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Innovative Cleaning Methods in the Conservation of Historic Buildings: Clean Galena and Arte Mundit

Innowacyjne metody czyszczenia w konserwacji zabytków: Clean Galena i Arte Mundit

Keywords: monument conservation, innovative cleaning methods, heritage protection

Słowa kluczowe: konserwacja zabytków, innowacyjne metody czyszczenia, ochrona dziedzictwa

Introduction

Cleaning the facades of both historic and modern buildings is a challenging task due to the significant environmental impact and the need to protect the original material. Conventional methods for cleaning natural stone, such as mechanical processes or chemical cleaning agents, often have significant drawbacks. Mechanical methods can damage the surface and lead to a loss of the original material structure. Chemical cleaning agents, on the other hand, carry the risk of attacking not only the dirt but also the stone itself, leaving behind harmful residues.

In recent years, awareness of the emissions that can result from facade cleaning has increased significantly. In particular, whether cleaning can release heavy metals into the environment has received considerable attention. This article presents two innovative cleaning methods: Clean Galena and Arte Mundit®. These methods offer effective, environmentally friendly approaches for cleaning facades and interior spaces while preserving the original material.

Clean Galena: Zero-emission facade cleaning

Background

Among the active ingredients used for cleaning purposes, surfactants play a prominent role. The surface-active properties of many of these substances are impaired by hardness-forming metal ions. Metal ions enhance the adhesion of dirt particles to surfaces and promote their cohesion.

Positively charged metal ions can act as “mediators” between negatively polarized surfaces and negatively polarized dirt components. This can be explained as follows: In dirt, metal ions can be bound as a central atom in a complex structure. This hinders the swelling of protein-containing dirt—a process crucial for cleaning—because the negatively polarized molecular groups of the protein are unavailable for interaction with water due to their bond with the metal ion. Consequently, more effective removal of dirt can be achieved by removing the metal ions from the relevant compounds.

Clean Galena was originally designed for the complexation and emission-free removal of metal ions—particularly lead ions—from building facade surfaces. Furthermore, Clean Galena has a cleaning effect in many cases, as the removal of metal ions is accompanied by several benefits for the cleaning process:

- destabilization of gypsum and lime deposits,
- improving the swelling capacity of organic contaminants,
- easier dispersion of dirt particles.

The dispersing effect of certain complexing agents is based less on the removal of metal ions from dirt particles than on the adsorption of negatively charged ions onto the dirt particles. As a result, the dirt becomes negatively charged. Dirt particles with the same charge easily break down into even smaller components and also repel one another. In addition, the dirt is repelled by negatively charged or polarized surfaces.

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Citation / Cytowanie: Haustein S. Innovative Cleaning Methods in the Conservation of Historic Buildings: Clean Galena and Arte Mundit. *Wiadomości Konserwatorskie – Journal of Heritage Conservation* 2026, 86S:208–212

otrzymano / Received: 10.05.2025 • **Zaakceptowano / Accepted:** 1.03.2026

doi: 10.48234/WK86SINNOVATIVE



Fig. 1. Cleaning service performed at the Louvre, Paris, using Clean Galena; photo by TOLLIS

Ryc. 1. Usługa czyszczenia przeprowadzona w Luwrze w Paryżu przy użyciu preparatu Clean Galena; fot. TOLLIS

Methodology

Clean Galena is a paste-like cleaning agent that is applied to the surface by brushing or spraying. In the process, contaminants are dissolved and drawn back into the compress—which serves as the carrier material—where they are bound. The carrier material used is bentonite, a layered silicate that binds various dissolved substances and colloids through adsorption and electrochemical processes. This process is supported by a small amount of cellulose, which regulates moisture transport.

To individually tailor the cleaning effect and, if necessary, the drying time of Clean Galena to a specific substrate, in addition to the standard version “Clean Galena neutral”—which contains the lowest possible active ingredient content (a formulation completely without active ingredients is also possible, though this results in a significantly altered consistency when mixed with the standard material)—there is an additional variant available that is characterized by an exceptionally low active ingredient content. To adjust the cleaning intensity of Clean Galena, the two variants can be mixed on-site. It is recommended to create test areas using different mixing ratios. Once a suitable mixing ratio has been selected, the mixture can be prepared on-site by the personnel performing the work for smaller areas. For larger areas, Clean Galena can also be provided from the factory in the appropriate mixing ratio upon request; this special mixture is then designated “Clean Galena individual.”

Advantages

- Low moisture exposure to the structure
- No dust exposure
- Easy to apply by brushing or spraying



Fig. 2. Cleaning with Arte Mundit at the Cathedral of Saint-Louis-des-Invalides, Paris; photo by TOLLIS

Ryc. 2. Prace oczyszczające przy użyciu Arte Mundit w katedrze Saint-Louis-des-Invalides w Paryżu; fot. TOLLIS

- No emissions of hazardous substances
- Z Absorption of pollutants into the compress and the resulting ease of disposal
- Clean Galena does not contain ammonium carbonate or EDTA

Procedure

The surface to be treated is first cleaned of loose particles and substances that reduce adhesion. The compress is preferably applied by machine to ensure even and economical application. After one to three days, once the compress has dried, it can be easily removed. Any remaining dirt can be washed off, and the dried compress material is disposed of in accordance with local regulations.

Arte Mundit®: cleaning of interior areas

Background

When it comes to cleaning historic facades, there is an almost overwhelming number of different methods. In recent decades, however, none of these methods has proven effective for the systematic cleaning of large areas in historic interiors. There are many reasons for this. Some of the methods mentioned require a considerable amount of water, which can lead to problems indoors. Other methods generate a great deal of dust, which is also considered problematic. Methods that avoid these drawbacks are rare or, as in the case of laser technology, have such low area coverage that cleaning large interior surfaces is hardly feasible for cost reasons.

The only product commercially manufactured to date and used on a large scale for cleaning interior surfaces is essentially an EDTA-containing paste. This paste can be used both to remove thin layers of plaster and to reduce copper, nickel, and iron stains.

A more recent development for cleaning interior wall surfaces is represented by peeling agents, which are characterized by peelable pastes based on a specially formulated natural latex dispersion. As the water evaporates, the polymer cross-links, causing an elastic film to adhere to the surface being cleaned. The film formed in this way can be mechanically removed without the use of water. The cleaning effect is based on two different principles, which vary in intensity depending on

the type of soiling and the product’s formulation. On the one hand, surface contaminants adhere to the resulting film; on the other hand, relevant compounds on the surface to be cleaned are dissolved and complexed, so that they are also incorporated into the latex film. After the product is peeled off, a clean surface remains. Arte Mundit® is suitable for cleaning natural stone surfaces, including marble, as well as other mineral substrates, such as brick, plaster, or concrete.

Methodology

It is applied to the surface to be cleaned and forms an elastic film that binds the contaminants. Once dry, the film can be easily removed mechanically. The system is based on a combination of adhesion and chemical dissolution of contaminants.

Arte Mundit® consists primarily of a specially formulated natural latex dispersion known for its excellent film-forming properties. This dispersion contains natural latex particles that, together with additional binders and solvents, enable effective dirt removal.

There are five different variants of Arte Mundit®, suitable for various substrates and degrees of soiling. The base product, Arte Mundit® Type I, is a specially formulated aqueous dispersion of natural rubber. If cleaning beyond binding adhering dust particles is required, contaminants are chemically removed by adding small amounts of various complexing agents to the base material. The addition of these components affects the viscosity of the latex dispersion, so the final product must be reformulated accordingly to achieve the desired processing properties. Consequently, different types of Arte Mundit® are available depending on the content and type of cleaning-active ingredients:

- Arte Mundit® type I,
- Arte Mundit® types II, III and V,
- Arte Mundit® Eco.

Unlike many other methods, cleaning with Arte Mundit can be carried out without any problems while a building is in use.

Advantages

- Virtually no water required
- No dust generation
- Low noise levels
- Easy to apply by brushing or spraying
- No chemical aftereffects
- User-friendly and highly efficient
- Existing salts are not activated
- Cleans even deep pores and facial contours

Procedure

Before applying Arte Mundit®, all surfaces not to be treated must be protected. The latex dispersion is applied and, once completely dry, removed mechanically. Often, a fine layer of dust remains, which can be removed with a damp sponge.

Project example: Cleaning the interior walls of the Wrocław Cathedral with Arte Mundit

Background

The Wrocław Cathedral, officially known as Archikatedra św. Jana Chrzciciela we Wrocławiu, is one of the most significant Gothic religious buildings in Poland. Its origins date back to the thirteenth century, and it has undergone numerous expansions and renovations over the centuries. The interior walls consist primarily of brick masonry, supplemented by natural stone elements and plastered vaults.

Reconstruction after the Second World War

During the Second World War, the cathedral was severely damaged. The damage affected the vault, the walls, and the interior furnishings in particular. The reconstruction, which began in 1945, is considered an outstanding achievement in Polish historic preservation. With great dedication and limited resources, the restorers succeeded in preserving the historic structure and restoring the cathedral to its original form.

Comparison of Arte Mundit and Clean Galena

Criterion	Arte Mundit®	Clean Galena
Scope of application	Interior spaces (natural stone, brick, plaster, vaults)	Facades and exterior surfaces (natural stone, lime, gypsum deposits)
Technology	Latex-based peel-off paste	Bentonite compresses with complexing agents
Water demand	Virtually no water	Minimal exposure to moisture
Dust generation	None	None
Chemical exposure	No activation of salts, no aggressive residues	No hazardous active ingredients, no EDTA, no ammonium carbonate
Application	Apply, let dry, peel off mechanically	Apply, let dry, remove the compress
Advantages	Gentle, efficient, deep-acting, user-friendly	Binds heavy metals, removes plaster/lime, environmentally friendly
Typical projects	Churches, museums, historic interiors	Exterior facades, natural stone surfaces exposed to heavy use



Fig. 3. Aerial view of the Wrocław Cathedral, author unknown; source: <https://commons.wikimedia.org/w/index.php?curid=38330996> (accessed: 23.02.2026)

Ryc. 3. Widok z lotu ptaka na katedrę we Wrocławiu, autor nieznany; źródło: <https://commons.wikimedia.org/w/index.php?curid=38330996> (dostęp: 23.02.2026)

The challenge of internal cleaning

Despite the successful structural restoration, the interior walls remained marred by stubborn stains for decades—particularly soot, dust, and residues from the war. Cleaning these surfaces posed a particular challenge, as both the variety of materials and the historical significance of the site required a particularly gentle approach.

Initial trials with dry sandblasting

At the start of the project, a dry sandblasting method was used to remove surface contaminants. However, due to heavy dust generation and the risk of material damage, this method had to be discontinued. The burden on the workers and the surrounding area was unacceptable, and there was a risk of damaging sensitive surfaces.

Use of Arte Mundit®

After a thorough evaluation of alternative methods, the decision was made to use Arte Mundit®, a latex-based cleaning system specifically developed for cleaning the interiors of historic buildings. The process involved applying the paste to the wall surfaces, followed by mechanical removal once it had dried. The cleaning was carried out section by section without the use of water or generating dust.

Benefits of Arte Mundit® in the project:

- No water damage to the historic structure
- No dust is generated during cleaning
- Gentle removal of even deep-seated dirt
- No activation of existing salts
- Good ability to monitor cleaning results



Fig. 4. Application of Arte Mundit; photo by S. Haustein

Ryc. 4. Zastosowanie Arte Mundit; fot. S. Haustein



Fig. 5. Inspection of Arte Mundit; photo by S. Haustein

Ryc. 5. Kontrola działania Arte Mundit; fot. S. Haustein



Fig. 6. View of the Cathedral's interior after cleaning works; photo by S. Haustein

Ryc. 6. Widok wnętrza katedry po pracach oczyszczających; fot. S. Haustein

Conclusion

Modern cleaning methods such as Clean Galena and Arte Mundit® offer effective and environmentally friendly solutions for cleaning facades and interiors. Both methods are characterized by their ability to bind pollutants while preserving the original material. Clean Galena is particularly effective at complexing metal ions and removing urban pollutants, while Arte Mundit® enables water-free and dust-free cleaning of interior spaces. These innovative methods help preserve historic and modern buildings over the long term and maintain their aesthetic appeal.

At a time when awareness of environmental protection and historic preservation is steadily growing, these methods offer a welcome and necessary alternative to conventional cleaning procedures. They

demonstrate that it is possible to clean historic buildings and monuments while simultaneously protecting the environment and preserving cultural heritage for future generations. By using these advanced technologies, we can ensure that our valuable historic buildings and monuments are preserved in all their splendor and continue to serve as testaments to our shared history and culture.

Collaboration

The project was carried out in close collaboration with the company Pracownia Konserwacji Zabytków Rodonit, whose expertise and experience contributed significantly to the project's success. Coordination among the project participants was exemplary, and the results were regularly documented and evaluated.

Abstract

The article was presented as part of the fourth edition of the International Scientific Conference European Culture Commonwealth 2025 (EuCuComm 2025), titled "500 years of the Reformation in Upper Lusatia and Silesia: religious, architectural and cultural heritage" (May 21–23, 2025, Luban, Poland). The article presents the advantages of using specialized cleaning products for both facades and interiors in historic buildings. The methods presented are effective and environmentally friendly, while protecting the original substance. The methods presented allow for long-lasting and aesthetic maintenance of historic surfaces without fear of damage.

Streszczenie

Artykuł był prezentowany w ramach 4. edycji międzynarodowej konferencji European Culture Commonwealth 2025 (EuCuComm 2025) „500 lat Reformacji na Górnych Łużycach i Śląsku: dziedzictwo religijne, architektoniczne i kulturowe” (21–23 maja 2025, Luban). Autor przedstawia zalety stosowania specjalistycznych produktów do czyszczenia zarówno elewacji, jak i wnętrz obiektów zabytkowych. Zaprezentowane metody są skuteczne i przyjazne dla środowiska, a jednocześnie chronią oryginalną substancję zabytkową. Umożliwiają przeprowadzenie trwałej i estetycznej konserwacji powierzchni zabytkowych bez ryzyka ich uszkodzenia.