purafil

Filtration Group®

Jose Bayon, Director of Sales EMEA

Industrial Corrosion Solutions

- Purafil develops and manufactures proprietary media and systems that protect people, processes and the environment
- Our patented products remove harmful and unpleasant particles, gases, odors, bacteria, and viruses from the environment
- Since 1969 Purafil is the global leader in gas phase (molecular) air filtration operating in 72 countries
- Purafil's best-in-class research provides continued development of revolutionary products that improve corrosion control, indoor air quality, energy conservation, odor control, pathogen removal, and toxic gas scrubbing


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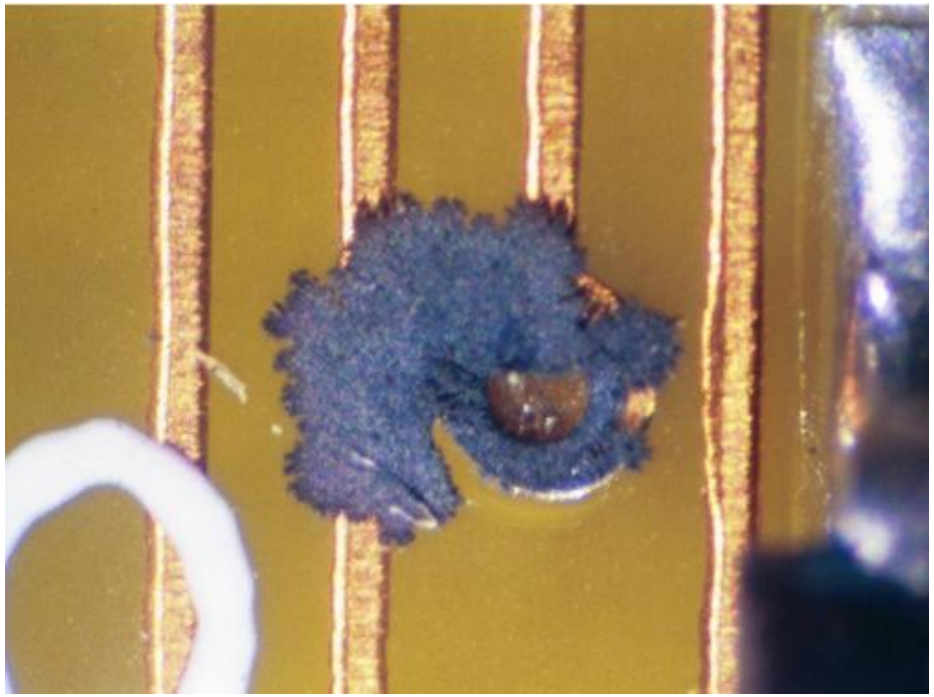
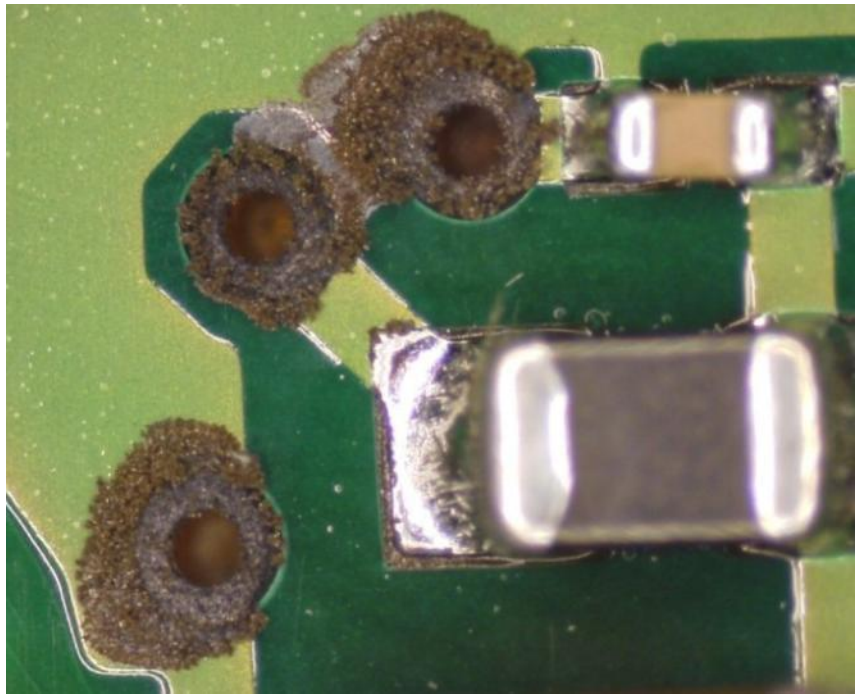
What is corrosion?

For our purposes, corrosion can be defined as a byproduct of chemical reactions between gaseous contaminants and various types of metal.

In particular, we are concerned with three types of gaseous contaminants: **acidic gases, caustic gases, and oxidizing gases.**





What causes corrosion?

Of the different classes of contaminants that can cause corrosion, four classes of acidic gases are the most common and the most harmful.

- **Active sulfur compounds**
  - Hydrogen sulfide (H_2S), mercaptans (R-SH), elemental sulfur (S)
- **Sulfur oxides**
  - Sulfur dioxide (SO_2), sulfur trioxide (SO_3)
- **Nitrogen oxides**
  - Nitric oxide (NO), nitrogen dioxide (NO_2), nitrogen tetroxide (N_2O_4)
- **Inorganic chlorine compounds**
  - Chlorine (Cl_2), chlorine dioxide (ClO_2), hydrochloric acid (HCl)
- **Others**
  - Hydrogen fluoride (HF), ammonia and derivatives (NH_3, NH_4^+), photochemical species (O_3)

With copper and silver, the metals most susceptible to corrosive attack, the byproducts formed are metal salts that remain on the surface causing mass gain or metal loss.

Where are corrosive environments found?

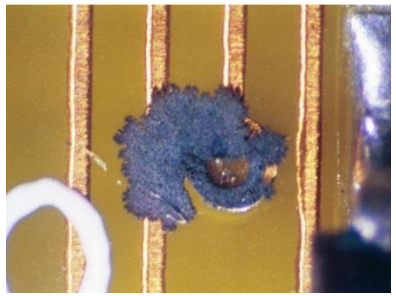
COMMON EMISSIONS OF NATURAL AND INDUSTRIAL PROCESSES

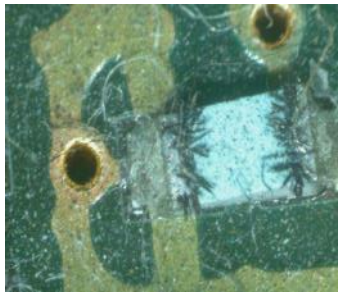
Industrial Process	Emissions
Power generation	SO_2, C, CO, NOx, hydrocarbons, organics
Automotive combustion	SO_2, SO_3, HCl, HBr, NOx, hydrocarbons, organics, CO, HBr
Diesel combustion	CO, NOx, many organics
Fossil fuel processing	H_2S, S, SO_2, NH_3, hydrocarbons, other organics, mercaptans
Plastic manufacture	All organics, aldehydes, alcohols, NH_3, SO_2
Cement plants	SO_3, dust, SO_2, NOx, CO
Steel blast furnaces	H_2S, SO_2, CO, HF, coal dust
Steel electric furnaces	H_2S, SO_2, C, CO
Coke plants	H_2S, CO, HCN, carbon, dust
Pulp manufacture	Cl_2, SO_2, H_2S, CO, wood fibers, dust
Chlorine plants	Chlorine, chlorine compounds, NaCl
Fertilizer manufacture	HF, NH_3, CH_4, gas, liquids, dust, acids
Food processing	Hydrocarbons, many organics
Rubber manufacture	H_2S, S_8, R-SH
Paint manufacture	C, hydrocarbons, oxygenated hydrocarbons, dust
Aluminum manufacture	HF, SO_2, C, dust
Ore smelting	SO_2, CO, H_2, dust
Tobacco smoke	H_2S, SO_2, HCN, CO, tars and particulates
Gasoline and fuel vapors	Hydrocarbons, oxygenated hydrocarbons
Battery manufacture	SO_2, acids, dust

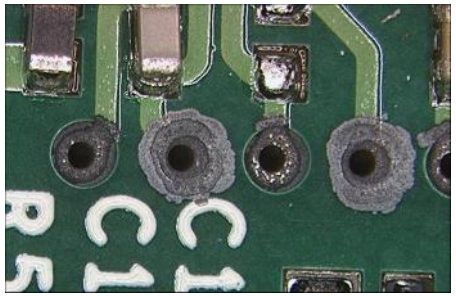
International regulations and industry standards

RoHS (lead-free) regulations that took effect since 2006 have changed the landscape with regards to electronic equipment reliability.

- Electronic equipment has become much more sensitive to environmental factors – especially gaseous contamination.
- Corrosion failures have increased dramatically with the most common failures being on the most common components.
- More so than industrial computer systems, commercial datacom and IT equipment were negatively impacted by the changes brought about by RoHS.







International regulations and industry standards

All leading DCS manufacturers have warranty requirements tied to ISA Standard 71.04.

Honeywell: Guidelines to Maximize Equipment Uptime

Chemical purification systems and verification by reactivity monitoring.

Honeywell: Control Hardware Planning Guide.

"Uncoated boards are rated for **mild (G1) environments**."

ABB: Environmental Data.

"Corrosive protection – compliant according to **ISA-71.04**…"

Yokogawa: Hardware Features.

"…corrosion resistance meets the specifications of **ANSI/ISA 71.04** as standard."

ISA Standard 71.04-2013

As with the original 1985 version, the current edition still classifies four levels of environmental severity for electrical and electronic systems.

- Now incorporates silver corrosion rates as a **required** metric for determining severity levels.
- The higher of the two reactivity rates sets the overall severity level.

Most of the major electronic process controls manufacturers, IT/datacom equipment manufacturers, and those in related industries already have or will be updating specifications to reference the 2013 version of ISA 71.04.

Class	Severity Level	Copper Reactivity	Silver Reactivity	Comments
G1	Mild	<300Å	<200Å	Corrosion is not a factor in determining equipment reliability.
G2	Moderate	<1,000Å	<1,000Å	Corrosion effects are measurable and corrosion may be a factor. OSP and ImSn PCB surface finish failures.
G3	Harsh	<2,000Å	<2,000Å	High probability that corrosive attack will occur. ENIG and ImmAg PCB surface finish failures.
GX	Severe	≥2,000Å	≥2,000Å	Only specially designed and packaged equipment will survive.

Purafil's solution – Monitoring & Analysis

We assess and measure the reactivity level of air contaminants, temperature, and relative humidity in a controlled environment to identify problems before costly failures occur.

Reactivity monitoring is an accurate and reliable method of evaluating the quality of makeup and recirculation air in a controlled environment.

Active monitoring involves constant feedback of data measuring the type and level of corrosion, temperature and humidity.

Passive monitoring involves installation of a one time use coupon that accumulates corrosion over a pre-designated period of time

Purafil's solution – Media & Equipment

We design build-to-order systems for any environment. Airflows from less than 100 cfm to over 50,000 CFM. This illustration indicates the typical process for scrubbing contaminated air using Purafil equipment.

1. Untreated air
2. Inlet with mist eliminator
3. Prefilter
4. Blower
5. Initial media pass
6. Polishing media pass
7. Final filter
8. A better quality of air

What manufacturers say

What controls manufacturers are saying…

Honeywell: The Environment in Control and Equipment Rooms: How Important Is It, and What To Look For?

- "We recommend the chemical filtration be handled by a 3rd party, such as Purafil. Real time, active and passive monitors, are available to help monitor the effectiveness of chemical filtration. Optimized filtration can be monitored using either Purafil's On-Guard systems, or reactivity monitoring, including silver and copper coupons."

Schneider Electric: Electrical Equipment and Components in Adverse/Corrosive Environments

- "…data collected by Purafil® have shown that using copper corrosion alone as a gauge for equipment reliability can seriously understate the corrosive potential of the local environment."
- "Purafil® has established the shortcomings of direct gas monitoring and why the use of corrosion monitoring for environmental classification is being used as a replacement."
- "If you suspect a corrosive environment… we suggest that you contact an environmental consulting or corrosion engineering firm, such as Purafil®."


TOGETHER, WE ARE MAKING
THE WORLD SAFER, HEALTHIER
AND MORE PRODUCTIVE.
Filtration Group®
Filtering The World