CONDUIT PIPE DRYING

This Presentation will guide you to why systems fail!

This will also provide you with the knowledge to insure long life for your

Investment

Drainable and Dryable System Design Trough the Years

- 1950 to current Insulated carrier pipe inside a coated steel outer conduit
  - Insulation thickness sized to keep coating from seeing 100 degrees F IE 6" steam 3" insulation.

- 1988 to current insulated carrier pipe inside insulated steel outer conduit
  - Insulation thickness sized to keep annular space at 200 degrees F 6" steam 1.5" insulation

Why The Design Change

The Federal Government and Universities had a high rate of system failures!

- Low annular space temperature
- Poorly maintained cathodic protection system
- Flooded systems not dried out and started up

System Design Changes

- Dry in place
- Design a system with a higher internal temperature
- Eliminating exposed metal by covering anchors not just coating with paint

Is my System Performing at the Level It Was Designed to?

What are the signs it's not!

- Steam vapor coming out of manhole cover
- Higher energy cost then budgeted for
- Water dripping from drains on end plates
- Manholes hotter then design and corrosion damage on end plates

These are just a few signs your system is failing.

COMMON SIGNS OF CONDUIT FAILURE DUE TO WATER

Unless you're drinking it or bathing in it, water is bad.

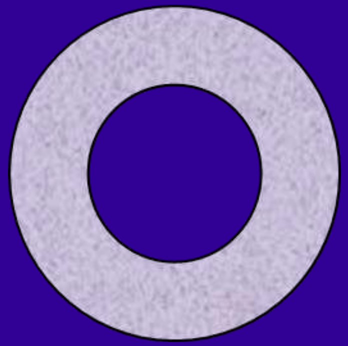
- Poor Protection During Construction
- Flooding of Manholes & Vaults
- Humidity During Instalation

PREVENTATIVE MEASURES NEEDED DURING INSTALLATION

- Dewatering plan in place when rain is a threat
- Sealing field joint areas nightly
- Complete field joints
- Seal with plastic wrap
- Only place as much pipe in the trench as can be protected

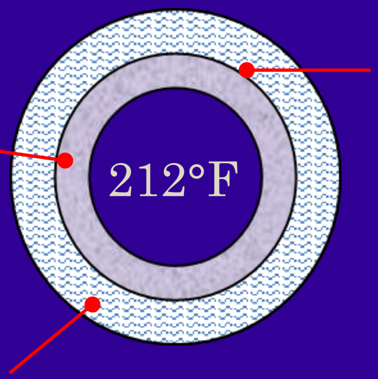
Effects Water Has On Conduit Piping Systems

- Corrosion of conduit pipe and service pipe
- 75% Loss Of Thermal Efficiency Due To Wet insulation
- Costly Repairs Needed And Even Total System Failure



Dry Insulation
Pipe Temp. Per Design
Insulation Surface Temp. Per Design

Wet Insulation – Initial Flood Event
Pipe Temp. Less Than 212°F
Insulation Surface Temp.≈ .75 Pipe Temp

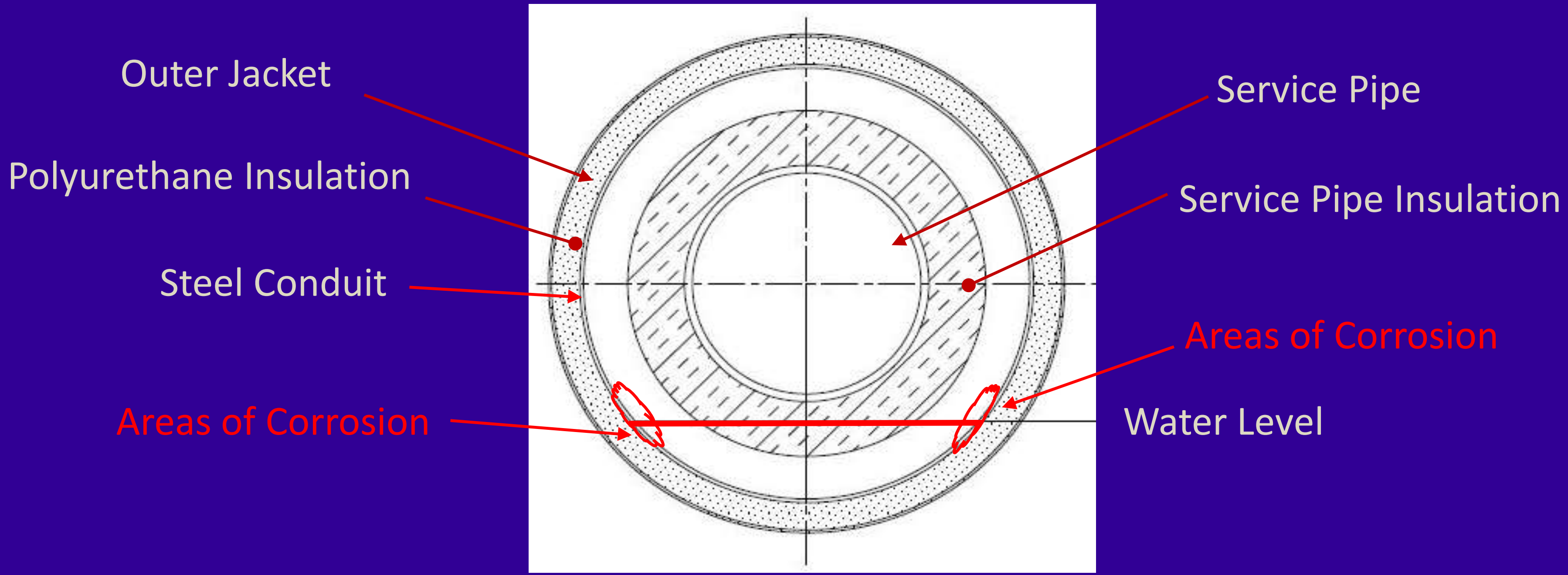


Wet Insulation – Initial Flood Event
Pipe Temp. Greater Than 300°F
Insulation Surface Temp.≈ .75 Pipe Temp. (after water in the conduit lowers to a level below the “dry inner band”

Conduit interface temperature goes above 206 degrees F

Typical Areas Of Corrosion

Depending on water level, carrier pipe corrosion can also occur.



Drying Of A Wet Conduit System

- Pressure test entire conduit to check for leaks in outer conduit pipe
- Flush any mud/debris that may have entered the conduit with clean water
- Ensure all plugs & valves are removed from end of system where air will be exhausted & begin the flow of dry air
- CFM required is based according to conduit diameter SCFM = annular space cross sectional area (ft.2) x air velocity (20ft. / sec.) x 60 (sec./ min.)
    - Air must be oil free
    - Have a dew point of -20F or less
    - Not to exceeded 10psi of pressure in conduit
    - Air must be induced at a constant and flow until system is dry
    - Take a initial dew point reading
    - Heating of the service pipe can aid in drying but must be done at a safe temperature
    - Once a satisfactory reading of the air exiting the conduit is made stop the flow of air
    - Allow system to rest for 4hrs then begin flow of air and read dew point of air exiting containment
    - If reading is +20 dew point or lower the flow of air may be stopped. Continue the flow of air if greater than +20 dew point

Example

SCFM Required To Properly Dry A 6" Steam Line With 2" of MinWool Insulation in a 12 ¾" Conduit

Annular Space Cross Section (.33ft2) X Air Velocity (20ft/Sec) x 60(sec/min) = 130 SCFM

Water Removal Rate

•Calculated By Measuring inlet air dew point and outlet air dew point

Example

Inlet air with a measurement of -20 Dew Point is removing .26 gallons of water per 100,000cfm Outlet air a measurement of +40 Dew Point = 5.4 gallons of water per 100,000cfm

Water Removal Rate (5.40-.26) gal of Water x 20 SCFM x 1440 (minutes per day) = 1.5 Gallons Of Water Per Day 100,000SCF




How Long Will It Take To Dry?

- Type & thickness of insulation
- Length of conduit system wetted
- Temperature of service pipe (optional heating)
- Flow of air
- Incoming air dew point
- Constant Flow Of Air

EXAMPLE

4” High Temperature hot water line with 2” of MinWool Insulation In A 10 ¾” Conduit Approximately 350’ of piping was fully wetted

Initial dew point reading of HWS - (+55 F) - Based on the average of five (5) different tests over a 1 hour period

HWR - (+60 F) - Again based on average of five (5) different tests over a 1 hour period

Dew Point readings 3 days later HWS - (+22 F) - Based on the average of five (5) different tests over a 30 minute period

HWR - (+28 F) - Again based on average of five (5) different tests over a 30 minute period

Dew Point Reading 8 days after initial reading

HWS - (-40F) - Based on the average of five (5) different tests over a 30 minute period

HWR - (-35F) - Again based on average of five (5) different tests over a 30 minute period

Dew Point Readings After 4hr shutdown and equalization period

HWS - (-14 F) - Based on the average of one (1) test over a 5 minute period

HWR - (-22 F) - Again based on average of one (1) test over a 5 minute period

Annual Dryness Testing Of Existing Systems

- Yearly pressure testing of outer containment
- Inspection that all check valves, drains and plugs are installed
- Inspection of Gland Seals/End Seals
- Dew point check of air inside containment
- Drying of conduit if presence of water is found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