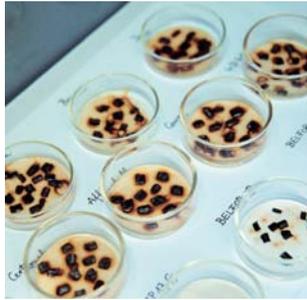




nation. Restoration is more than just cleaning; it is a multi-stage process: Drawing on the documentation, equipment, entire facilities, installations and building parts are opened up as far as possible, decontaminated and de-corroded, repaired if necessary and finally to its pre-damage condition restored.



Corrosion test on cast iron pieces

In all these processes, R&D:

- Tests methods, machines and work materials
- Creates suitable, typical workflows
- Defines methods, materials and quality controls in standard operating procedures and technical information leaflets, etc.

- The documents are contained in manuals and the knowledge database Technical Information System (TIS), used as the basis to provide staff with technical training.

Design and test of restoration chemicals

The effective combination of chemicals and procedures must remove all types of contamination and corrosion and even production residue without attacking material and coatings. Surfaces must also be protected before and after restoration. This is why R&D has created 45 of its own restoration agents for all conceivable objects and applications:

- Light and heavy (long term) preservatives to protect against corrosion (acids, corrosive gases) and environmental impact
- Cleaning agents for electronics, machines, buildings and clean rooms. In addition to soot, they must also remove all kinds of greases, oils and resins.



Emulsification test following a damage caused by rapessed oil

- Corrosion removers, polish and passivators for all kinds of corrosion (oxides, sulphides...) and (non)precious metals
- Smell eliminating agents / encapsulants
- Disinfectants and preservatives to protect against bio-contamination (bacteria, mold, fecal bacteria)

The perfectly tailored parameters for use are analyzed in all materials, for instance the required concentration, temperature, period of reaction, pH, bath/spray/foam applications, but also the compatibility for humans and the environment. The restoration agents that R&D releases are manufactured and sold by the BELFOR subsidiary Brandchemie on behalf of the global BELFOR Group.

Quality control

Following orders, the R&D department is also charged with the downstream auditing of restoration success by means of analysis or technical measurements in the laboratory or on the ground.

RESEARCH AND DEVELOPMENT

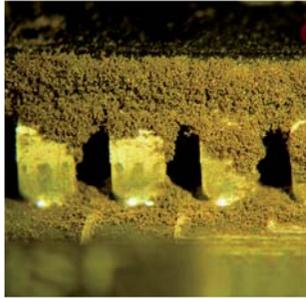


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R&D enables successful remediation

Electronics, machines, buildings and inventories place very different requirements in a restoration company. Generally speaking, the objects requiring remediation must be dried



Conductive soot and construction dust on electronics

and restored effectively and in a manner that preserves the materials. The respective use, the original function and the reliability must be put back in place. This applies even more to technically elaborate, hygienically sensitive and clean room areas and also to those areas with special security requirements.

Fundamental knowledge and experience in the forms and consequences of damage are in demand here. Seeing as the consequences of damage are so unusual and the demands so high, professional restoration will usually remain elusive and not guaranteed if just superficial procedures or simple household or not appropriate industrial cleaning agents are used.

Identifying the consequences of damage – finding solutions

Contamination following fire, flooding and environmental damage, corrosion and toxic agents often require complex refurbishment processes in order to restore the original state prior to the damage. For this, the central R&D department at BELFOR develops SOLUTIONS, that is synergistic combinations of methods and restoration materials that guarantee not just effective

but also economic drying and restoration. The remediation

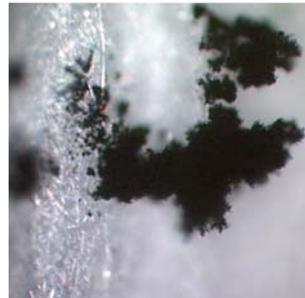


Extinguishing powder corrosion on copper

protocols are tailored continuously to adopt new technologies and materials; they are also audited within the most sensitive industrial fields. See flyer on quality control.

Analytic capacities

The R&D laboratory analyzes (unidentified) deposits following damage. After an initial (trial) restoration, extremely precise equipment can determine whether all contaminants were removed. A series of analytic methods is used to identify relevant contamination or faults in function and suitability for use:

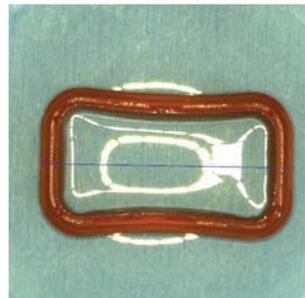


Identification of soot agglomerates



Residue analysis using digital microscopy

- Invisible particles and films or changes using digital microscope, oblique illumination, UV radiation.
- Water-soluble, corrosive substances analyzing conductivity in the watery extract (guideline value: <math>< 260 \mu\text{S}/\text{cm}</math>).
- Typical damage or corrosive anions (fluoride, chloride, nitrate, phosphate, sulphate) using ion chromatography



Compatibility test on one seal (dimensions)



Roughness measurement to check the specification

- Typical damage or corrosive / toxic metals (sodium, calcium, iron, lead, arsenic, etc.) using atomic emission spectroscopy (ICP-AES) or scanning electron microscope with energy dispersive analysis (SEM-EDX).
- Organic/toxic substances (PAHs, dioxins, plasticizers, silicones, etc.) using infrared spectroscopy (FT-IR) or gas chromatography analysis (GC-MS).
- Functional properties: Dimensions, roughness, layer thickness, wall thickness, passivation, surface resistance (SIR).

Restoration on the cutting edge of technology

Reliable and reproducible restoration also requires expertise in relevant technology standards and equally in the technologies, components and materials in use – irrespective of whether they are in electronics, mechanical engineering or in buildings. The development of remediation solutions frequently necessitates cooperation between various specialist disciplines. For instance, the increasingly gas tight structure of housing complexes and the rise in resident sensitivity generate a rise in new mold and bacteria problems that call for modern and accepted restoration concepts.

Developing standard restoration protocols

Restoration can be divided into four levels: Restoration phases, restoration steps, restoration methods and restoration resources (facilities, equipment, chemicals and auxiliary means) that require good alignment and a synergistic combi-



Cleaning test with spray extraction and alkaline agent AC 12 of BELFOR on sticky fire condensate