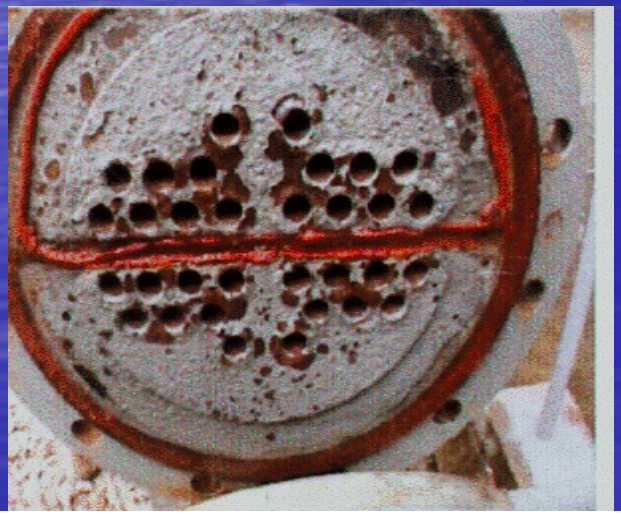
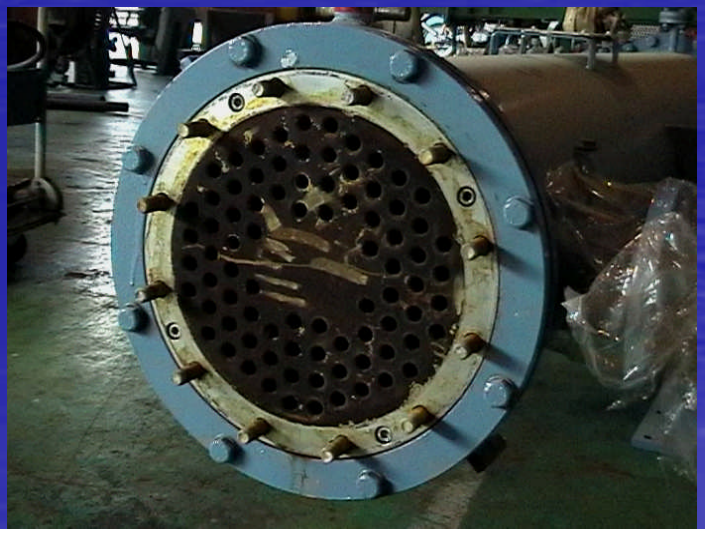
Anion Performance Chemicals

A Billion Dollar Problem!!!

Water borne sedimentation i.e. Scale, rust, lime, mud and silica that builds up in the waterside of your equipment causes Billions of dollars in losses to industries in breakdowns, unplanned shutdowns, process contamination, high product reject rate, expensive parts replacements etc..





What is Scale?

Anion D'Scale

Scale is a coating or precipitate deposited on surfaces that are in contact with hard water. Water that contains carbonates or bicarbonates of calcium or magnesium is especially likely to cause scale. When water is heated or evaporation takes place, scale minerals precipitate layers of rocklike deposits inside pipes, water heaters, equipment, and on fixtures and glassware. While most common scale is a result of calcium carbonate, other combinations of ions commonly found in water offer a variety of scale.

Illustration

Anion D'Scale

Scale deposits interfere with heat exchangers and reduce their efficiency by insulating the heat transfer surfaces. The most common form of scale in cooling water systems is calcium carbonate (CaC03). In the water, calcium ions combine with bicarbonate to form calcium bicarbonate: (Ca++)+(2HCO) Ca(HCO3)2.

If scale deposits are left to accumulate, water flow is restricted and piping and heat exchanger tubes become plugged. Ultimately, ignoring scale depositions can lead to the destruction and possible failure of heat exchanger tubes. In addition to loss of efficiency, process contamination can occur.

Anion D'Scale

Common Evidence of Scale

Scale is most visually evident as hard white to off white deposits which build-up in faucets, showerheads and drains. Scale leaves deposits on dishes, glassware, sinks, countertops and on vehicles that were just washed. Most scale formations are hard and very difficult to clean. Visual references also include fixtures such as toilets, bathtubs, showers and appliances like coffee and icemakers. Swimming pools and spas can experience scale build up on tile and pump equipment. *Cooling towers have tremendous scale problems that causes industries alone a billion dollars a year to remove.* Evaporative coolers, boilers, car washes, irrigation systems, processing equipment, paper pulp mills all experience scale problems. *Because scale forms a "coating" it can significantly effect thermo-transfer and reduce the flow of fluids. The increase of fuel cost due to scale build-up is astronomical.*

Present or Conventional Methods Used to Remove Water Borne Sedimentation.

- *Industrial Acids e.g. Phosphoric Acid, Sulfuric Acid, Barium Nitrate, Glycine Acid etc..*
- *Rodding*
- *High Pressure Steam*
- *Scrapping*
- *High Pressure Water Jet*

- ***Last but not least - replacement of the equipment!***

None of the above are effective, some are even damaging to the equipment, in that some of these methods can only bring the equipment back to optimum operating efficiencies by compromising downtime, and the integrity of the equipment.

Present Methods of Preventing Sedimentation or better known as Fouling.

Ion-Exchange
Phosphates
Permanent Magnets
Electronic Conditioning
Inhibitors - scale, rust, algae, bacteria

Some of the above methods are effective in SLOWING DOWN the process of scaling and should be used, BUT it does not remove or totally prevent sedimentation build up.

The Retardation of Heat Transfer Caused by Fouling in Heat Exchangers Is the Prime Reason for the Increase in Energy, Maintenance, and Operational Cost

What is fouling?

Fouling is generally defined as the accumulation of unwanted materials on the surfaces of processing equipment. It has been recognised as a nearly universal problem in design and operation and affects the operation of equipment in two ways:

- The fouling layer has a low thermal conductivity. This increases the resistance to heat transfer and reduces the effectiveness of heat exchangers – increasing temperature
- As deposition occurs, the cross-sectional area is reduced, which causes an increase in **pressure drop** across the apparatus

Cost Due to Fouling

Despite the enormous costs associated with fouling, only very limited research has been done on this subject. Reliable knowledge of fouling economics is important when evaluating the cost efficiency of various mitigation strategies. The total fouling-related cost can be broken down into four main areas:

- **Capital expenditure, which includes excess surface area (10-50%, with an average around 35%), costs for stronger foundations, provisions for extra space, increased transport and installation costs**
- **Extra fuel costs, which arise if fouling leads to extra fuel burning in furnaces or boilers or if more secondary energy such as electricity or process steam is needed to overcome the effects of fouling**
- **Production losses during planned and unplanned plant shutdowns due to fouling. These are often considered to be the main costs of fouling and are very difficult to estimate**

Cont.

According to Pritchard and Thackery (Harwell Laboratories), about 15% of the maintenance costs of a process plant can be attributed to heat exchangers and boilers, and of this, half is probably caused by fouling

Fouling can be very costly in refinery and petrochemical plants since it increases fuel usage, results in interrupted operation and production losses, and increases maintenance costs. Panchal (Argonne National Laboratory), based on the study of Van Nostrand, re-estimated the energy and economic penalties associated with heat exchanger fouling for the US refineries, as more than **$2 billion per year.** The maintenance costs in the USA were revised because they have increased significantly due to recent environmental regulations. Typically, cleaning costs are in the range of $40,000 to $50,000 per heat exchanger per cleaning

Garrett-Price and Pritchard found that total heat exchanger fouling costs for highly industrialised countries such as the US and the UK are about 0.25% of the countries' gross national product (GNP). Steinhagen et al found that the fouling costs for New Zealand are 0.15% of the New Zealand GNP, which is less than for industrialised countries. Using these percentages, Müller-Steinhagen lists total fouling related costs for various countries based on 1992 US$. - NEXT PAGE figure 1

Figure 1

Country	Fouling ($Million)	1992 GNP ($Billion)	Fouling Costs/GNP %
UK	2500	1000	0.25
US	14,175	5670	0.25
New Zealand	64.5	43	0.15
Germany	4875	1950	0.25
Japan	10,000	4000	00.25
Australia	463	309	0.15
Total Industrialised World	45,029	22,510	0.20

Energy Is by Far the Largest Component of the Total Life Cycle Cost of Most Energy-using Equipment

The evidence above shows that fouling on the waterside of your equipment will increase your energy cost tremendously. Current methods of maintenance/cleaning would not be able to address this problem as equipment is not cleaned to bare metal and fouling is spread over a large surface area

A good proactive/predictive maintenance programme, with regards to waterside fouling, reduces unplanned shutdowns, astronomical energy and operational costs, lower maintenance budgets and maintaining optimum operating efficiency in equipment. The effectiveness of heat exchangers is reduced with the increase in thermal resistance; even a minute layer of fouling reduces thermal conductivity. Due to the;

1. Introduction of new water continuously,
2. Existing fouling in the piping system,

Fouling cannot be avoided in everyday situations, it can only be minimised

Two basic and effective ways to reduce energy costs that apply to all energy production, distribution and end-use categories are

1. To reduce the load or need for energy
2. Increase the operating efficiency of energy-using equipment

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Beebe, Ray (1995) *Machine Condition Monitoring* MCM Consultants (1995 Reprint) ISBN 0646250884

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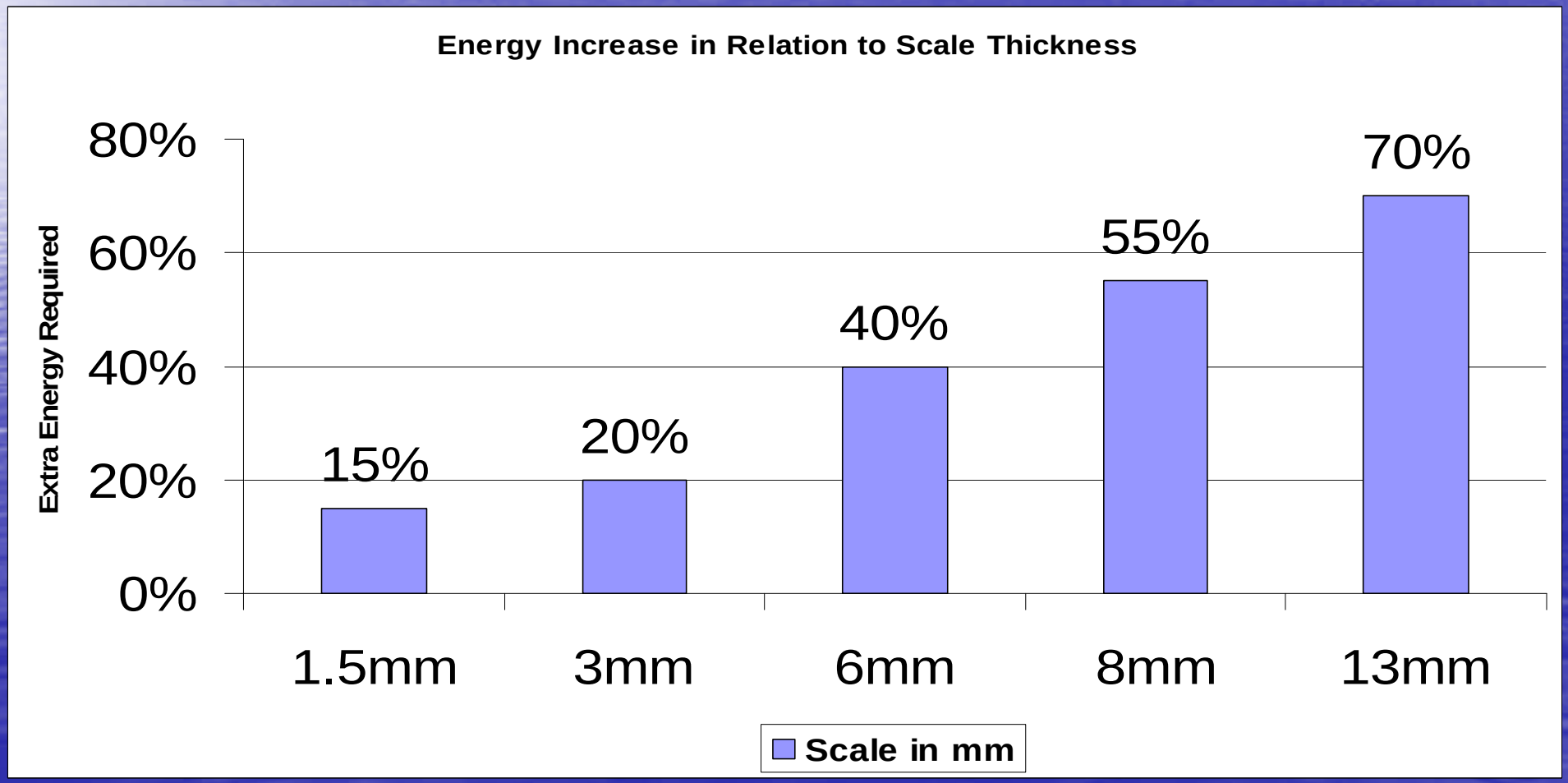
Eryurek, E and Warrior, J (1997) *Smart Field Devices Improve Process Anomaly Detection* Rosemount Inc Technical Paper

Haynes, C J and Fitzgerald, M A (1986) *Scheduling Power Plant Maintenance Using Performance Data* ASME Paper 86-jpgc-pwr-63

Pritchard and Thackery (Harwell Laboratories

Panchal (Argone National Laboratory)



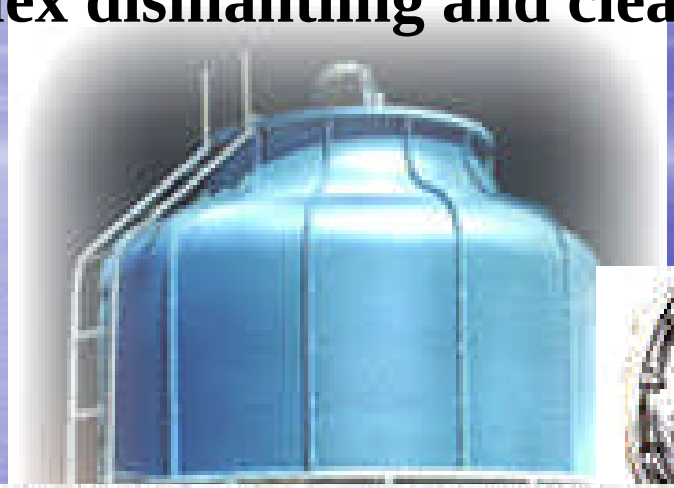
Anion D'Scale

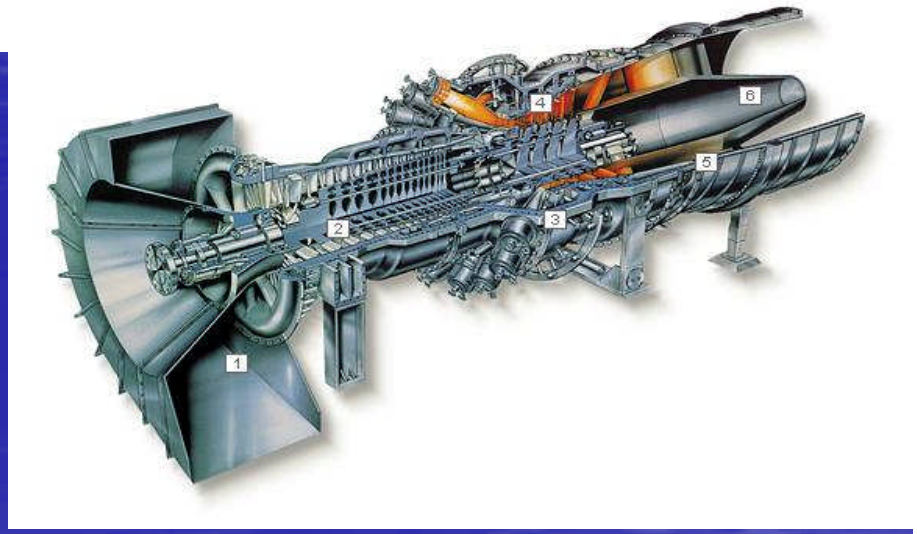
IS A LOGICAL EVOLUTION TO MAINTENANCE

Maintenance Strategy	Technique Needed	Human Body Parallel
Proactive Maintenance	Monitoring and correction of failing root causes, e.g. removal of water based scale with Anion D'Scale	Cholesterol and blood pressure monitoring with diet control
Predictive Maintenance	Monitoring of vibration, heat, alignment, wear debris	Detection of heart disease using EKG or ultrasonics
Preventive Maintenance	Periodic component replacement	By-pass or transplant surgery
Breakdown Maintenance	Large maintenance budget	Heart attack or stroke

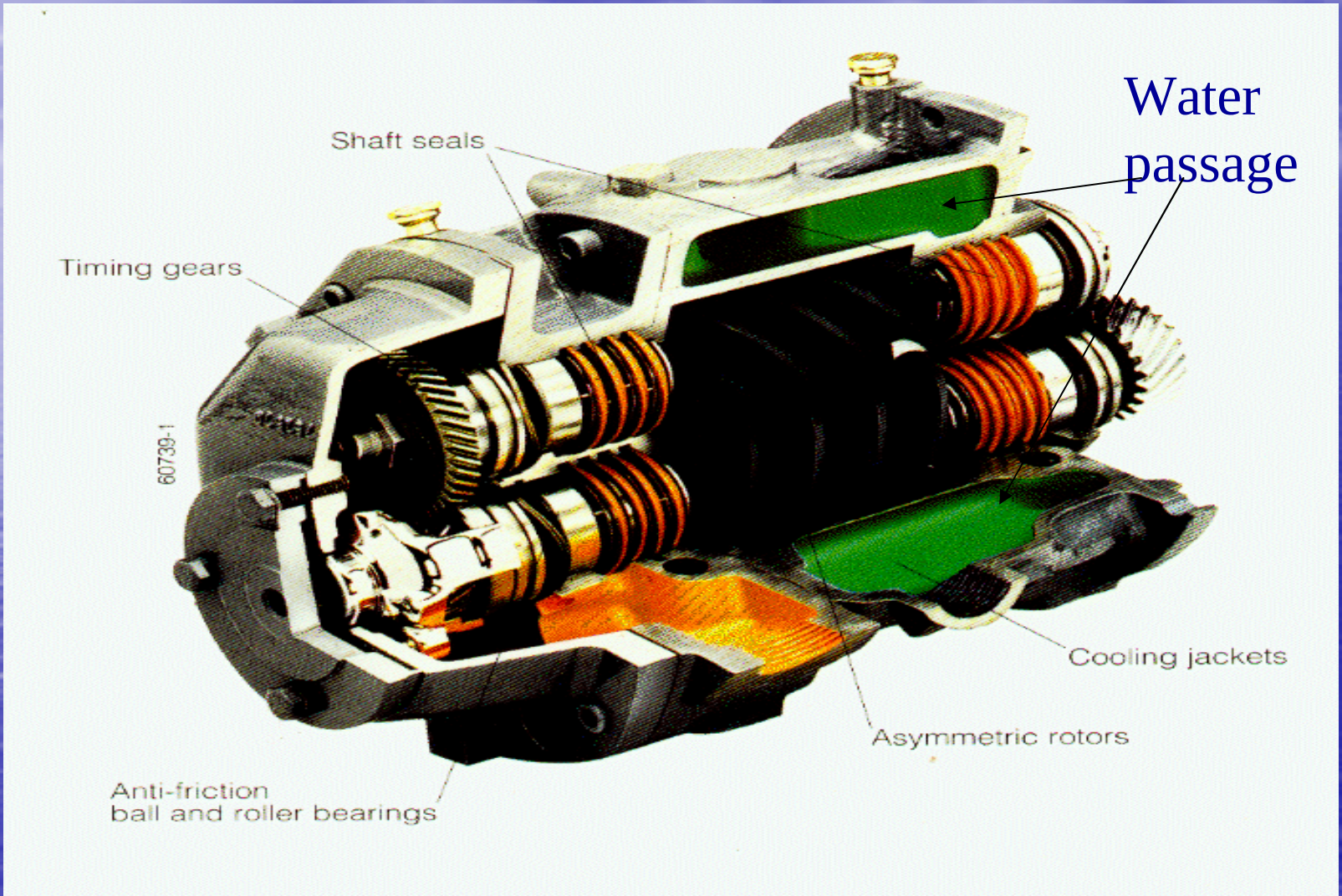
Common Water Cooled Equipment

Complex dismantling and cleaning of equipment





Complexity of cleaning certain equipment - Air pressure Cylinder (Screw Type)

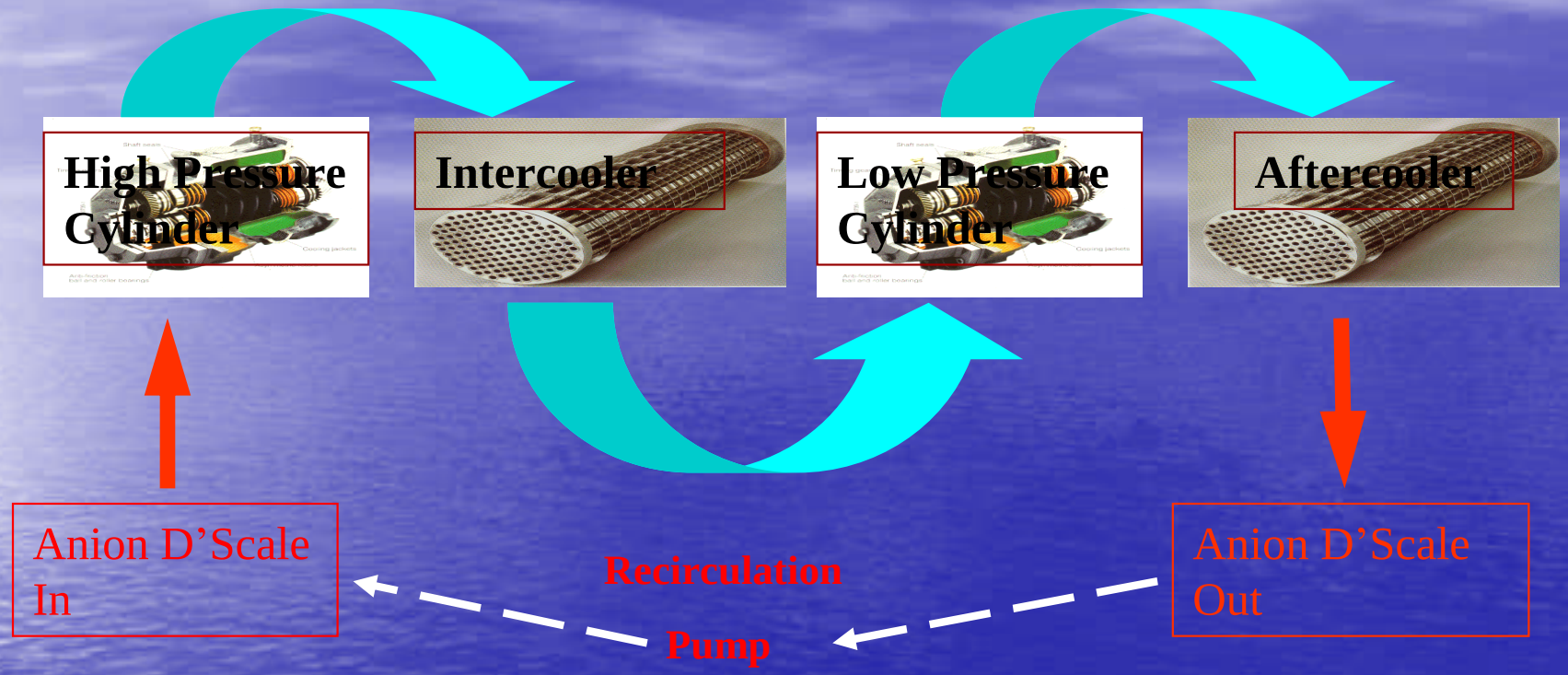


Recommended to change every 5 to 6 years - 200hp Compressor -

Anion D'Scale

- ***Quick - EQUIPMENT IS CLEANED WITHIN A FEW HOURS***
- ***EASY TO USE /EFFICIENT***
- ***HIGHLY INHIBITED - NON CORROSIVE WITH SUPERIOR CORROSION INHIBITORS. YOUR EQUIPMENT WILL NOT BE HARMED!***
- ***POWERFUL DETERGENTS AND PENETRATING AGENTS***
- ***REMOVES RUST, MUD, SILICA AND OTHER NON-SOLUBLE SEDIMENTATION.***
- ***EXTREMELY LOW-FOAMING!***
- ***POWERFUL WETTING AGENTS!***
- ***BIODEGRADABLE - WILL NOT HARM YOUR ENVIRONMENT (SPENT PRODUCT)***
- ***SAFE TO HUMANS - WILL NOT HARM YOUR PERSONNEL***
- ***SAVE TIME AND MONEY - PREVENTS COSTLY SHUTDOWNS, EXPENSIVE REPAIRS, REDUCES ENERGY AND OPERATIONAL COSTS AND WILL EXTEND THE LIFESPAN OF YOUR EQUIPMENT!***

Anion D'Scale is Non-Corrosive!



Typical components in a Compressor

Because Anion D'SCALE does not corrode, pit, erode or have any other harmful effects on materials and metals such as; **STEEL, IRON, BRASS, COPPER, PLASTIC, FIBER, TEFLON** or other metals or materials found in water-based systems or equipment, you can clean your equipment **IN-SITU** (and sometimes without shutting down the machine)**.**

The Domino Effect

When the cooling side of an equipment is not maintained, ALL other parts will eventually breakdown.

Example 1 : When your car engine is overheating due to rust and scale in the water system (radiator & engine block), it will:

a) Increase fuel usage

b) More usage of engine oil, carbon build up will be faster, effecting spark plugs etc.

c) If nothing is done about this, pistons will start to wear out and finally and overhaul will be needed.

BREAKDOWN OCCURS - HUGE $$$$$ COMES WITH IT

The Domino Effect

Example 2 : When your WCPU (Water Chilled Package Unit) starts producing warm air it is normally because the condensers are full of scale, rust and mud! However most of the time “they” tell you to change the compressors which cost thousands of dollars!!! This is what happens :

Due to the sedimentation, heat transfer does not take place. Therefore condensation of R22 gas does not occur. R22 goes back to the receiver tank in mainly gas form, which will eventually damage the compressor and “they” will be right - you have to change the compressor for $$$$$$$ and keep changing it frequently because the condensers are still not cleaned! Regular cleaning and maintaining the condensers will not only keep the air cool but prolong the lifespan of the compressors and save you $$$$$$$.

Anion D'scale Will Work for You

Automotive

Closed Circuit Cooling
Dynamometers
Extruders
Molders
Radiators
Welders

Rubber/Plastics

Banbury Mixers
Calendar & Mill Rolls
Extruders
Injection Molders
Molds
Temperature Control Units
Throat Coolers
Towers

Manufacturing

Chillers
Compressors
Furnaces
Quenchers
Vacuum Pumps

Food

Condensers
Ice Machines
Kathabars
Refrigeration Equipment
Steam Tables

Refinery

Compressors
Converters
Crackers
Exchangers
Piping
Pumps

Metals

Bearings
Castings
Fans
Hearth & Vacuum
Furnaces
Shelters
Sprays

Chemicals

Dryers
Extruders
Kettles
Mixers
Reactors
Scrubbers
Vacuum Pumps

Utilities

Boilers
Turbines
Transformers
Cooling Towers
Air Compressors
Hydrogen Coolers
Lube Oil Heat Exchangers

Bottling

CO2 Generators
Heaters
Exchangers
Rinse Tanks
Sterilizers
Washers

Mining

Bearings,
Conveyors,
Filters,
Presses,
Process Lines,
Radiators

Pharmaceutical

Exchangers
Loop Systems
Kathabars
Pumps
Reactors
Stills
Sterilizers

Others

Ball Mills
Demisters
Evaporators
Locomotives
Absorption Units
Diesel Generators
Induction Furnaces

Some of Our Clients in North America

Goodyear Tire & Rubber

Nor Baker

Atlas Copco

Ingersoll Rand

Compair

Coco-cola

3m

Chemical Lime

Trane

General Motors

Gates Canada

Esso

International Paper

Georgia Pacific

Carmeuse Natural Chemicals

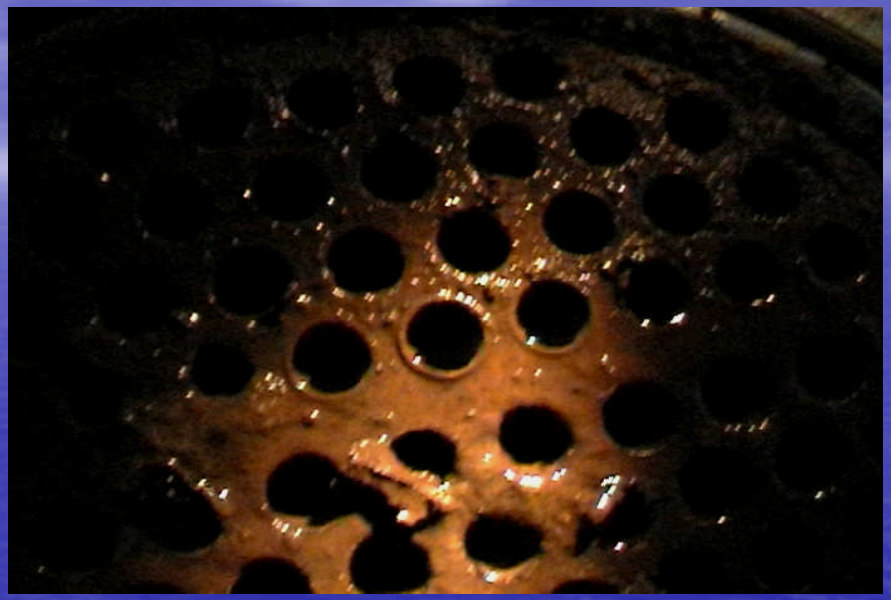
Anion D'Scale Pictures & Diagrams

Ford Motors - Welding Gun Cleaning

Welding Guns and hoses checked by Ford Personnel after cleaning - now operating without heating. Scheduled to clean all their guns every 4 to 6 months to maintain problem free production. Also, specialized hoses costs them an inordinate amount of money. Now these hoses do not have to be changed as often due to clogging! They have 700 hundred of those hoses!!!

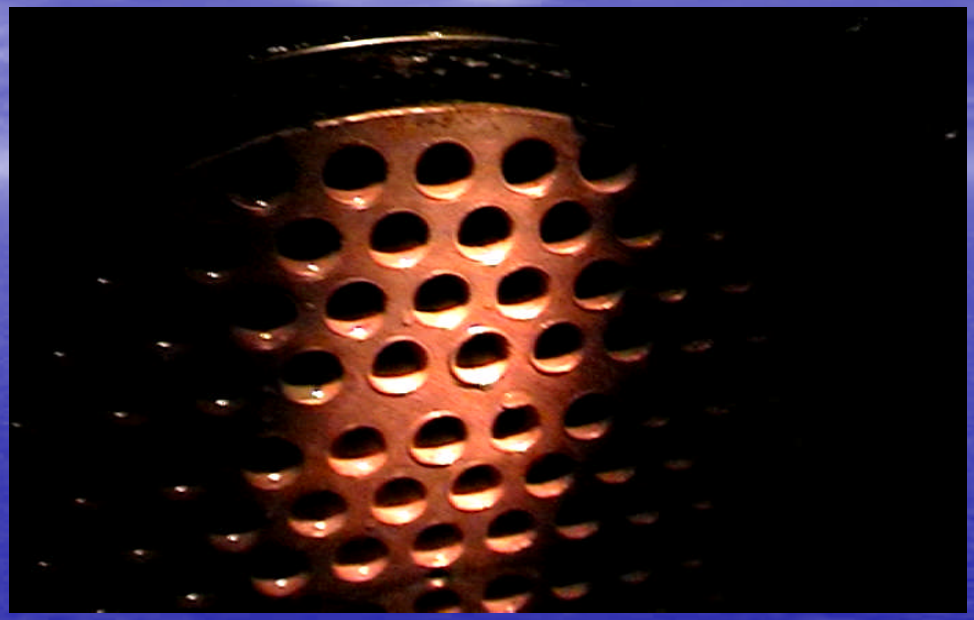
Lafarge Cement

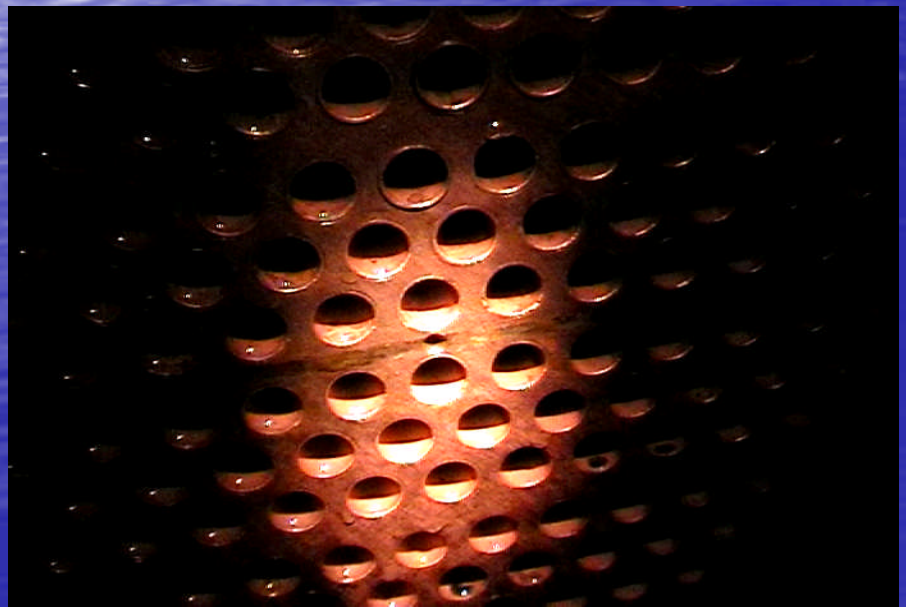
MAAG Oil Cooler - 10 Feet Length x 1 Foot Diameter

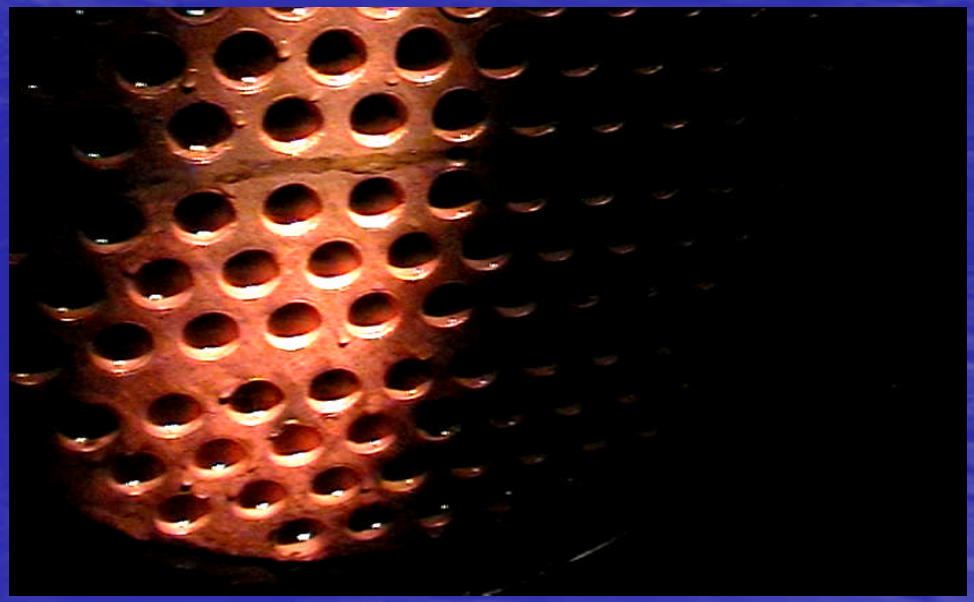


Lafarge Cement

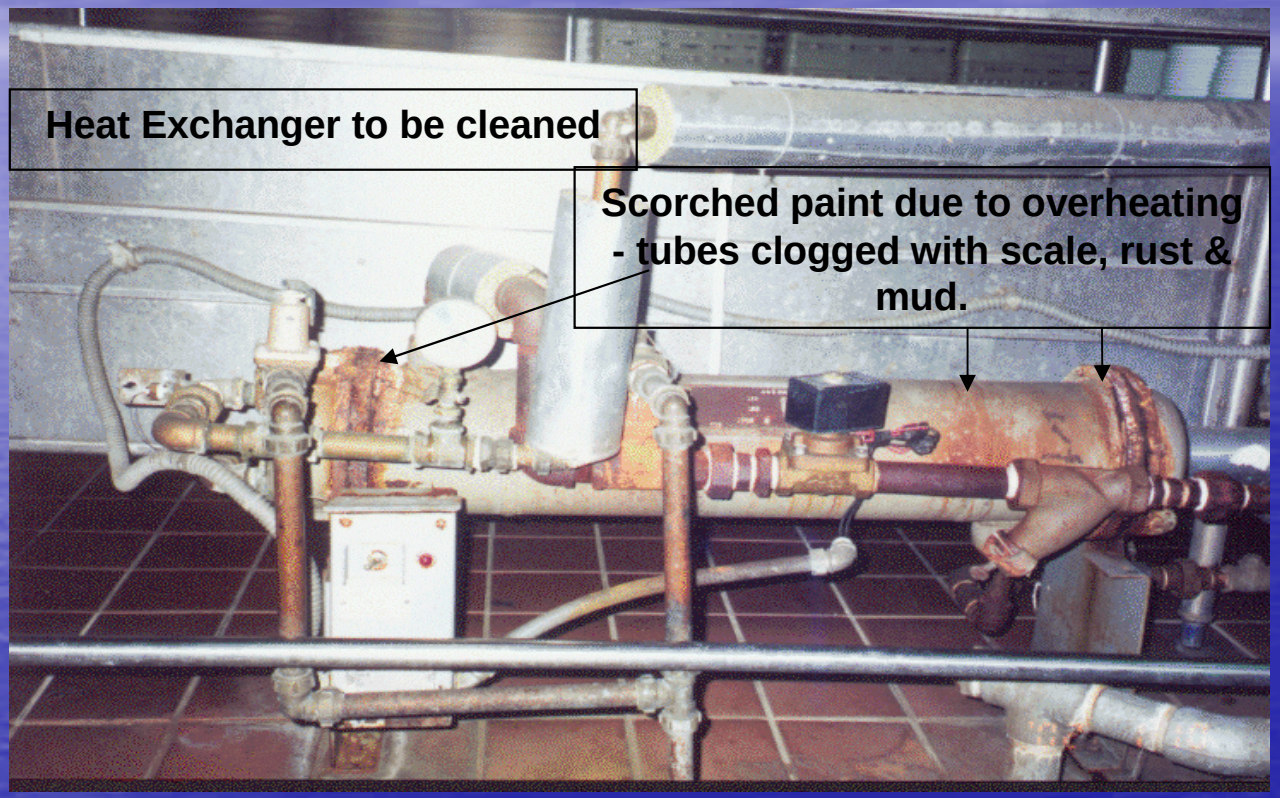
MAAG Oil Cooler - 10 Feet Length x 1 Foot Diameter





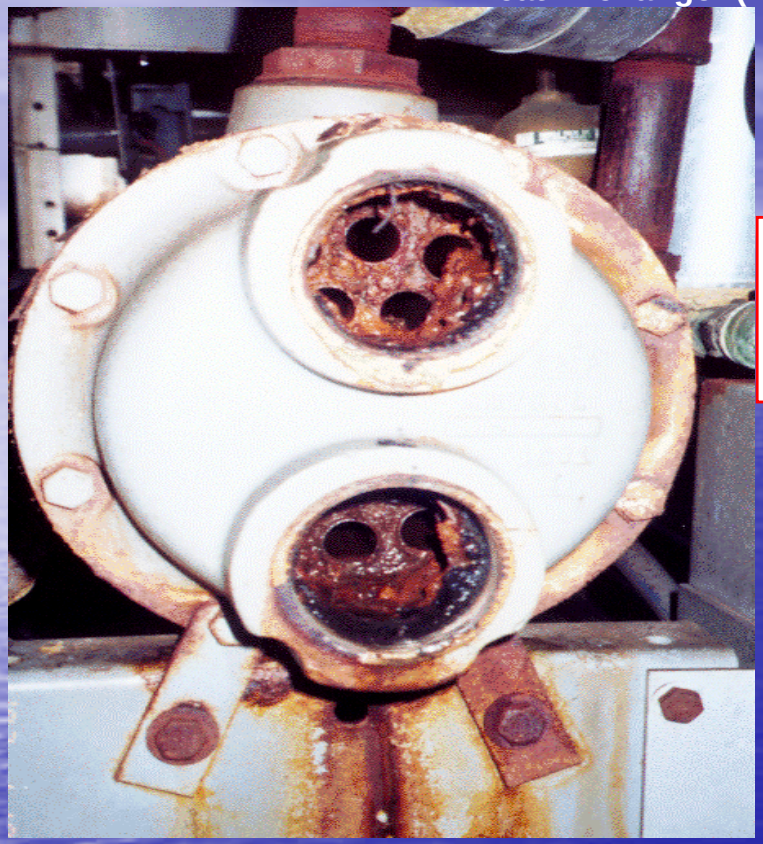


Shangri La Hotel - Complete Water Side Cleaning of High Pressure Steam Washer Heat Exchanger



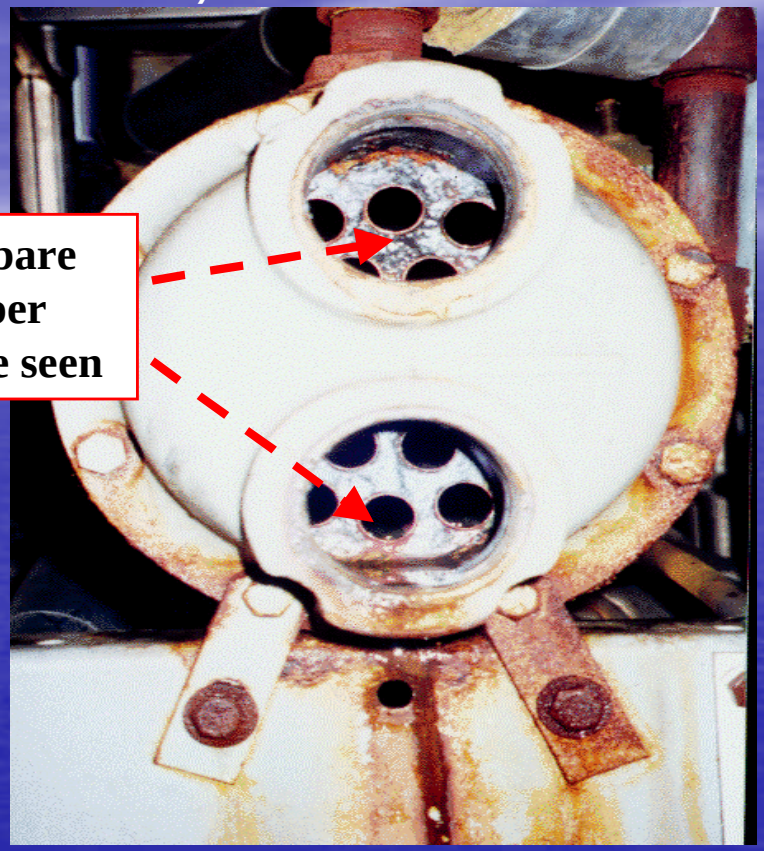
Unable to remove cover as it was fused to the shell. Also just 2 weeks prior to our cleaning one more heat exchanger of the same condition was replaced for $4355.00 USD

Shangri La Hotel - Complete water side cleaning of Heat Exchanger (High pressure steam washer)



Before

Cleaned to bare metal. Copper tubes can be seen



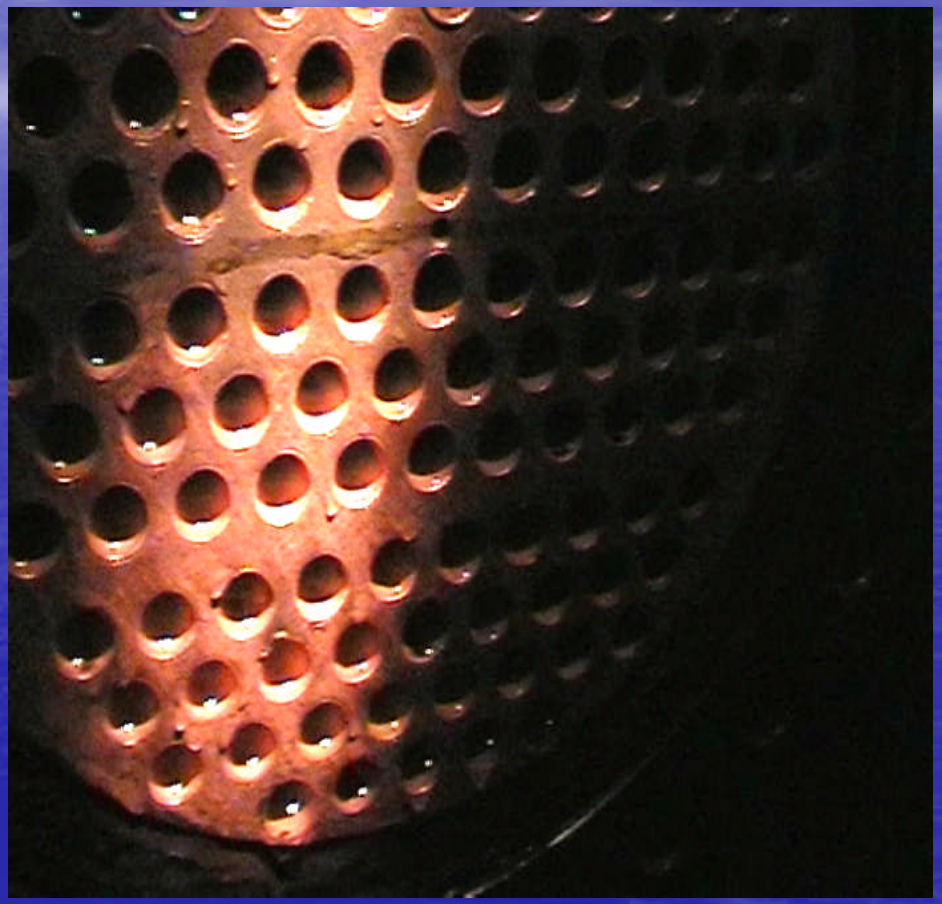
After

Observations: The tube side is seen to be coated with a thick layer of rust, scale & mud. This would have tremendously retarded thermal transfer efficiency, causing extremely **high operating costs** and **damage** & **eventual breakdown** of the heat exchanger. Some tubes were partially clogged. Due to the age of the machine and the probable bad condition of the shell cover seals, the shell cover was not opened for a full view of the tube bundle. Because of this even manual cleaning could not be performed. **After 1 1/2 hours of circulation with Anion D'SCALE, it can be clearly seen that the tube bundle has been cleaned to bare metal. All rust, scale and mud has been removed completely, bringing the heat exchanger to optimum operating condition on the waterside which saved the Hotel $ 4355.00** USD

Lafarge Cement

MAAG Oil Cooler - 10 Feet Length x 1 Foot Diameter - They could not believe that it was back to brand new condition and glowing in the dark!!

Before



After

Would'nt you want your equipment to look like this?

Anion D'Scale Saves You Money:

A) Your Downtime During Waterside Maintenance!

What is downtime?

- Man Hour - Inclusive of Overtime

- Production Time

With Anion D'Scale your equipment is up and running in hours, while all conventional methods takes days. Imagine the downtime cost that you will save!!

B) Your Downtime For Unnecessary Breakdowns

- Domino effect

C) Prevent Unnecessary Accidents to Personnel

- Conventional Methods require lifting, handling and dismantling heavy equipment. Many still use industrial acid which is harmful to personnel & environment.

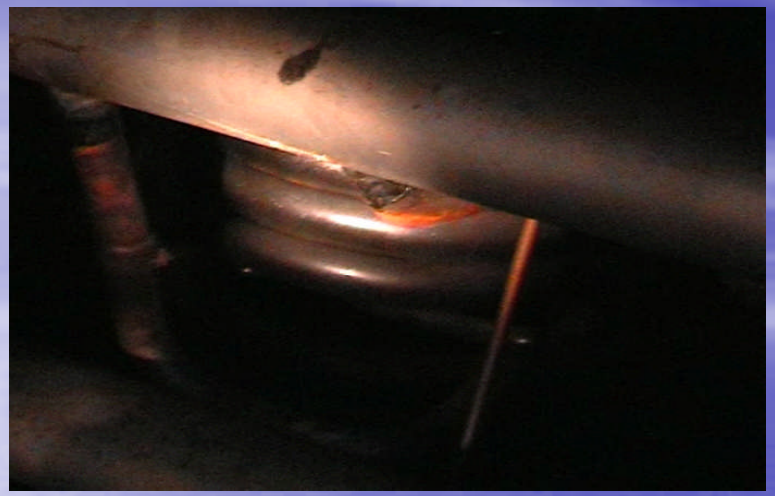
D) Energy Cost - as Illustrated Earlier

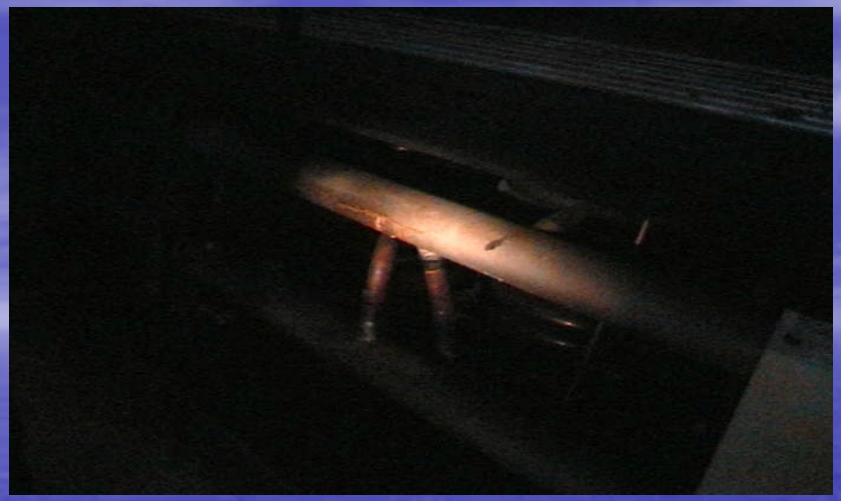
E) Efficient & Uninterrupted Production and Quality - example : The Cleaner The Waterside of Mould The Faster The Mould Cycle Will Be and Fewer Rate of Rejects. Therefore Increasing Production.

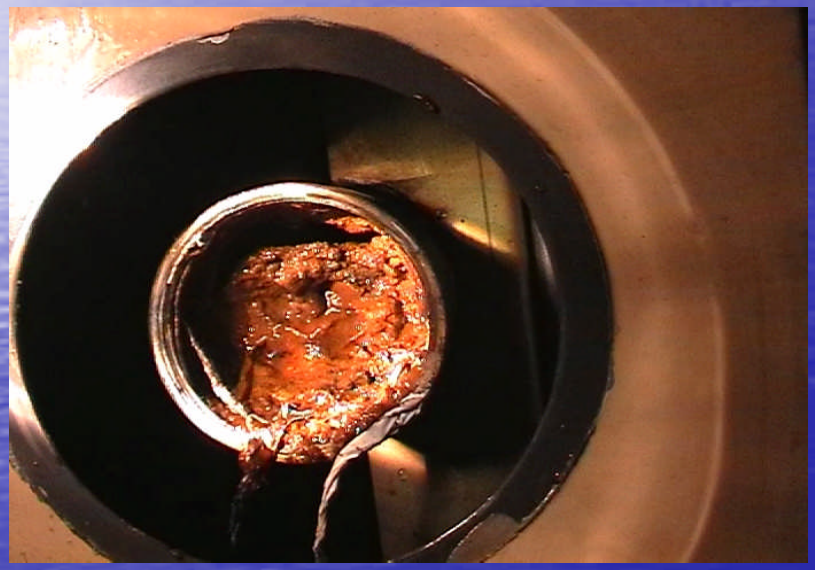
F) No Need For Excessive Spare Parts or Auxiliary Units. Also Frequent Changing Of To New Parts In Older Equipment Has High Infant Mortality Rate, Leading to More Downtime!

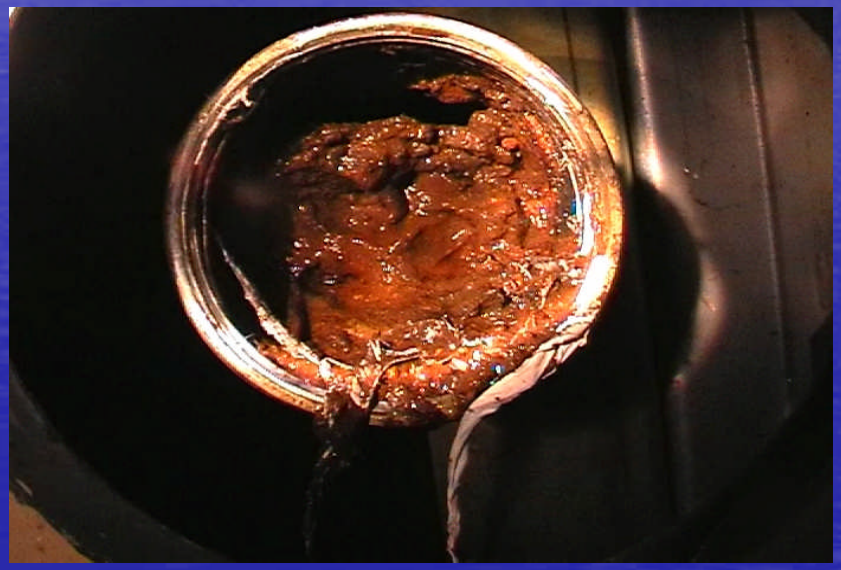
G) Prolongs The Lifespan Of Your Equipment. Proper Asset Management Thus Reducing Capital Cost

Units







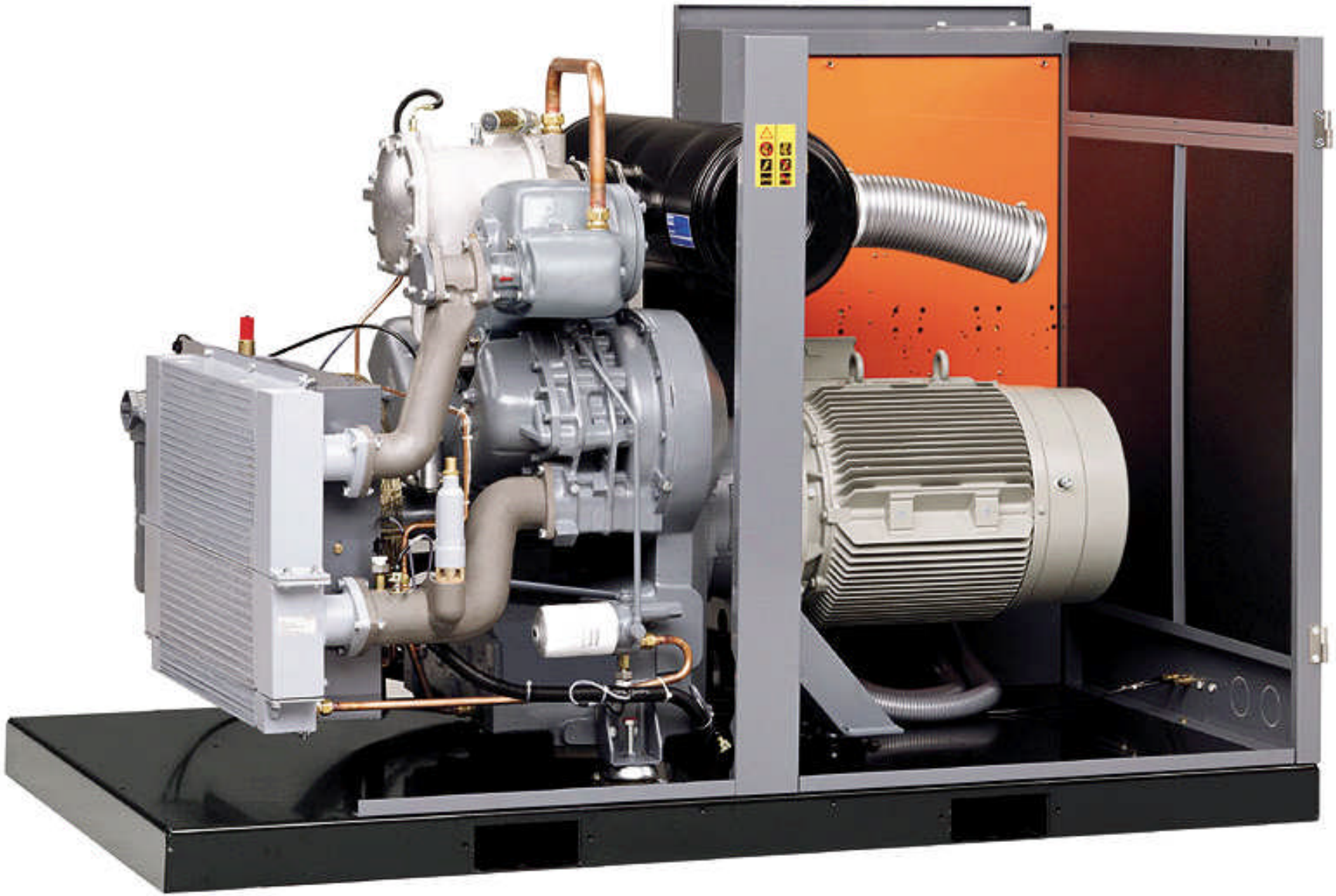


Twin Coil WCPU was cleaned. (1 1/2 hours). Air conditioning was warm prior to cleaning. As can be seen from the water inlet clogging, the coils would have been badly clogged as well. Since there was insufficient heat transfer, condensation of the R22 gas was not taking place. Eventually the compressors (2 units) will have to be replaced (a couple thousand USD each). Cleaning every 6 to 8 months will ensure continuous chilled air and will prolong the lifespan of the compressors and the coils.

Different types of Heat Exchangers

Compressor - Atlas Copco ZR90

Compressor - Atlas Copco ZT45



Compressor - Atlas Copco ZT75

Ingersoll Rand- Compressor

Ingersoll Rand Compressor 05SE

Mould Machines

Cooling Towers

Anion Performance Chemicals

Located in the Mississippi Delta

- Production
- Warehousing
- Sales

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Anion D'Scale