

## New Technologies for Tackling Corrosion in Active Fire Protection Systems



## Let's remind ourselves what corrosion is

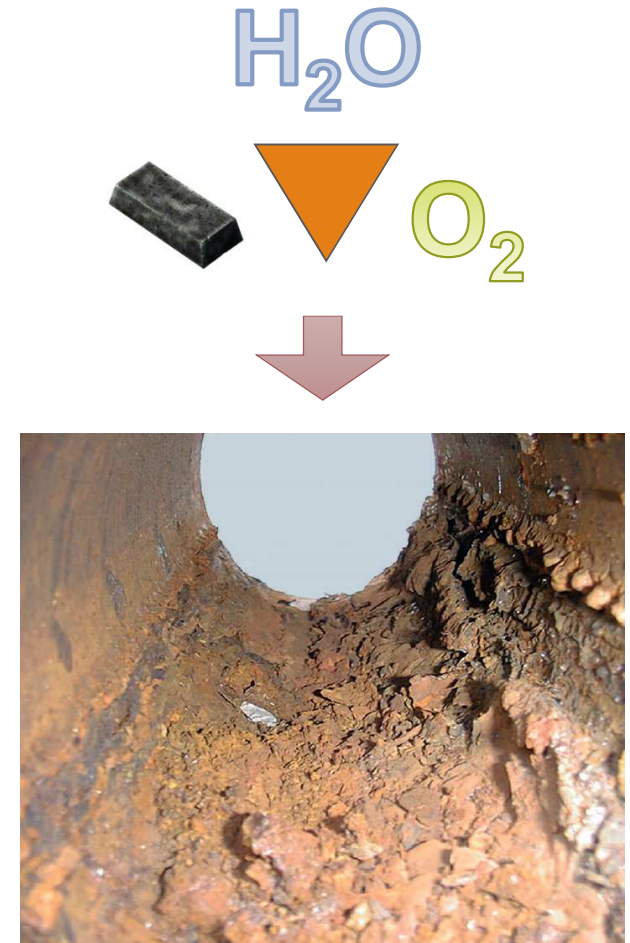
Corrosion is...the erosion or wearing away of material through chemical action

Steel pipes contain iron which will rust when in the presence of water and oxygen

First the metallic iron is partly dissolved in the water

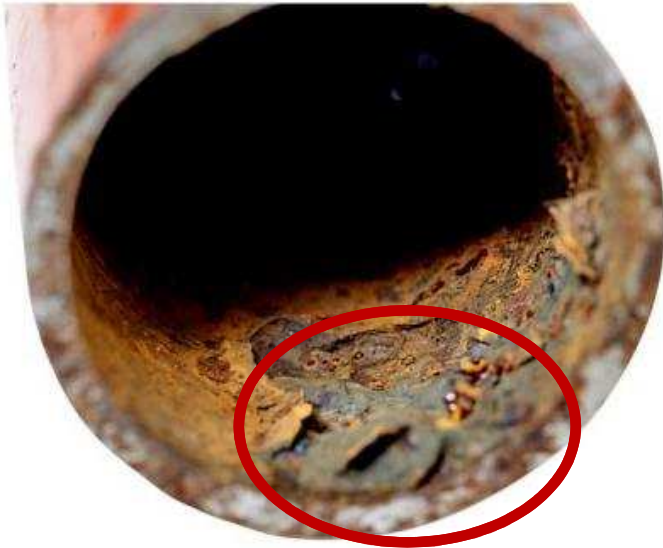
The resulting iron ions then combine with the oxygen in the air and water to form iron oxide

So why is that an issue?



## Surface corrosion

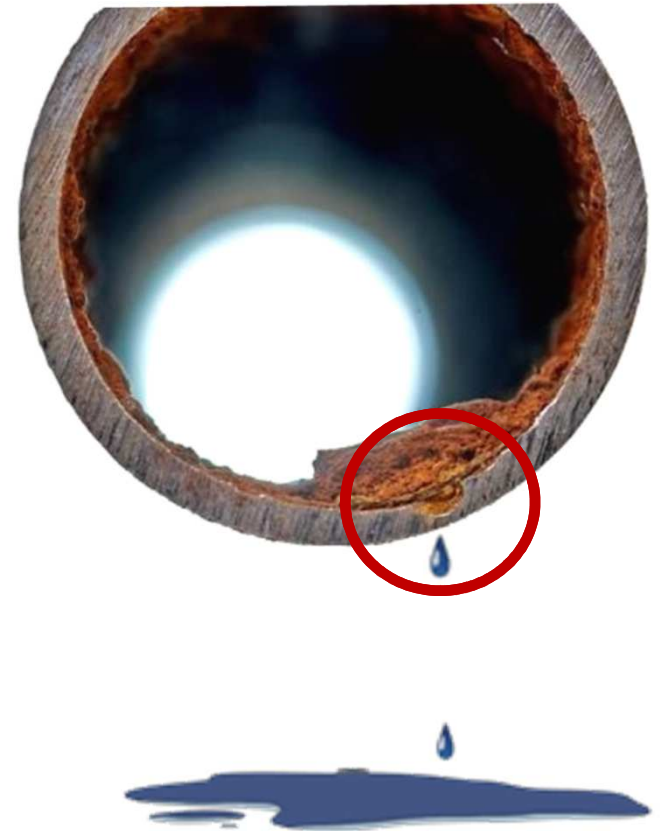
- Rough surfaces
- Encrustations
- Deposits



- Increased pipe friction
- Reduced clear cross-section of the pipes
- Clogging due to corrosion deposits
- Leakages

## Pitting corrosion

- Perforation
- Rust-through



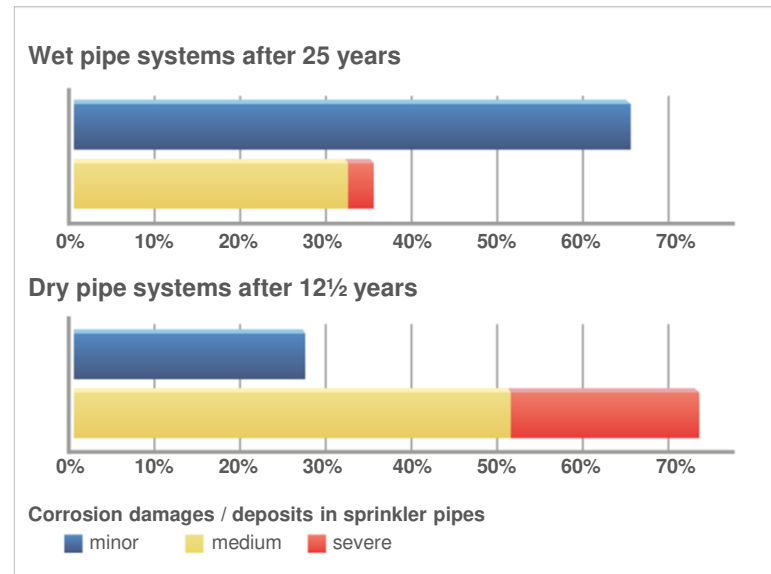
## Corrosion is not rare and often remains undetected

### Wet pipe systems

- Traditionally, pipes are untreated on the inside with only the outside receiving paint or powder coating
- Medium to severe corrosion issues in 1/3 of wet pipe systems after 25 years

### Dry pipe and preaction systems

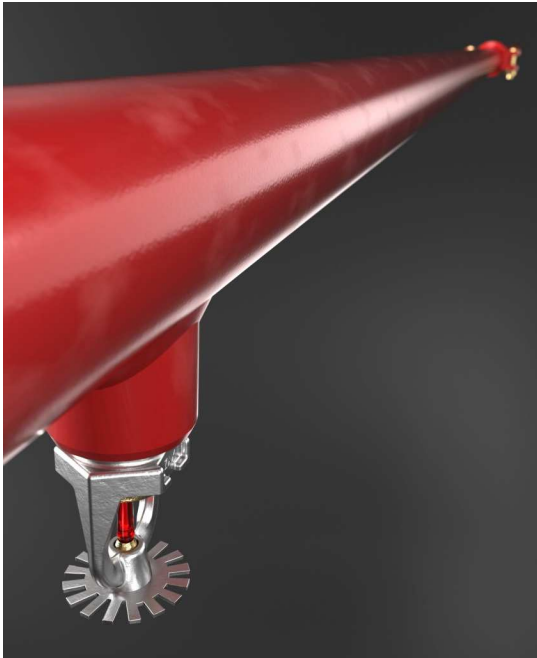
- Particularly at risk due to moist compressed air and water that collects in the low points of the piping and remains after drain-down
- For many years, typically constructed with galvanized pipes
- Medium to severe corrosion issues in 2/3 of dry pipe systems after 12½ years
- **Problems remain undetected for long periods of time**
- **High repair costs in the long term**



Source: VdS Schadenverhütung (statistics old system inspections)



## Are we inspecting our systems as we should?



The problem remains hidden – how do we uncover it?

Inspections are required:


### EN14972-1

- Annual inspection of pipework for corrosion – External only
- 12 nozzles removed after 5 years for inspection and test
- Flushing and inspection of pipework after 10 years



### NFPA 750

- Refers to requirements of NFPA 25
- Internal inspection minimum every 5 years

A close-up photograph of a metal surface that has undergone severe corrosion. The surface is covered in a thick, brownish-orange layer of rust, with deep, irregular pits and cracks. A black rectangular text box is overlaid on the left side of the image. The background is a plain, light blue-grey color.

So what are our options?

## Galvanized pipe is no longer the solution

### Problems with galvanized pipes

- For many years, galvanized pipes were preferred for dry pipe and pre-action sprinkler systems and for wet pipe low pressure water mist
- Disintegration of the zinc layer caused by residual moisture in combination with salts, oxygen and carbon dioxide in dry systems
- Hydrogen formation may occur due to corrosion – several pumphouse explosions have been reported, some resulting in injuries

### Reactions in the world of standards

- Since 2013, NFPA shows no better C-value for galvanized pipe than for untreated steel pipe
- Since 2014, VdS no longer recommends galvanized pipe in dry pipe systems
- Since 2016, FM requires the integration of N<sub>2</sub> generators in galvanized dry pipe / preaction systems or other comprehensive measures to mitigate the risk of corrosion
- FM has prohibited galvanized pipes in wet pipe systems since 2017 due to the hydrogen issue
- CEA 4001 'strongly advises' against use of galvanised piped in wet systems
- CEA 4001 does not recommend galvanised for dry systems "due to the potential increase of the corrosion rate"





## What about stainless steel or CPVC pipes...



Great corrosion performance...but they add significant cost to many systems



...certainly performs very well against corrosion but is not suitable for dry or higher pressure systems



## Steel is still a very good choice for pipework



- Steel pipes have been used for decades in our industry
- The market is adapted to using them (on-site processes, tools, fittings etc)
- Steel pipes are easily sourced

### HOWEVER

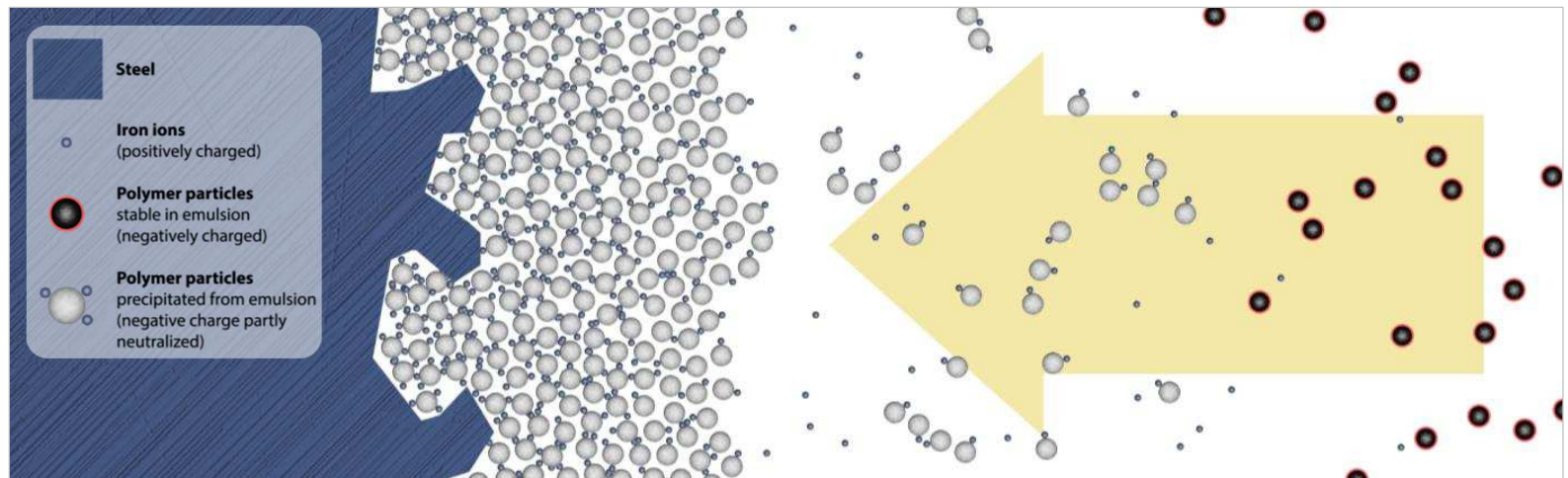
- We need to improve their corrosion performance
- We are not alone in tackling corrosion
- Looking at other industries we adapted well-established corrosion processes to pipework

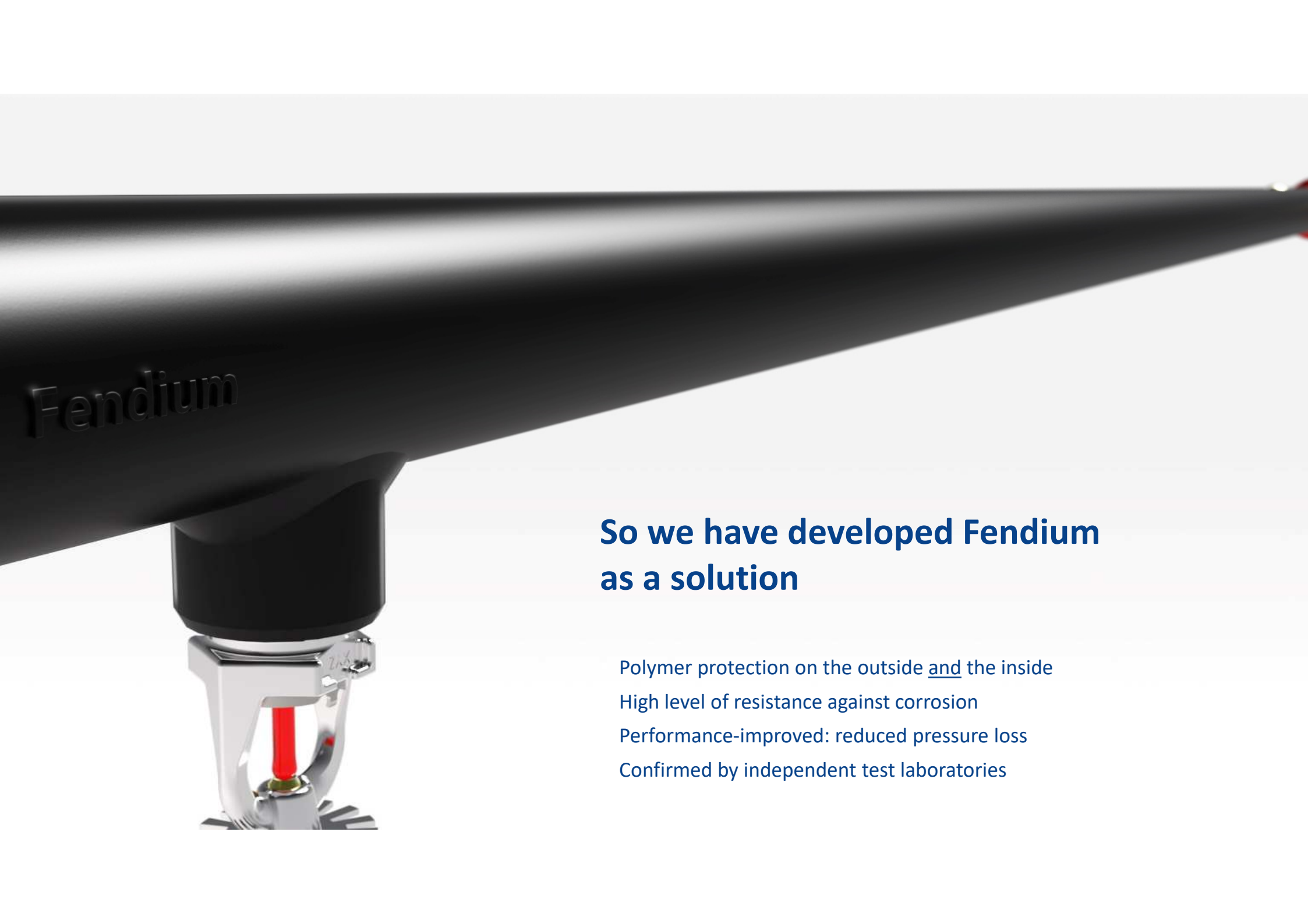


## We developed existing technology to suit fire protection pipework

- The steel pipe (standard EN spec) is first cleaned in several baths
- The steel pipe to be enhanced is dipped in a tank filled with polymer emulsion
- The pipes are not being coated or painted – this is bonding process on a microscopic level
- Fluorides ions in the emulsion cause a release of iron ions from the pipe surface
- Positively charged iron ions partly neutralize the negative charge of polymer particles
- Polymer particles combine with each other and are attracted to the positively polarized steel pipe surface
- The polymer protection is developed and the pipe is smoothed out – **outside and inside**
- Once the desired polymer protection is achieved, the pipe is removed from the dip tank

## We now have pipework treated against corrosion on the inside and outside



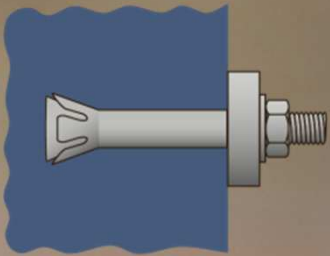


Fendium

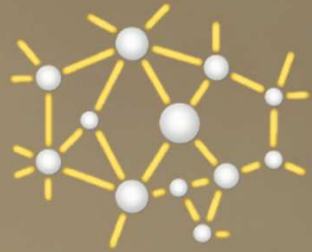
## So we have developed Fendium as a solution

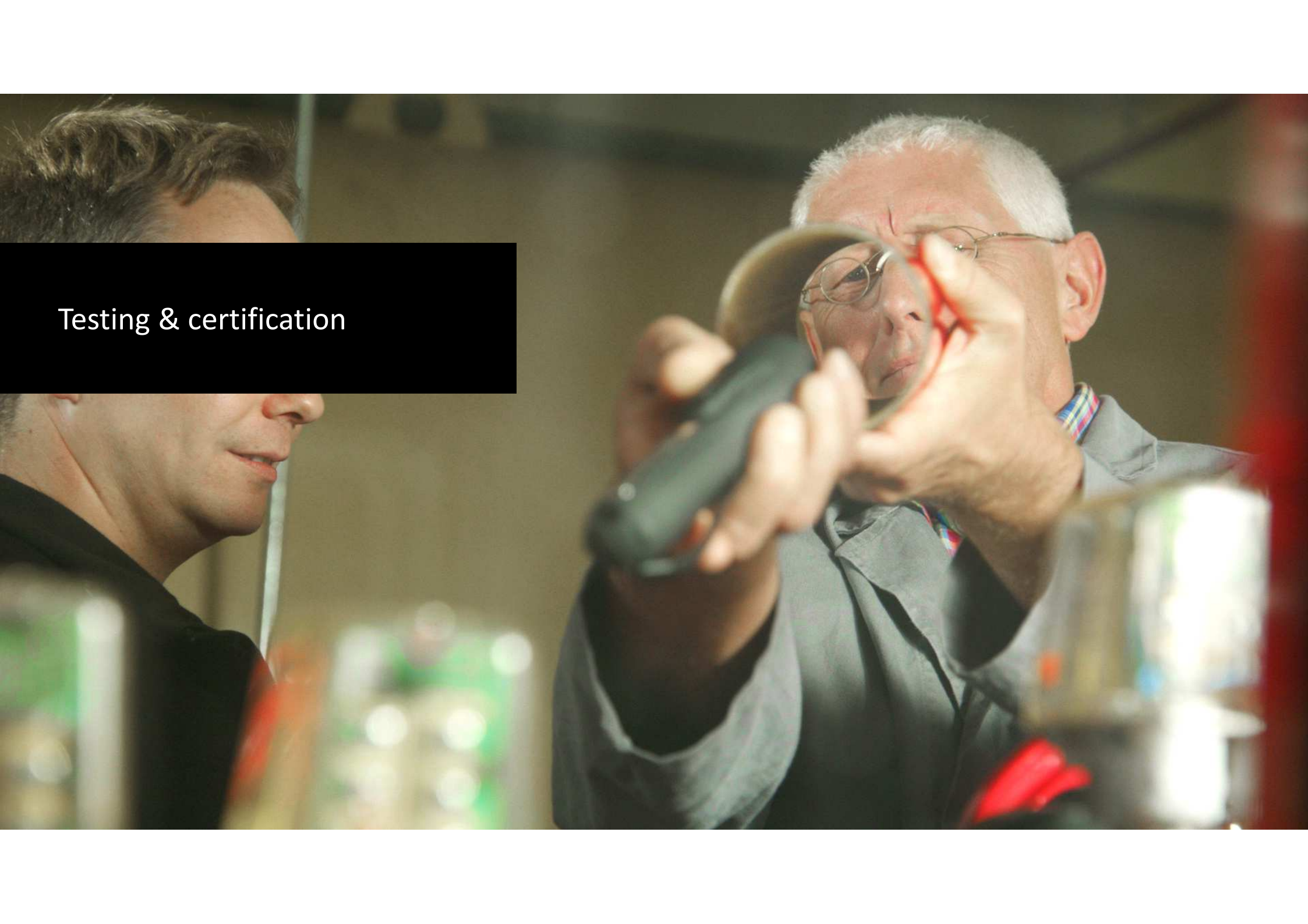
- Polymer protection on the outside and the inside
- High level of resistance against corrosion
- Performance-improved: reduced pressure loss
- Confirmed by independent test laboratories





- A strong and corrosion resistant surface locked to the steel pipe
- Treatment on the outside and the inside
- Increased smoothness of the surface improved hydraulic performance
- Two levels of treatment for wet and dry/preaction/deluge systems
- Powder coat can be added as part of the process (Fendium is naturally black)
- Grooved and threaded pipes available
- Prefab or standard 6m lengths



A photograph showing two men in an industrial or laboratory setting. The man on the right, with white hair and glasses, is wearing a grey button-down shirt and is focused on inspecting a component. He is holding a black handheld device, possibly a scanner or a specialized tool, against a circular object. The man on the left is partially visible, looking towards the first man. A black rectangular box with white text is overlaid on the left side of the image.

Testing & certification

1 Month



6 Months



Testing by FM validates our claims

1 Month



Testing by FM validates our claims

1 Month



3 Months



Testing by FM validates our claims

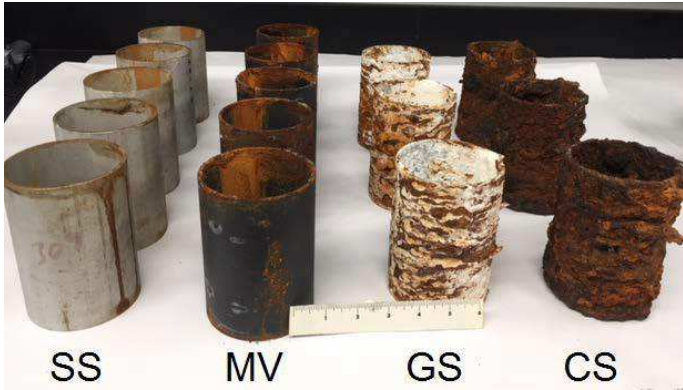
1 Month



3 Months



6 Months






# Salt spray testing

26710\_Fendium - IWS corrosion test\_720h\_slide show\_English.mp4 - VLC media player

Media Playback Audio Video Subtitle Tools View Help



## Fendium

Salt spray test

A direct comparison of untreated steel pipe, Fendium polymer-enhanced pipe and galvanized steel pipe

© Viking S.A.

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The pipes are now FM and VdS approved:

- C140 confirmed
- Grooved & threaded
- Wet, dry, preaction & deluge
- DN25 to DN300
- Standard black or painted options

However, prefab is not a single product, the production is just as important:

- The dedicated factory is also approved to produce prefabricated pipes



## Benefits for contractor and end-user alike

- Long lifespan, up to **10-year guarantee** against rust-through\*
- **Low pipe friction** allows the use of smaller pipes or smaller pumps in many cases
- Smaller pipes **weigh less** and are therefore easier and faster to install
- Available with different levels of polymer protection suited for different corrosive conditions
- Standard Fendium black or tailored colour options available



\*Subject to agreement







# Fendum

– Simply the better pipe

