# A CLOSER LOOK AT MINIMISING CUI

WATER REPELLENT PRODUCTS FOR INDUSTRIAL APPLICATIONS



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### NATURE'S WAY TO KEEP WATER AWAY

Minimise the risk of CUI by choosing Paroc Pro Pipe Sections WR. Just like a bird's feathers, stone wool is nature's own invention. It absorbs less water, dries out faster and has technically superior insulation performance. When choosing insulation, choose Paroc Pro Pipe Sections WR – nature's way to keep water away.

## **INDUSTRIAL INSULATION IMPROVES PRODUCTIVITY**

For Paroc, every day is a new opportunity to save energy, conserve resources and make decisions that help sustain our planet. We work to reduce our negative footprint and expand our positive handprint. Paroc products contribute to sustainability by creating an energy-efficient, fire safe and acoustically sound environment. We pay special attention to environmental aspects, such as energy efficiency, recycling and emissions.

Properly planned and installed insulation solutions provide many advantages such as cost and energy savings, decrease of heat losses, improvement of process control, reduction of emissions and maintenance, as well as prevention of **corrosion under insulation (CUI)**.

CUI is one of the biggest challenges when it comes to insulation solutions for industrial applications. Paroc has been selling water repellent (WR) products for more than 20 years and has been continuously investing in research and development to improve its product properties. Latest tests from independent test laboratories prove that Paroc's WR product range for industrial applications has market-leading properties for stonewool insulation material – including **lowest water absorption and highest temperature range**. Additionally, Paroc has the **broadest product offering** of WR products including pipe sections, wired mats, mats and slabs.

# CORROSION UNDER INSULATION – UNDERSTANDING THE PROBLEM

Corrosion under insulation dramatically reduces the lifetime of piping and equipment, and increases the risk of leakages, shutdowns and potential injury to personnel in the area. A 2003 ExxonMobil study found that 40–60% of maintenance costs on industrial pipes is caused by CUI.

Corrosion under insulation basically refers to any type of corrosion that occurs due to moisture present on the external surface of insulated pipes and equipment. CUI is an issue for both onshore and offshore operations, including petrochemical, refining and power sectors, among many others.

#### The scale of the problem

Although the seriousness of CUI is increasingly acknowledged by professionals in the industrial sector, its consequences remain an ever-present issue. Wet insulation leads to corrosion under insulation, reduced insulation performance, leaks and fractures, all of which translates directly into additional inspection work, higher operating costs and increased weight.

A study by the National Association of Corrosion Engineers titled "Corrosion Costs and Preventive Strategies in the United States", commissioned by the American Congress in 2001, reported the direct national cost of corrosion to be US\$ 276 billion per year, and that is without consideration of indirect costs such as energy loss<sup>1</sup>. As further studies of NACE show, the annual global cost of corrosion is US\$ 2.5 trillion – equivalent to a roughly 3.4% of the world's gross domestic product<sup>2</sup>.

### **PAROC WR PRODUCTS:**

- 10 × less water absorption than the requirements of the toughest standard (EN13472/24h)
- Half the water absorption of best competitor according to EN13472/24h
- Highest temperature range <300°C / 572°F</li>
- Safe to use during painting operations and certified according to the requirements of the coating compatibility standard VDMA 24364
- More than 20 years' experience with WR mineral wool products for industrial applications
- Broadest WR offering range on the market including pipe sections, wired mats, mats and slabs

### DID YOU KNOW?

According to Ecofys studies, the impact of insufficient, missing or damaged insulation in the industrial sector has the annual savings potential equivalent of the energy consumption of 10 million households<sup>3</sup>.

# PAROC WR PRODUCTS PROVIDE EXCELLENT PROTECTION AGAINST CUI.



Very high water repellency and permeability, preventing absorption and allowing moisture to easily egress the insulation.



Very low water-leachable chloride content and acidic compounds, which effectively reduce the risk for external stress cracking.

<sup>1</sup> http://impact.nace.org/documents/ccsupp.pdf

<sup>2</sup> http://impact.nace.org/economic-impact.aspx

<sup>a</sup> https://www.eiif.org/sites/default/files/2018-12/EiiF\_ClimateProtectionWithRapidPayback\_EN\_online.pdf

#### **DID YOU KNOW?**

In 2006 an ageing petrochemical plant facility on the USA's Gulf Coast had a leak from a 4-inch hydrocarbon line. The leak resulted in a massive fire that in turn destroyed half the unit and cost the company US\$50 million. The cause was CUI<sup>4</sup>.

#### CUI AFFECTS INDUSTRIAL PLANTS IN THE FOLLOWING WAYS:

- Operational
- Economical
- Safety

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# MARKET-LEADING WATER ABSORPTION PROPERTIES FOR STONE WOOL INSULATION

10 × BETTER THAN THE REQUIREMENTS OF THE TOUGHEST STANDARD AVAILABLE (EN13472)\*



Why choose Paroc?		
	LOWEST WATER ABSORPTION!*	PAROC pipe sections maintain effective protection against CUI by providing market-leading water absorption properties. Third party tests prove that the properties of PAROC Pro Section 100 WR are more than 10 × better than the toughest requirements on the market, absorbing less than 0,1 kg/m <sup>2</sup> when tested against compliance with EN13472.
	SUPER SHORT DRY-OUT TIME!*	Extremely short period of a potential corrosive environment between the pipe and the insulation material. A fibrous, open-pore structure allows any bulk water to drain away and for vapor to dry out naturally.
	HIGHEST TEMPERATURE RANGE!'	Performing and keeping the superior water absorption properties at temperatures up to 300°C, ensuring the best water repellency ever seen for stone wool products.
<b>6</b>	VERY LOW CONTENT OF LEACHABLE CHLORIDES!	The content of water-leachable ions such as chlorides, sodiums, silicates and fluorides in PAROC stone wool does not exceed 10ppm, meeting the standards of ASTM C795. PAROC's products are chemically inert to steelwork to mitigate risk of corrosion.

## A MATTER OF TIME

Low water absorption is a very important property, since most industrial insulation solutions are at risk of being exposed to water, high humidity or other liquids.

**Dry insulation always performs better than wet insulation.** Water in the insulation material will dramatically decrease performance and add weight to the insulation, in addition to increasing the risk of generating a corrosive environment at the surface of the insulated equipment.

### PAROC'S STONE WOOL IS WATER REPELLENT – A TWOFOLD BENEFIT!

- DURING INSTALLATION provides shortterm protection against water exposure
- DURING SERVICE delays water ingress and reduces water absorption

Corrosion is accelerated by the duration of any wetness, therefore protection against water trapped under or in the insulation material itself becomes a function of time. In other words:

#### Less water and faster dry-out = less corrosion

PAROC WR Pipe Sections are tested at independent laboratiories according to European (EN), British (BS) and American (ASTM) standards.

### **A SOLUTION TO PREVENT CORROSION**

A key to protecting insulated metal surfaces from exposure to moisture and other harmful substances is to use highly water-repellent, non-hygroscopic, chemically robust and durable insulation material.

According to AGI Q 132, the maximum content of chloride ions (CI-) shall not exceed 10ppm. PAROC stone wool fulfills this requirement. In addition, the range of protective facings and foils increases process functionality.

**STONE** 

PAROC WR PRODUCTIONS:

**PROTECTION AGAINST CUI** 

### **APPLICATIONS**



### **PROCESS INDUSTRIES**

Process industries demand specialist insulation solutions. The temperature in pipelines must remain within certain parameters, heat loss must be minimised, and the whole process must be reliable, durable and safe. Paroc's industrially manufactured, mutually compatible insulation components provide the same insulation capacity both for straight pipe sections and pipe elbows, helping to maintain optimal performance throughout the pipeline.



### **POWER PLANTS**

The high service temperatures involved in power generation, together with the variety of components that require insulation, demand a wide range of special insulation solutions. For example, boilers need flexible, multi-layer solutions, whereas tanks require a range of varying density slabs with high compressive strength. Paroc has developed insulation solutions for boilers, tanks, flue ducts, chimneys, and other plant equipment that can increase the efficiency, service lifetime and reliability of the plant.

### A CLOSER LOOK AT ENERGY SAVING AND COST REDUCTION

Studies show that even small flaws in industrial insulation can have a much greater impact on absolute heat loss than even large flaws or insufficient insulation in building exterior walls.

According to a study commissioned by the European Industrial Insulation Foundation (EiiF), insufficient or entirely missing industrial insulation across the European Union (EU) is responsible for energy losses of approximately 480 PJ per year - the equivalent of the annual energy production of Hungary<sup>5</sup>.

In order to operate smoothly and in an economically optimal manner, process industries and power plants require long lasting, reliable, maintenance-free and guick-to-install insulation solutions. For the owners and plant engineers it is important that the return on investment of the process can be observed during its lifecycle as planned without losses caused by malfunctions.

So how much can a single factory save if it invests in proper, economically justified insulation of its critical process elements? TIPCHECK Program, established by the EiiF, serves to provide industry with a standardised, high-quality thermal energy audit tools, focusing on the thermal performance of technical insulation systems. One of its many cases shows that even a small investment in a long-term, effective solution can bring about operational cost savings that far outweigh its capital investment and lead to rapid payback.

### **LEARN FROM THE POSITIVE EXAMPLES<sup>6</sup>**

A large chemical plant in Italy had been diagnosed with 650m of piping which was uninsulated or covered with damaged insulation, as well as 300 flanges, 160 valves, and 3 tanks which lacked any insulation at all, mainly for operational and maintenance reasons. Yet, based on the audit report and the presented energy, cost and CO<sub>2</sub> saving potential, the plant owner decided to proceed with the full implementation of its recommendations.

Recommended actions, included installing new pipe sections, helped to save 11.100 MWh, approximately 200.000 EUR and 2.240 tonnes of CO<sub>2</sub> annually. The payback period of this project was less than one year. The client recognised that the new insulation would fulfil operational and maintenance needs, while also saving money and reducing production overheads.

### **BEST PRACTICE IN INDUSTRY**

Original Source of an graphic www.eiif.org7

**Chemical Plant (France)** Payback: 2-4 months Energy savings: 12 600 000 kWh/a Money savings: 505 000 EUR/a

Refinery (Italy) Payback: 1-3 years Energy savings: 1 021 958 kWh/a Money savings: 75 000 EUR/a

**Processing plant (Germany)** Payback: 3 months Energy savings: 1 448 500 kWh/a Money savings: 47,800 EUR/a

<sup>5</sup> https://data.europa.eu/euodp/data/dataset/information-on-energy-markets-in-eu-countries-with-national-energy-profiles <sup>6</sup> https://www.eiif.org/sites/default/files/<sup>2018</sup>.<sup>11/1</sup>\_TIPCHECK\_Report%<sup>20</sup>%<sup>282</sup>%<sup>20</sup>ed%<sup>29</sup>.pdf

### PAROC PIPE SECTIONS – PERFECT FOR ALL OCCASIONS

PAROC products are hydrophobic and non-capillary, so they do not absorb or draw water into the insulation, providing effective protection against moisture absorption across the entire thickness of the insulation. Paroc's range of WR Pipe Sections includes rigid insulation that allows for easy installation, routine maintenance and protection against damage from mechanical impact.

### DOUBLE THE PROTECTION, HALF THE INSTALLATION TIME

PAROC Water Repellent pipe sections are available as a one layer system with the benefits of a two layer application. Paroc Pro Lock Sections can provide up to 50% reduction of installation time compared to comparable alternative solutions.

### **BENEFITS ALL AROUND**

PAROC Water Repellent products provide the same insulation capacity for both straight pipes and pipe elbows, can be applied to a various pipe dimensions and diameters and offer a wide range of thicknesses to meet diverse project requirements.

### **SHARED ADVANTAGES**

All PAROC products are made of natural stone, a naturally resilient and essentially inexhaustible material that offers many advantages. Thanks to its composition, the end product is a highly durable, non-combustible fibre product that not only offers excellent insulation but also an **environmentally friendly solution** for industrial use.

Double-layer insulation can be replaced with PAROC Pro Lock 100 or 140 (z-lock), a tongue-and-groove pipe insulation that can be installed in a single work moment.

### **BENEFITS OF PAROC INDUSTRIAL PIPEWORK INSULATION SOLUTIONS:**

- Full product range for pipes and pipe elbows rapid, easy design process
- Tight solutions without gaps in joints minimum heat loss
- Solutions that do not require supporting structures improved energy efficiency
- · Controlled process temperature process works more efficiently
- Environmentally effective solution reduced CO<sub>2</sub> emissions
- Compatible pipe sections and elbow insulations time and money saved on installation and minimum waste on-site
- Exact dimensioning fits with pre-fabricated cladding
- Double-layer (DL) products are delivered nested, one inside the other more effective logistics
- Very low water absorption and low chloride content reducing and minimising the risk of corrosion
- · Long-lasting solutions with low maintenance costs investment for life
- Broadest range fits all common pipe diameters

### PAROC<sup>®</sup> STONE WOOL SOLUTIONS – A SOUND CHOICE

# EXCELLENT THERMAL INSULATION IN A WIDE SERVICE RANGE

The main purpose of thermal insulation is to prevent heat flow to or from the application to the surroundings. The thermal conductivity of the insulation material is one of its most important properties. Stone wool has low thermal conductivity, which makes it highly resistant to heat transfer. Reducing heat transfer results in direct savings in energy usage and costs.

### **PROTECTION AGAINST FIRE**

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Stone wool is non-combustible as it is made of stone, which does not burn and cannot be ignited. Stone wool insulation does not contribute to the spread of fire – on the contrary, it protects against fire. PAROC stone wool is classified in Euroclass A1, which is the highest class of fire performance for building material.

### THE EFFECT OF ECONOMICAL AND ENERGY-EFFCIENT INSULATION ON ENERGY COSTS IN INDUSTRY



# LONG-LASTING SOLUTIONS WITH UNCHANGING PROPERTIES

In demanding industrial applications, it is absolutely essential that an insulation solution withstands very high temperatures without sagging. With a maximum service temperature of up to 680°C, PAROC high-density products retain their form, compressive stress and thermal resistance over the entire lifetime of the plant.

### **COMPRESSIVE STRENGTH**

In industrial applications, good compressive strength can be important to the long-term performance of insulation products. In pipe insulation solutions, this property helps the products retain their nominal thickness during and after installation and this is particularly important when they are used on higher temperature pipes. It also helps to ensure that cladding materials can be accurately fitted with good uniformity and helps resist the effects of mechanical distortion of the cladding. In tank insulation especially, insulation slabs for walkable roofs must have good resistance to compression and need to fulfill requirements according to specifications. The declared values for compressive stress have been determined in accordance with EN14303.

### **EFFECTIVE NOISE REDUCTION**

High-speed air, steam and liquid movements in industrial processes create a lot of noise, which can adversely affect the working environment of employees. Due to their porous fibre structure and high density, PAROC products – especially when installed as multi-layer solutions – provide good sound insulation, which creates a more pleasant working environment. PAROC provides competitive and certified solutions according to the industrial standard for insertion loss **ISO 15665**. PAROC products meet the requirements for Class A, B, C and D (Shell Class).

### **ENVIRONMENTALLY FRIENDLY**

PAROC stone wool products are made from clean, natural material. They are environmentally friendly throughout their lifecycle, causing no harm to nature during or after use. Stone wool does not contain any ingredients or chemicals that prevent or impede recycling.

### **CLASSIFIED SAFETY**

PAROC products are safe to use. No CFCs or HCFCs are used in the production of the products. PAROC products also fulfill the requirements of Note Q of EU Commission Directive 97/69/EC. This means that stone wool fibres are biodegradable and are not classified as a possible carcinogen to humans. They do not contain asbestos. Health and safety data sheets for PAROC stone wool products are available at **www.paroc.com** 

### THE BEHAVIOUR OF CERTAIN CONSTRUCTION MATERIALS IN A "STANDARD FIRE"\*



\* A "standard fire" simulates the development of temperatures in a fire in a normal room space according to the standard combustion curve ISO 834.

#### THERMAL CONDUCTIVITY OF STONE WOOL. At Higher temperatures it is important to use high-density products

#### Lambda , XW/m°K



Temperature, °C

# PROTECTION AGAINST CUI

MARKET LEADING WATER REPELLENCY



REUSABLE



REDUCING





MOISTURE Proof







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PAROC<sup>®</sup> stands for energy-efficient and fire safe insulation solutions of stone wool for new and renovated buildings, marine and offshore, acoustics and other industrial applications. Behind those products, there is an 80-year history of stone wool production knowhow backed with technical insulation expertise and innovation.

Building Insulation offering covers a wide range of products and solutions for all traditional building insulation. The building insulation products are mainly used for the thermal, fire and sound insulation of exterior walls, roofs, floors and basements, intermediate floors and partitions. Sound absorbing ceilings and wall panels for interior acoustic control, as well as industrial noise control products, are available in the range.

Technical Insulation offering includes thermal, fire and sound insulation in HVAC systems, industrial processes and pipework, industrial equipment as well as shipbuilding and offshore industry.

For more information please visit **www.paroc.com** 

