

The graphic features a large, rusted metal letter 'C' on the left. To its right, the word 'CORROSION' is written in a bold, dark brown, textured font. Below 'CORROSION', the words 'at home' are written in a bold, dark red, sans-serif font.

Protecting Health, Safety, and Everyday Living

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Governing Board (ETGB) Chair

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Engineering Training Governing Board - ETGB

ETGB is responsible for developing and delivering corrosion-related engineering training, and advancing the mission of ICorr. Our training portfolio includes;



Course Title	Tutor	Status
Fundamentals of Corrosion for Engineers (FOCE-MICorr/TICorr)	Jane Lomas	Running
Microbiologically-Influenced Corrosion (MIC)	Tony Rizk	Running
Corrosion at Home and its Prevention (CaH&P)	Tony Rizk	Pilot
Corrosion Mechanisms in Stainless Steels (CMiSS)	Sarah Bagnall	Running
Boiler Failures (Combined Heating/Cooling)- (BF-H/C))	Sarah Bagnall	Running
Corrosion Management (CM)	Steve Paterson	Under development
Production Chemistry for Corrosion Engineers (PC4CE)	George Winning	Under development
Galvanic Corrosion (GC)	Roger Francis	Under development
High Temperature Corrosion (HTC)	Peter Elliott	Potential development in 2027
Corrosion Under Insulation (CUI)	Clare Watt	Potential development in 2027

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Corrosion at Home: Purpose & Approach

The presentation has been developed as an;

- Accessible, non-technical introduction to everyday corrosion and prevention
- Supports ICorr commitment to inform and protect the public
- Uses plain language and simple household demonstrations
- Flexible format adaptable to different audiences and settings
- Because the presentation is designed in a flexible, topics format, e.g. kitchen, water systems, garage, etc., some repetition between sections is unavoidable
- **Today's session is a pilot to gather feedback and strengthen ICorr public outreach**



Outlines

- ✓ Introduction
- ✓ Rust, scale and mould
- ✓ Plumbing system and bathroom
- ✓ Kitchen cookware and appliances
- ✓ Heating system
- ✓ Electrical wiring
- ✓ Garden and tools
- ✓ Garage, loft and shed
- ✓ Gas cylinder
- ✓ Doors and windows
- ✓ Batteries
- ✓ Opportunities in corrosion science & engineering
- ✓ Q&A



Corrosion Never Sleep

- ❑ Corrosion is defined‡ as *the deterioration of a metal as the result of exposure to an environment*
- ❑ Corrosion is a health and safety, aesthetic and cost issue;
 - ✓ Results in a higher depreciation rate
 - ✓ Affects common household items
 - ✓ Impairs taste, colour and performance due to scale, mould and corrosion products formation
- ❑ Implementing corrosion prevention best practices can result in around 6.4%† cost avoidance (of average annual household spending in the Furnishings & Household Equipment category by the Office for National Statistics)

‡ : AMPP: *the deterioration of a material of construction or its properties as the result of exposure to an environment*

†: *The average annual corrosion cost was calculated using figures generated from the AI Weighed Probability-Cost Model over a 15-year period. The model incorporates data from the Water Regulations Approval Scheme (WRAS) and repair-cost data from the Energy Saving Trust. The resulting value was then normalised by dividing it by the Office for National Statistics' figures for average annual household spending in the Furnishings & Household Equipment category and multiplying by 100.*



Salient Points

- ❑ Corrosion is a natural process that can be controlled but cannot be eliminated
- ❑ It occurs under different conditions. Relevant factors affecting corrosion in the home include;
 - ❖ Water (moisture, acid, and salt)
 - ❖ Bacteria and mould
 - ❖ Dissimilar metal coupling
 - ❖ High temperature exposure
 - ❖ Scaling and deposit accumulation
 - ❖ Cleaning/household chemicals
 - ❖ Overloading of electrical wires
- ❑ It affects equipment indoor and outdoor
- ❑ Awareness helps control corrosion to ensure safety and avert harm



Corrosion in Bathroom and Water System

- ❑ Copper is a relatively noble metal and has provided reliable service in domestic water systems for over two centuries
- ❑ Scale and mould formation are common corrosion problems in bathroom
- ❑ Mould is a health and safety risk (in December 2020, two-year-old Awaab Ishak† died in Rochdale, UK, due to a severe respiratory illness linked to mould in his home)
- ❑ Scale formation reduces efficacy and water flow, promotes corrosion and microbial attachment, reduces service life, and causes aesthetic impairment
- ❑ Corrosion could lead to coloured water, stained laundry, bitter taste, greenish-blueish products, stains around basins and drains



† :[Awaab Ishak: Family demands 'punishment' for boy's mould death - BBC News](#)



Corrosion Prevention of Water System

- ❑ Install plumbing (tubes and joints) of the same metal
- ❑ Use properly cleaned, installed and commissioned tubes to BS EN 1507 (2006)
- ❑ Carry out a pre-installation corrosion survey for aquifer water
- ❑ Use graded plastic wherever applicable (e.g. aquifer water)
- ❑ Repair any leaks promptly, monitor the water for changes in colour, deposits, treatment conditions, or geochemical composition (particularly for aquifer water), and regularly flush the heating system to minimise the build-up of deposits
- ❑ Look for any signs of corrosion (greenish-blueish deposit)
- ❑ Ventilate home, keep it dry, and address any damp issues promptly to minimise mould growth
- ❑ Use good quality sealant to retard mould and protect fixing bolts to wall and floor



Mould Control and Prevention

1. Mould develops where moisture, warmth, and poor ventilation come together
2. Prevention starts by cleaning affected surfaces promptly, before the problem becomes established
3. Mature mould (biofilms) can also host microbes known to influence corrosion



How to Control Mould

- **Reduce moisture:** fix leaks, and use extractor fans or dehumidifiers
- **Clean small patches promptly:** early removal prevents spread of mould
- Use household cleaners:
 - **Hydrogen peroxide (3%),** effective on hard surfaces and helps remove staining
 - **Rubbing alcohol ($\geq 70\%$),** useful for non-porous surfaces and quick drying
 - **White vinegar,** helps clean and discourage regrowth
- **Dry the area thoroughly:** mould returns quickly if moisture remains
- **Prevent recurrence:** keep rooms ventilated, avoid condensation, and maintain regular cleaning



Dealing with Scale in the Bathroom

- Scale build-up on shower heads is common in hard-water areas, where dissolved minerals (mainly calcium and magnesium) deposit on the nozzles and internal surfaces
- Scaling reduces water flow, affects spray patterns, and makes the shower look dull or neglected

Simple Method to Remove/Control Scale:

- Partially fill a plastic bag with vinegar
- Secure the bag around the shower head
- Leave it in place for about 30 minutes — longer if the scale build-up is heavy
- The mild acidity dissolves mineral deposits, restoring flow and appearance without the need for specialised products
- Remove the bag and rinse the shower head thoroughly, inside and out, with running water
- You should notice a clear improvement in water flow



Removing Scale from Surfaces and Taps

- Scale can accumulate on taps, pipe covers, shower doors, and other surfaces
- Although scraping may seem like a quick fix, it can damage the surface and leave permanent marks
- Removing scale is not only for appearance but also it is an important factor in the initiation of corrosion

Simple Method to Remove Scale:

- Cut a lemon in half
- Rub the cut lemon directly onto the scaled areas
- Regular gentle cleaning (using lemon or vinegar) helps protect both the look and longevity of bathroom fixtures
- Rinse the surface thoroughly with clean water
- The surface should regain its shine and feel smooth again
- Repeat the process if the scale build-up is heavy



Rub shower/bath tap with a half lemon to remove scale

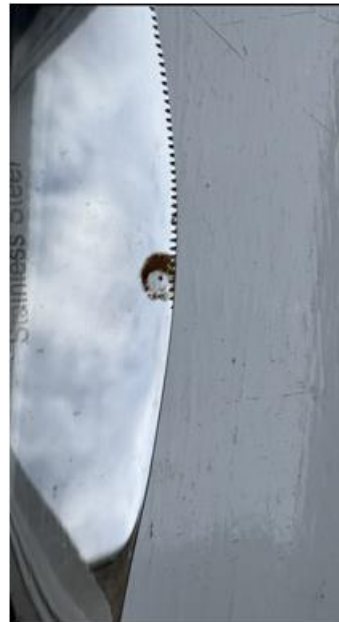
Corrosion in Kitchen

- ❖ High temperature and acids cause cookware metal to leach into food and affect both health and taste
- ❖ Corrosion impair appearance of kitchenware and appliances
- ❖ Scratching the nonstick layer in cookware expose metal and could leave trace deposits of metals in food
- ❖ Polytetrafluoroethylene (PTFE) lining of cookware is common to control food from sticking to metal
- ❖ Appliances are nowadays well coated, yet they stain. Coating disbondment leads to rapid corrosion
- ❖ Mould in kitchen can lead to corrosion and blemish appliances



Corrosion Control in Kitchen

1. Do not store or leave food in saucepans for long periods
2. Avoid scratching coated cookware. Use wood or plastic spoons for stirring/cooking
3. Wash dishwasher-approved items only, in dishwasher
4. Do not leave cutlery wet for a long time. Adding a small volume of ammonia† to washing up water improve degreasing and prevent dulling of cutlery but should be rinsed well after
5. Do not heat cutlery in the oven to above 200 °C, it may oxidise and discolour
6. Clean/wipe appliances and avoid leak and accumulation of water and dirt
7. If corrosion occurred, try removing rust by using a commercial rust product, or a house hold alternative (vinegar, lemon juice or rubbing alcohol)



†: Mixing ammonia and chlorine (bleach) can be life threatening due to the release of poisonous chloramine gas

Vinegar Test

Most stainless steel used cookware are either 304 or 316 grades. A simple test to assess the safety of stainless steel, and quality of metallic cookware;

- ❑ Add two table spoons of vinegar to cookware
- ❑ Swirl and leave to rest for 10 minutes
- ❑ Taste the vinegar in the cookware, and compare to the taste of unused vinegar;
 - ❖ If tastes the same as unused vinegar indicates acceptable quality cookware
 - ❖ If tastes metallic indicates poor quality of cookware and should be avoided



Health Effect of Kitchen Corrosion

Poor corrosion control in kitchen including scratching, exposure to high temperature, acids and salts can have health implications

- Leached metal into food affect both health and taste;
 - **Aluminium** has been linked to Alzheimer disease
 - **Stainless steel** and **copper alloys** can aggravate allergy to Nickel sensitivity
 - Oral doses of **nickel** and **chromium** can cause adverse reactions such as dermatitis
 - **Chromium** has been linked to lung and stomach complications
 - Large amounts of **copper** can cause nausea, vomiting, and diarrhoea
- Chemicals in **Teflon** (PTFE) have been linked to low birth rate, thyroid disease, kidney and testicular cancer, and harm to children's immune systems
- **Teflon** fumes released from very hot cookware ($\geq 260\text{ }^{\circ}\text{C}$) can also cause flu-like symptoms when inhaled
- For people who have a health condition called hemochromatosis, **cast iron** isn't a good option since the extra iron it adds to food could lead to too much iron in their system



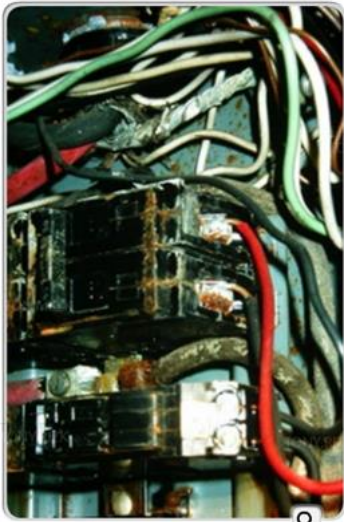
Corrosion of Heating System

- Radiators are susceptible to corrosion caused by internal sediment buildup, stagnation zones (crevice), paint holidays, and galvanic coupling
- Anode rod in hot water tank protect against corrosion but sediment buildup at lower end is a concern
- Regular flushing of system help mitigate sediment buildup, minimise corrosion, costly leaks, and potential water damage
- Signs of corrosion in heating system include rust-coloured water, leaks, reduced heat output, noise, and foul odour
- Corrosion signs should not be ignored to avoid major system failure, higher energy bills, potentially costly repair, and even health hazard
- The black water in radiators is due to the formation of magnetite (iron oxide) suspended in the water
- Regularly (at least once a year) flush boiler and heating system to minimise corrosion



Corrosion Control of Electrical Wires

- Moisture, bi-metallic (e.g. aluminium and copper) and/or higher discharge rate cause corrosion of electrical wires
- Corrosion weakens the contact between conductor terminals thus increasing the contact resistance; heat is generated, and sparks may be produced
- Electrical connections in the loft and garage are usually exposed to more moisture



Recommendations

- Avoid exposure of electrical wires to wet/humid conditions
- Regularly check terminals for any signs of corrosion products buildup, and keep electrical system components clean
- Use the correct size of wires to avoid over heating
- Use circuit breaker to protect against incidents
- Always use the correct fuse rating and never override or bypass a fuse

Garden Corrosion

- Metal furniture and tools corrode when left in damp conditions. Rust is accelerated by salt near coastal areas
- Rust weakens metal, shortens lifespan, and dulls sharp cutting tools such as lawnmower blades, reducing efficiency and increasing the need for costly replacements
- Scratches in paint or protective layers, poor maintenance, and prolonged contact with wet soil or grass allow corrosion to set in



Recommendations;

- Stainless steel, treated aluminum, or coated iron are more resistant options compared to untreated ferrous metals
- Covering or storing furniture indoors during winter or prolonged wet seasons significantly reduces corrosion risk
- Regularly inspect and clean blades and tools to remove moisture, dirt, and plant residue
- Sharpen or replace blades at least once per season, or sooner if corrosion is visible
- Use purpose made paint including a primer and replace damaged tools



Corrosion of Gas Cylinder

- Contained gas (propane/butane) is not corrosive
- Coated on outside to protect against corrosion
- Widely used for BBQ and inside home in developing countries

Concerns:

- ☐ Subject to high pressure and is a health and safety issue
- ☐ Harsh handling during transportation and storage, damages external coating
- ☐ Subject to leak from regulator, valve, piping and fitting
- ☐ Internal corrosion from moisture contamination

Recommendations:

- ✓ Check test date (stamped on neck ring or shoulder)
- ✓ Close valve when cylinder is empty to avoid moisture getting inside
- ✓ Loss or damage to the external coating is a sign of negligence and could lead to corrosion
- ✓ Check for leak using water and soap
- ✓ Avoid placing cylinder under direct sunlight or warm conditions



Corrosion in Garage

Garages often house vital systems like the electrical panel (fuse box) and boiler, along with valuable equipment—so corrosion can cause costly damage, safety risks, and major financial loss

- Temperature swings cause condensation on metal surfaces, leading to rust
- Residues of oil, fuel, and road salt, combined with cleaning agent spills, compromise protective coatings and initiate corrosion of hardware and fixtures
- Rust on hinges, locks, and garage doors reduces security and functionality

Recommendations:

- Improve ventilation and apply protective coating to floor and walls
- Remove salt, dirt, and chemical residues and paint metal lock
- Identify early signs of corrosion and act promptly and ensure sloped floors, and clear water outlets
- Paint door, lubricate moving parts, keep hinges, springs, and rollers oiled to prevent wear and sticking



Corrosion of Batteries

- Misuse of battery including exposure to moisture can lead to corrosion
- Overcharging is another frequent culprit for corrosion
- Corrosion of battery can release chemicals (acids) and gases (hydrogen, sulphur) that are irritant and can cause fire or serious health risk if swallowed
- Battery corrosion can damage electronics. Leaks can send the corrosive substances and gasses deep into the device, destroying sensitive elements
- Battery terminal corrosion can result in lower power, overheating and can damage the battery and device
- Battery corrosion is commonly manifested as a buildup of flaky or crumbly material around the battery terminal
- A baking soda water solution will clean up corroded terminals
- The simplest way to prevent battery corrosion is to use anti-corrosion type of battery
 - Always use the same type and brand of battery for devices requiring multiple batteries. Mixing alkaline, recyclable, and lithium batteries — or even the same kind of battery from different brands — results in whichever battery is discharging faster, increasing the possibility of battery leakage
 - Remove batteries from any device you don't use often



Corrosion Control with Household Items

Environmentally Friendly Home Remedies

- **Vegetable oil** – lubricates joints, reduces friction, eliminates noise
- **Weak acids** (vinegar, lemon juice) – dissolve scale, clean corroded or blocked items
- **Soda** – removes rust and corrosion products (e.g., car battery terminals)
- **Wax** – repels water, protects furniture, floors, and cars

For More Severe Cases

- **Petroleum-based penetrating oil** – loosens rusted bolts, provides lubrication
- **Cleaning chemicals** – ammonia, alcohol, silver polish for targeted cleaning
- **Abrasives** – steel wool, sandpaper for surface preparation
- **Paints** – touch up damaged coatings, restore protection
- **Baking soda** – versatile cleaner, mild abrasive, neutralises acids



Most Effective Practices to Control Corrosion at Home

Preventive Measures

- **Keep surfaces dry** – moisture accelerates rust and corrosion
- **Apply protective coatings** – wax, paint, or oil to repel water and oxygen
- **Use mild cleaners** – vinegar, lemon juice, or baking soda for safe, eco-friendly maintenance
- **Regular inspection** – check joints, terminals, and exposed metal for early signs of corrosion
- **Ensure good housekeeping** – keep areas clean, organised, and free from debris
- **Use items as intended** – fit for purpose, avoid misuse that accelerates wear
- **Apply common sense** – don't rely on damaged or unsafe items

Corrective Actions

- **Lubricate moving parts** – vegetable oil or penetrating oil to reduce friction and loosen rusted bolts
- **Remove deposits** – soda or weak acids to clean scale and corrosion products
- **Surface preparation** – abrasives like steel wool or sandpaper before repainting or recoating
- **Touch up coatings** – repaint damaged areas to restore protection

Pathways into Corrosion Science & Engineering

Corrosion is a natural phenomenon that affects homes, infrastructure, energy, transport, healthcare, food production, and more

It is only briefly covered in most undergraduate programmes such as chemical, mechanical, materials, and civil engineering

Advancing Your Knowledge

- Many universities offer postgraduate degrees in Corrosion Science for those wishing to specialise
- ICorr and other bodies offer structured training and recognised qualifications that translate academic knowledge into practical, industry-ready competence



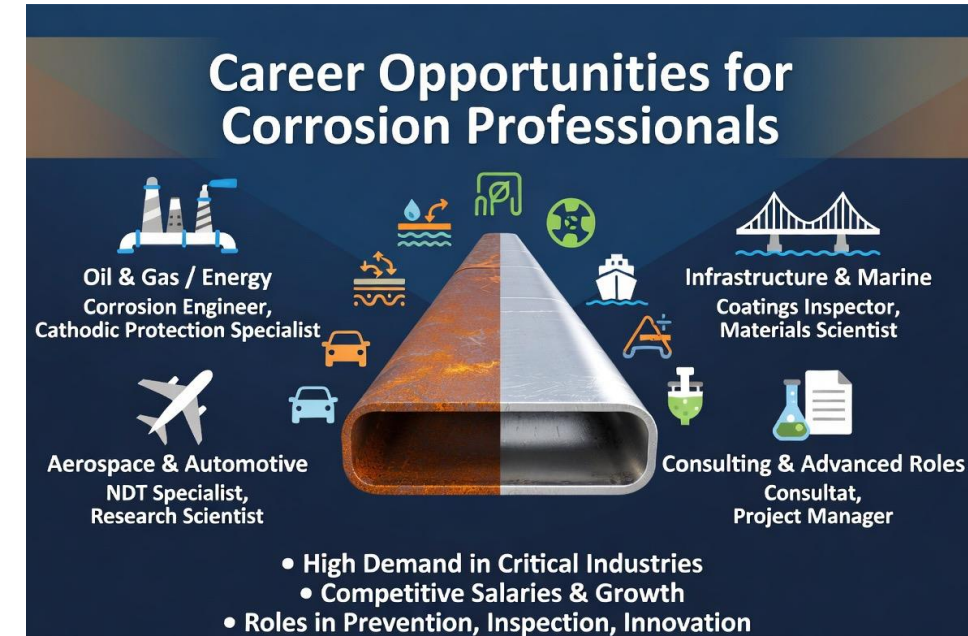
A Career with Wide Opportunities

A corrosion qualification can lead to roles across diverse sectors, including:

- Energy (oil & gas, renewables, hydrogen, nuclear)
- Manufacturing and processing industries
- Food and beverage production
- Medical devices and biotechnology
- Transport, water systems, and infrastructure

Why choose corrosion?

- High global demand for specialists
- Opportunities to work across multiple industries
- Meaningful impact on safety, sustainability, and asset reliability
- A rewarding career combining science, engineering, and practical problem-solving



The global cost of corrosion is estimated at approximately US \$2.5 trillion per year

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