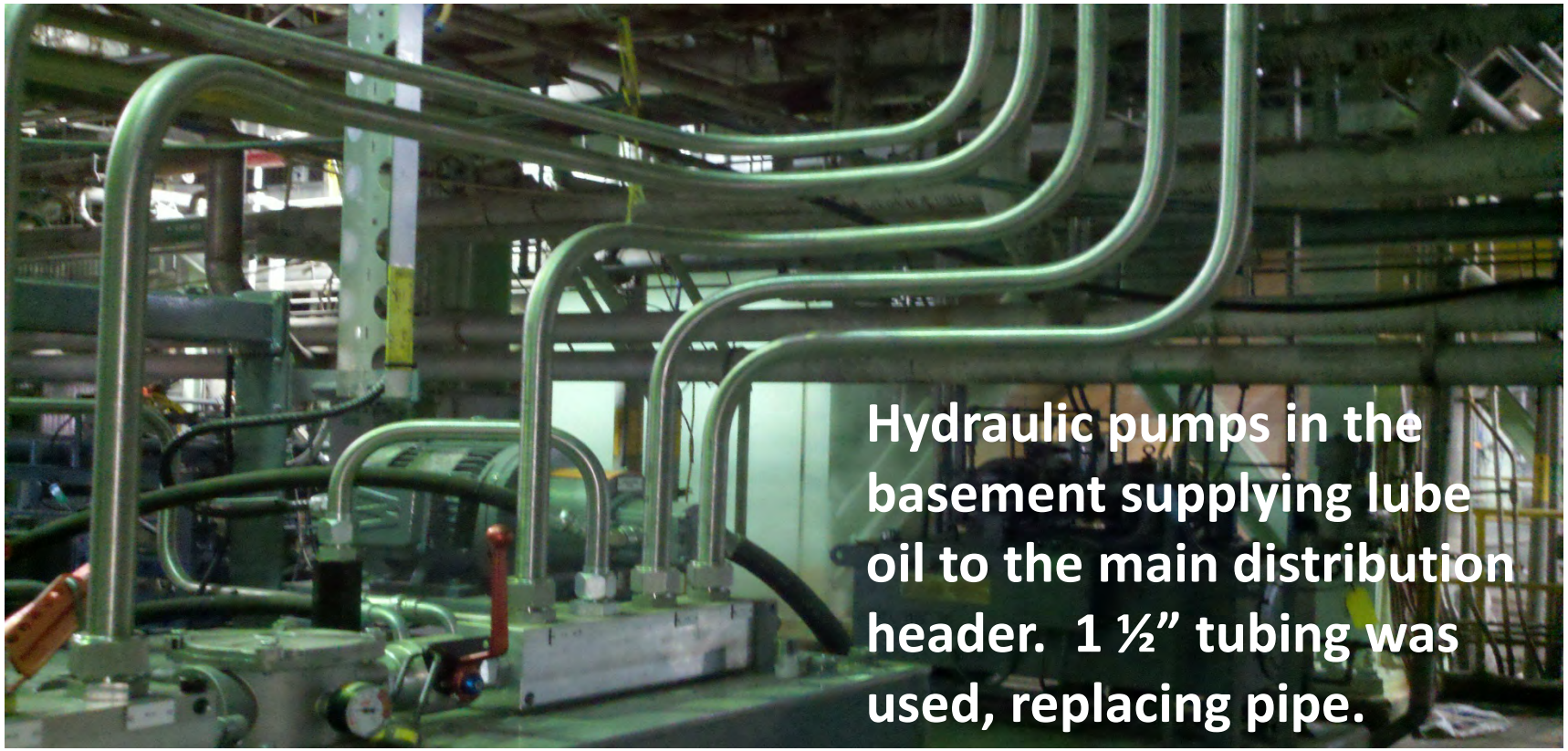
Save 59%

Traditional Piping System

Pulp and Paper bearing lube oil rebuild project



Pulp and Paper bearing lube oil rebuild project



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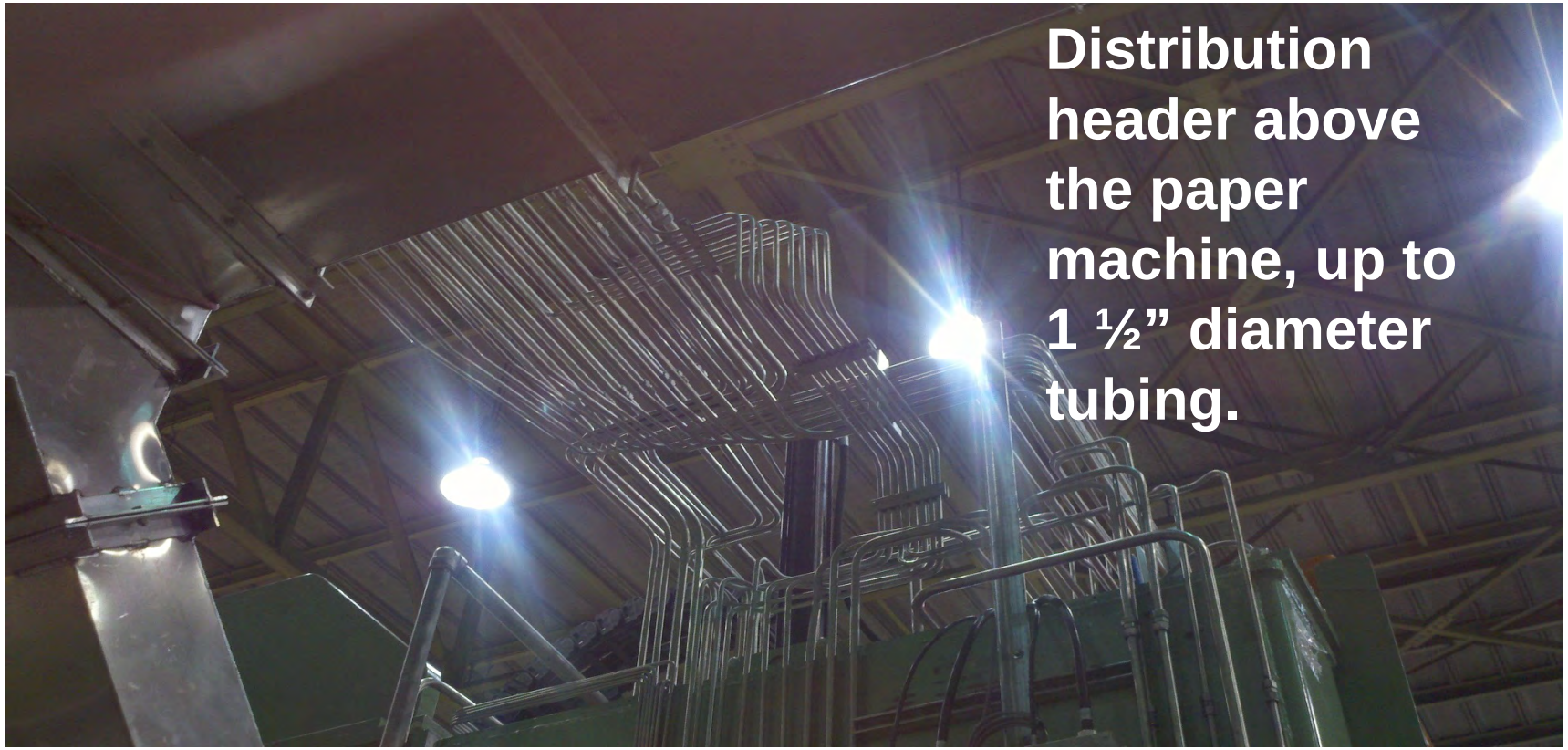
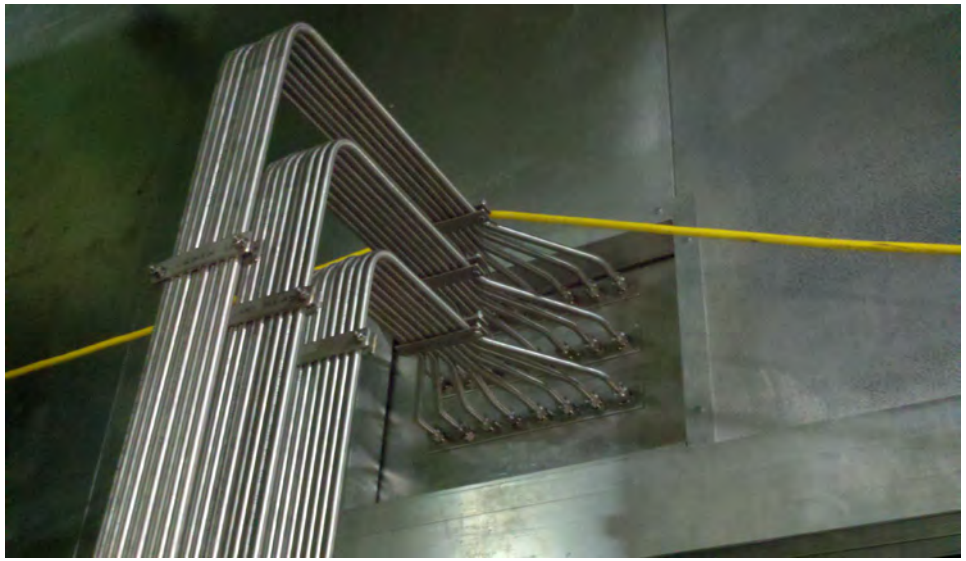
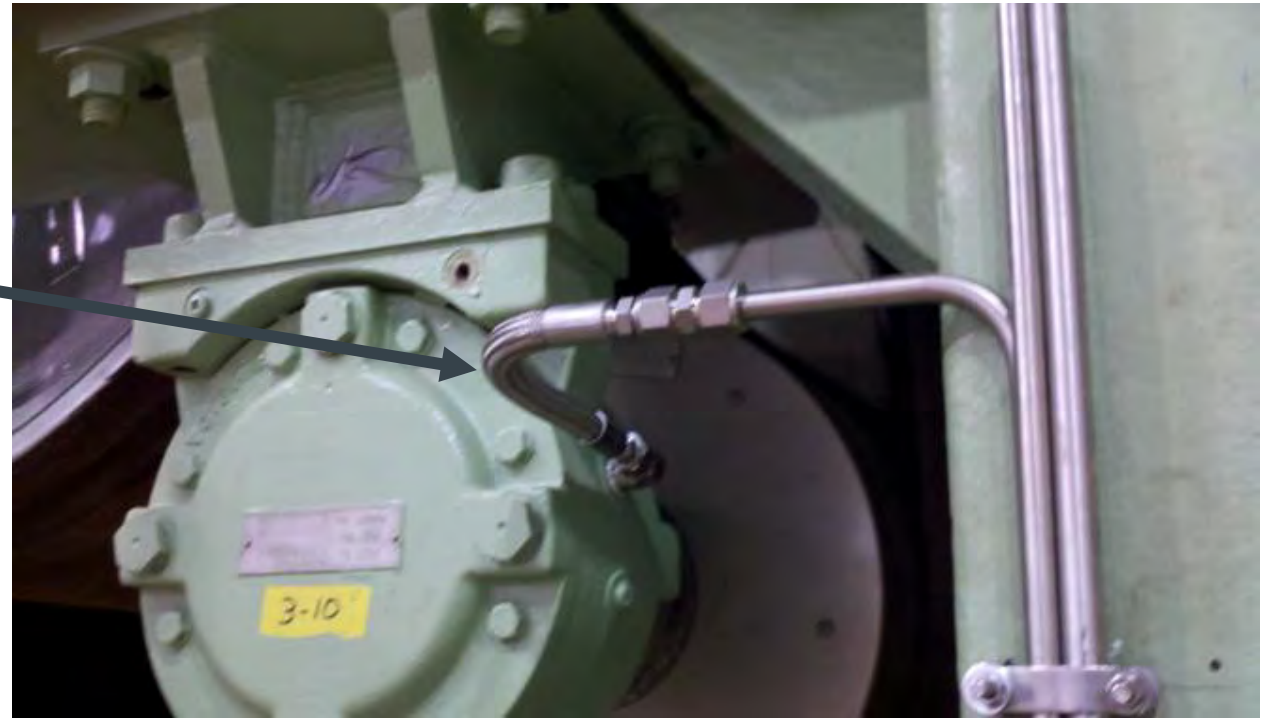


Pulp and Paper bearing lube oil rebuild project



Pulp and Paper bearing lube oil rebuild project

For ease of installation the last 12 to 18 inches to the bearings flex hose was used.



Project Installation Support Capabilities

Tools
Multi-head Swaging Unit, Table Top Bender, Tube Bender

Training

Certified Contractor Program
Referral

Upcoming Tech Talks

May Tech Talk: Gas Distribution Program

Wednesday, May 19th 11:00 am to 12:00 pm

Register for our free tech talk on the common challenges with today's industrial gas distribution systems.

*Led by Karim Mahraz, Swagelok's product manager for analytical instrumentation and custom solutions, this **60-minute tech talk** will cover what a gas distribution system is, why to make such systems a priority, common challenges, the role of pressure regulators, and the benefits of using Swagelok's innovative solutions.*

Questions?