


Blygold[®]

I T A L I A

SUBJECT: Blygold Italia Presentation and Blygold Standard Painting System Description – Rev. 1, 28/02/2017

Document objectives:

1. To present the services offered by Blygold Italia;
2. To describe the Blygold Standard Painting System for Copper-Aluminum Coils;
3. To describe the Blygold Painting System for Copper-Copper Coils;
4. To describe the Blygold Standard Painting System for MCHX Coils.

1. Blygold Italia – Main services

Impresa Donelli has signed a License Agreement in 2009 to establish a cooperation with **Blygold International**, a Dutch company renowned worldwide for its innovative solutions for the **anti-corrosion protection** of heating, ventilation, air-conditioning and refrigeration systems.

Blygold Technologies have provided for the last 35 years the **HVAC/R industry** a set of solutions to **increase the life** of systems as well as maintain their **energy efficiency** for the last 35 years. These have been used in prestigious residential buildings (i.e. Palm Island - Dubai), hotels (i.e. Holiday Inn), institutional buildings (i.e. European parliament), international airports (i.e. Heathrow Airport), cruise ships (Queen Mary II), trains (i.e. TGV), airlines (i.e. British Airways), museums (i.e. Louvre) and military bases (i.e. Pearl Harbour).

The wide range of Blygold products and services responds to all HVAC/R needs, including:

- **HVAC/R systems efficiency and reliability;**
- Resistance to **aggressive acids** (i.e. H₂S), **environments** and **climates** (i.e. Polual XT is UV resistant);
- Resistance to **temperature** (i.e. Polual XT High Temp is resistant up to 650°C);
- Products specifically developed for **MCHX** (Polual MC);
- **Quality of air** standards (i.e. Polual XT MB is specifically developed for hygienically sensitive environments such as hospitals and their surgery rooms).

Impresa Donelli, active since **1911**, brings to the partnership technical competences and experience in the anti-corrosion business and in the civil/industrial maintenance as well as certified in accordance to ISO 9001, OHSAS 18001, and ISO 14001.

Blygold Italia, leveraging on Impresa Donelli and other companies belonging to the Donelli Group, is capable of:

- Coating **new coils** in the state of the art painting shops of Cuggiono (MI), Voghera (PV), Ravenna and Brindisi;
- Carry out **maintenance projects** in existing systems in Italy and Malta.

The fit between the excellent Blygold products and the Donelli approach to corrosion issues has also allowed Blygold Italia to successfully propose new applications, such as its usage in two of the major Petrochemical Field Development projects.

2. Blygold Standard Painting System for Copper-Aluminum Coils

The Blygold Standard painting system for copper-aluminium coils, which withstands 4.000 hour salt-spray tests, is the following:

- Cleaning of surfaces to be coated with hot water at 100 bar and “Coil Clean” cleaning agent;
- Rinsing with sweet water to remove cleaning agent;
- Removal of residues of water with compressed air and drying in oven at up to 190°C;
- Combing of fins to improve material penetration (if required);
- **Painting system on aluminum fins:** supply and application of PoluAl XT;
- **Painting system on casing and external copper tubes:**
 - Supply and application of one coat of Refamac 3509 Primer;
 - Supply and application of one coat of PoluAl XT.

Inspection and quality control in accordance to Blygold protocol.

3. Blygold Painting System for Copper-Copper Coils

The Blygold Standard painting system for copper-copper coils, which withstands 4.000 hour salt-spray tests, follows the same procedure as that of copper-aluminum coils as described above except for the painting of copper fins, which required:

- Supply and application of a first coat of PoluAl XT with modified viscosity in 4 passes;
- Supply and application of a second coat of PoluAl XT in 6 passes.

Inspection and quality control in accordance to Blygold protocol.

4. Blygold Standard Painting System for MCHX Coils

The Blygold Standard painting system for micro-channels coils (MCHX), which withstands 4.000 hour salt-spray tests, is the following:

- Cleaning of surfaces to be coated with hot water at 100 bar and “Coil Clean” cleaning agent;
- Rinsing with sweet water to remove cleaning agent;
- Removal of residues of water with compressed air and drying in oven at up to 190°C;
- Combing of fins to improve material penetration (if required);
- **Painting system of core:**
 - Supply and application of Aluprep HX conversion layer;
 - Supply and application of PoluAl XT;
- **Painting system on casing and external copper tubes:**
 - Supply and application of one coat of Refamac 3509 Primer;
 - Supply and application of one coat of PoluAl MC.

Inspection and quality control in accordance to Blygold protocol.

The painting system described at paragraph “A.” will be carried out by Blygold certified applicators under the supervision of Blygold qualified inspectors at Donelli Alexo S.r.l. facilities (Via F. Somma, 64 – Cuggiono, MI or Via Pacchiarotti, 8 – Voghera, PV). Donelli Alexo and Impresa Donelli S.r.l. belong to the same group of companies and share an ISO 9001 certified quality system.

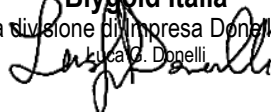
Please find annexed copy of:

- Technical datasheet and chemical resistance list of PoluAl XT;
- Technical datasheet of Refamac Primer 3509;
- Technical datasheet of PoluAl MC;
- Inspection and maintenance protocol.

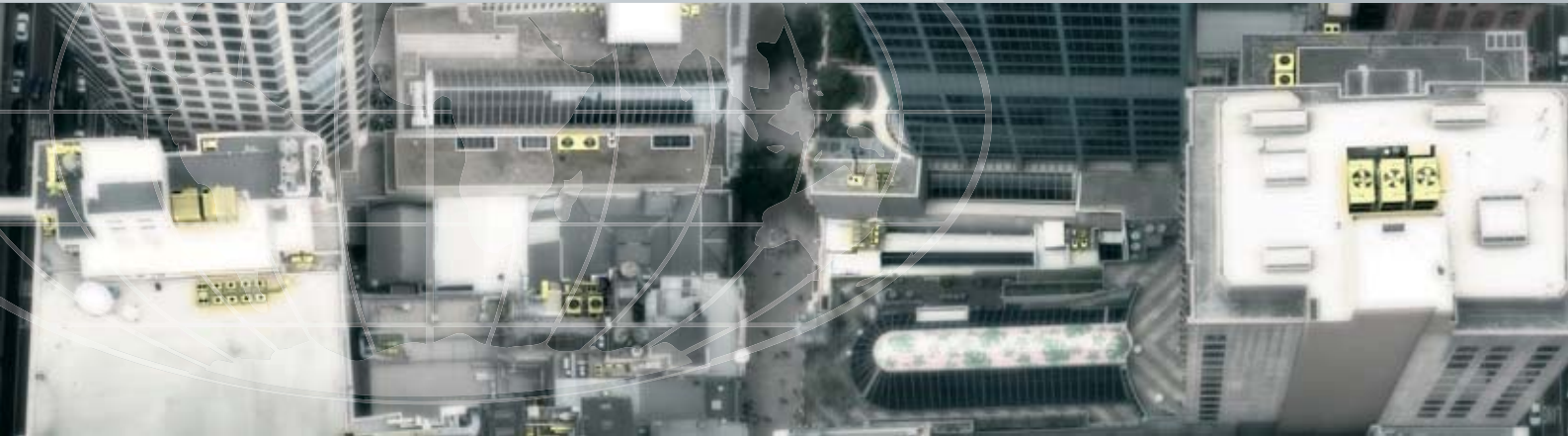
More information, references and laboratory tests are available at <http://www.blygold.com/> and/or upon request, once Your specific needs and applications are further investigated.

While we confirm to be at Your disposal for any further detail and/or information You might need (phone: +390331-408503, mobile: +39 328 6766850, email: italy@blygold.com), please accept our best regards.

Blygold Italia
Una divisione dell'impresa Donelli S.r.l.
Luca P. Donelli



PoluAl XT



PROBLEM

Heat exchangers are subject to severe corrosion because of their construction, which usually combines incompatible metals and because of the volume of polluted air passing through them. Corrosion and pollution of heat exchangers will directly affect the performance of the air conditioning system. The heat exchanger must be sealed off from the environment in a manner that will not reduce its heat transferability or cause a pressure drop. When this is accomplished, the cooling capacity will remain intact and energy consumption can be controlled.



WHY USE POLUAL XT?

- To control cooling capacity and energy consumption
- To extend the life time of the heat exchanger

SOLUTION

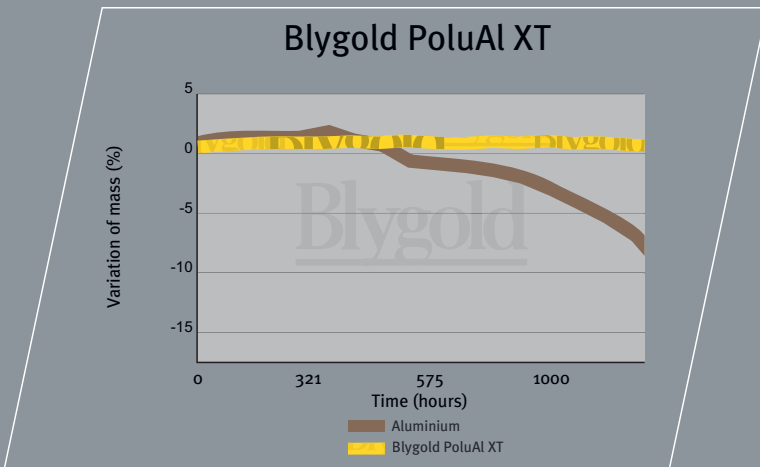
The Blygold PoluAl XT coating provides a long lasting corrosion protection to heat exchangers, without affecting heat transfer and pressure drop. The system can be applied in the factory as well as on-site.

The heat conductive pigmentation in the coating is oriented in such a way that it creates a very high chemical resistance at a low layer thickness. In combination with the unique application procedures of certified Blygold applicators the PoluAl XT is the best available option to prevent air conditioning failure and unnecessary energy consumption.



TECHNICAL INFORMATION

Treatment:	Blygold PoluAl XT
Coating type:	Aluminum pigmented polyurethane
Color:	Champagne
Pretreatment:	Degreasing
Temperature Range (dry):	-20 to 150°C (-4° to 302°F)
Substrates:	Aluminum and Copper
ASTM B117:	4000+ hours (neutral-salt spray test)
ASTM B-287:	4000+ hours (acid-salt spray test)
Kesternich (2.0 ltr SO ₂):	80 cycles
Layer Thickness:	25-30 µm (1 mil)
Pressure Drop:	0-5 % (depending on fin geometry)
Thermal Resistance:	0-3 % (depending on fin geometry)
Application:	Qualified Blygold Applicator
UV Resistance:	Excellent
Adhesion (cross hatch):	0 (European) 5b (USA)
Applications:	Heat exchanging surfaces in corrosive conditions
Chemical Resistance:	Excellent



CONTACT

Blygold International B.V.
 PO Box 44, 3990 DA Houten The Netherlands
 Phone: +31 30 6344344 – Fax: +31 30 6344300
 E-mail: info@blygold.com – www.blygold.com



BLYGOLD ITALIA

A division of **IMPRESA DONELLI S.r.l.**
 Via F.lli Cervi, 7 - I-20025 Legnano (MI) - ITALY
 Phone: +39 0331 408503 - Fax: +39 0331 408666
 Email: italy@blygold.com - www.blygold.com/it

Blygold PoluAI XT resistance to various agents and particles has been tested in lab conditions. The durability of a heat exchanger with Blygold PoluAI XT corrosion protection system will be subject to the exposure conditions simulated in this test. Values are based on average concentrations, at any doubt the R&D department of Blygold International shall be consulted (Tel. +31 30 6344344 - Fax +31 30 6344300 - info@blygold.com).

Attention!! Resistance is expressed in terms of vapours, not fluids. Concerning exposure to fluids, cleaning agents, chemicals, process fluids or others, Blygold International shall be consulted.

Resistance is based on exposure temperature of 20°C (68°F).

La resistenza chimica di Blygold PoluAI XT a diversi agenti è stata testata in laboratorio. La durata del rivestimento anticorrosivo di uno scambiatore con Blygold PoluAI XT dipende dalle condizioni ambientali. I valori sono basati su concentrazioni medie; in caso di dubbi contattare la R&S di Blygold International (Tel. +31 30 6344344 - Fax +31 30 6344300 - info@blygold.com).

Attenzione!! La resistenza è espresso in termini di vapori, non di fluidi. Per quanto riguarda esposizione a fluidi, agenti pulenti, prodotti chimici, fluidi di processo o altri, Blygold International deve essere consultata.

La resistenza è in funzione della temperature di 20°C (68°F).

Inorganic acids	Acidi inorganici	Max concentration in ppm
Arsenic acid	Acido arsenico	641
Boric acid	Acido borico	641
Hydrogen carbonate	Idrogeno carbonato	641
Chromic acid	Acido cromico	641
Bromic acid	Acido bromico	320
Hydrochloric acid	Acido cloridrico	320
Hydrogen fluoride	Acido fluoridrico	320
Hydrogen sulphide	Idrogeno solforato	320
Nitric acid	Acido nitrico	320
Sulphuric acid	Acido solforico	320
Phosphoric acid	Acido fosforico	320
Perchloric acid	Acido perclorico	320
Selenic acid	Acido selenico	320
Sulfonic acid	Acido solfonico	641
Organic acids	Acidi organici	Max concentration in ppm
Acetic acid	Acido acetico	320
Benzoic acid	Acido benzoico	320
Lactic acid	Acido lattico	320
Phenols	Fenoli	320
Citric acid	Acido citrico	320
Fatty acids	Acidi grassi	320
Formic acid	Acido formico	80
Hydrocyanic acid	Acido cianidrico	320
Malic acid	Acido malico	320
Margaric acid	Margaric Acido	320
Picric acid	Acido picrico	320
Oleic acid	Acido oleico	320
Oxalic acid	Acido ossalico	320
Sulphamic acid	Acido solfammino	320
Wine stone acid	Acido di vino	320
Barn stone acid	Barn stone acid	320
Palmitic acid	Acido palmitico	320
Tannin	Tannino	320
Phthalic acid	Acido ftalico	320
Propionic acid	Acido propionico	80
Salicylic acid	Acido salicilico	320
Stearic acid	Acido stearico	320
Valeric acid	Acido valerico	320
Alkalines	Alcalini	Max concentration in ppm
Ammonia	Ammoniaca	160
Caustic soda	Soda caustica	80
Sodiumhydroxyde	Idrossido di sodio	20
Caustic potassium	Potassio caustico	80
Potassium hydroxyde solution	Soluzione di idrossido di potassio	20
Lithium hydroxyde	Idrossido di litio	20
Calciumhydroxyde	Idrossido di calcio	20
Magnesium hydroxyde	Idrossido di magnesio	20

PoluAI XT Resistance List

Ethers	Eteri	Max concentration in ppm
Diethylether	Etere etilico	20
Acetic ether	Etere acetico	20
Aromatic hydrocarbons	Idrocarburi aromatici	Max concentration in ppm
Xylene	Xylene	640
Toluene	Toluene	640
Asphalt	Asfalto	640
Anthracene	Antracene	640
Benzaptherene	Benzopirene	640
Gumlac	Gomma lacca	640
Benzene	Benzene	640
Solventnaphta	Solvente nafta	640
Naphtalene	Naftalene	640
Terpenes	Terpeni	640
Aliphatic hydrocarbons	Idrocarburi alifatici	Max concentration in ppm
White spirit	Etere di petrolio	640
Shellsol TD	Shellsol TD	640
Bitumen	Bitume	640
Isopar G	Isopar G (Iso-paraffina pesante)	640
Paraffine	Paraffina	640
Paraffineoil	Olio di paraffina	640
Alcohols	Alcoli	Max concentration in ppm
Methanol	Metanolo	320
Ethanol	Etanolo	320
Isopropanol	Isopropanolo	320
n-Butanol	n-butanolo	320
Amylalcohol	Alcol amilico	320
Benzylalcohol	Alcol benzilico	320
Diacetonalcohol DAA	Diaceton alcol DAA	320
Glycerine	Glicerina	320
n-Propanol	n-propanolo	320
Pentanol	Pentanolo	320
Fuels and Oils	Carburanti e olii	Max concentration in ppm
Diesel	Diesel	640
Fuel oil	Olio combustibile	640
Petrol	Benzina	640
Superpetrol	Benzina super	640
Lubricating oils	Oli lubrificanti	640
Kerosene	Cherosene	640
Spheric oils	Olii pesanti	640
LPG	GPL	640
Mineral Oils	Oli minerali	640
Breakliquide	Liquido dei freni	640
Skydrol	Olio Skydrol	640
Animal oils	Oli animali	640
Ethric oils	Ethric oli	640
Vegetable oils	Oli vegetali	640
Butagas	Butagas	640
Acetylene	Acetilene	640
Esters	Esteri	Max concentration in ppm
Ethylacetate	Etilacetato	160
Amylacetate	Amylacetato	160
Propylacetate	Propylacetato	160
Ethyloxalate	Etilossalato	160
Butylacetate	Butilacetato	160
Butylpropionate	Butylpropionato	160
Ethylformiate	Etilformaldeide	160
Ethylbenzoate	Etilbenzoato	160
Ketones and Aldehydes	Chetoni e Aldeidi	Max concentration in ppm
Acetone	Acetone	320
Acetaldehyde	Aldeide acetica	320
Benzaldehyde	Aldeide benzilica	320
Formaldehyde	Formaldeide	320
Salicylaldehyde	Aldeide salicica	320
Diisobutylketone	Diisobutylketone	320
Methylisobutylketone	Methylisobutylketone	320
Methylethylketone	Methylethylketone	320
Butanal	Butanolo	320
Crotonaldehyde	Crotonaldeide	320

PoluAI XT Resistance List

Halogenated Hydrocarbons	Idrocarburi alogenati	Max concentration in ppm
1.1.1. Trichloroethane	1.1.1. Trichloroethane	20
Methylenechloride	Cloruro di metilene	20
Methylbromide	Bromuro di metile	20
Tetrachloormethane	Tetraclorometano	20
Dichloorethene	Dicloroetano	20
Trichloorethylene	Tricloroetilene	20
Perchloorethylene	Percloroetilene	20
Tetraiodicmethane	Tetraiodometano	20
PCB	PCB	20
Salts and watersolutions	Sali e soluzioni acquose	Max concentration in ppm
Sodiumsalts	Sali di sodio	640
Potassiumsalts	Sali di potassio	640
Calciumsalts	Sali di calcio	640
Aluminiumsalts	Sali di alluminio	640
Ammoniumsalts	Sali di ammonio	640
Bariumsalts	Sali di bario	640
Coppersalts	Sali di rame	640
Leadsalts	Sali di piombo	640
Lithiumsalts	Sali di litio	640
Magnesiumsalts	Sali di magnesio	640
Mercurysalts	Sali di mercurio	640
Lithopone	Litopone	640
Arsenious compounds	Composti di arsenio	640
Hydroquinone	Idrochinone	640
Ironsalts	Sali di ferro	640
Processwater	Acqua di processo	640
Rainwater	Acqua piovana	640
Seawater	Acqua di mare	640
Heavywater	Acqua pesante	640
Zincsalts	Sali di zinco	640
Tinsalts	Sali di stagno	640
Siliconsalts	Sali di silicone	640
Cement	Cemento	640
Quartz	Quarzi	640
Dolomite	Dolomite	640
Others	Altri	Max concentration in ppm
Carbondisulphide	Solfuro di carbonio	160
Carbonmonoxyde	Monossido di carbonio	640
Carbondioxyde	Biossido di carbonio	640
Nitrogen	Azoto	640
Hydrogenperoxyde	Perossido di idrogeno	320
Chlorine	Cloro	64
Iodine	Iodio	20
Tincture of iodine	Tintura di iodio	20
Bromic	Bromico	20
East-Indian ink	Inchiostro "East-Indian"	640
Phosphor	Fosforo	320
Diphosphorpentoxyde	Ossido di fosforo	20
Zinc	Zinco	640
Aluminium	Alluminio	640
Glucose (syrup)	Glucosio (sciroppo)	640
Fructose	Fruttosio	640
Mercury	Mercurio	640
Sulpher	Zolfo	640
Antimony	Antimonio	640
Indole	Indolo	640
Latices	Lattice di gomma	640
Nitroglycerine	Nitroglicerina	640
Hydrogen	Idrogeno	640
Epoxyresins	Resine epossidiche	640
Isocyanate	Isocianato	640
Rubber	Gomma	640
Schellac	Lacca Schellac	640
Urea	Urea	640
Fruit essences	Essenze di frutta	640
Beer	Birra	640

PoluAI XT Resistance List

Others	Altri	Max concentration in ppm
Flourproducts	Prodotti di farina	640
Corn	Mais	640
Liqueurs	Liquori	640
Coffee	Caffè	640
Tea	Tea	640
Liqueur	Liquore	640
Menthol	Mentolo	640
Camphor	Canfora	640
Cellulose	Cellulosa	640
Celluloseacetate	Acetato di cellulosa	640
Nitrocellulose	Nitrocellulosa	640
Methylcellulose	Metilcellulosa	640
Cocos	Cocco	640
Silicium	Silicio	640
Siliciumcarbide	Carburo di silicio	640
Cork	Sughero	640
Woodfibre	Fibra di legno	640
Photo-development bath	Liquido per lo sviluppo di foto	640
Viscose	Viscose	640
Rescosinol	Rescosinol	640
Resins	Resine	640
Tabaco	Tabacco	640
Nicotine	Nicotina	640
Trinitrobenzene	Trinitrobenzene	640
Gelatine	Gelatina	640
Printer's ink	Inchiostro della stampante	640
Milk	Latte	640
Potatoflour	Fecola di patata	640
Vegetables	Verdure	640
Fruit	Frutta	640
Spices	Spezie	640
Honey	Miele	640
Eggs	Uova	640
Cheese	Formaggio	640
Mustard	Senape	640
Mayonnaise	Maionese	640
TomatoKetchup	Ketchup	640
Curry	Curry	640
Cacao	Cacao	640
Lemonade	Limonata	640
Coca Cola	Coca Cola	640
Pepsi Cola	Pepsi Cola	640
Sauerkraut	Crauti	640
Blood	Sangue	640
Ketjap	Salsa Ketjap	640
Sambal	Salsa Sambal	640

BLYGOLD REFAMAC 3509

Penetrating Primer



TYPICAL PROPERTIES:

ADHESION (ASTM D3359)

- Cross Hatch Adhesion Test
- Class 5B

ABRASION RESISTANCE (ASTM D4060)

- Taber Abraser Test
- 1 kg load/ 1000 cycles w/ CS 10 wheel
- Weight Loss: 20 mg

FLEXIBILITY: (DIN 53156)

- Erichsen Test
- 8 mm depression at -4°F (-20°C)
- 10 mm depression at 68°F (20°C)

PHYSICAL DATA:

- Color: Red
- Desired Layer Thickness: 60 Microns (approximately 2.5 mils)
- Application Rate: 100 grams per square meter (approximately 3 oz. per square yard) = Dry Film Thickness of 60 Microns
- Shelf Life: 6 Months (upgradeable)
- Curing Times:

Touch Dry:	1.5 Hours	
at 70° F	Recoatable:	12 Hours
(21° C)	Complete Cure	7 Days



Blygold REFAMAC 3509 is a single-component, (rust) penetrating primer developed primarily to provide an enhanced adhering surface for other Blygold topcoats. It is a fast drying, high-solid content, moisture-curing polyurethane that has excellent adhesion to most ferrous/non-ferrous metals and painted surfaces. REFAMAC 3509 is typically applied to bare copper, aluminum, steel, galvanized steel, or previously painted surfaces of HVAC/R equipment installed in aggressive environments.

TYPICAL USES:

REFAMAC 3509 is used as a primer for Blygold's REFAMAC 3600 Casing/Cabinet Coating when 3600 is applied on the casings/cabinets of condensing units, air handling units, package units, wall mount units, chillers, cooling towers and a variety of other HVAC/R system components, such as: compressors, ventilation fans, fan motors, grills, air ducts, and evaporator drain pans. REFAMAC 3509 is also specified as

Protective Coatings for HVAC/R Coils & Equipment

a primer for Blygold PoluAl Protective Coating for HVAC/R Coils installed in aggressive chemical environments. It is applied to all exposed copper tubes, u-bends, and headers of Al/Cu condenser and evaporator coils.

www.blygold.com/it

[®]
Blygold

PoluAl MC

- Preserves high efficiency of micro channel HX
- Prevents early micro channel HX failure
- Heat conductive protective layer
- Improved water release properties
- Highly flexible for coil bending
- Reflective pigment prevents sun radiation absorption



Protocollo di Ispezione e Manutenzione

Questo protocollo di ispezione e manutenzione è da considerarsi parte integrante dei termini e delle condizioni di vendita dei prodotti e delle tecnologie Blygold. Ogni difetto, danneggiamento o fenomeno di corrosione trovato sul manufatto dovrà essere riferito immediatamente per iscritto all'applicatore qualificato Blygold che ha eseguito il lavoro.

Operazioni di ispezione e manutenzione:

1. Immediatamente dopo che l'installazione dell'unità, la batteria rivestita dovrebbe essere ispezionata per eventuali danneggiamenti occorsi durante la spedizione e/o la movimentazione.
2. La batteria dovrebbe essere pulita ed ispezionata periodicamente per assicurare la massima efficienza di scambio termico e la conservazione del rivestimento. La frequenza di verifica varia in funzione delle condizioni di esercizio dell'unità.
 - a. Il requisito minimo richiesto da Blygold è che le batterie, non appena messe in servizio, siano pulite ed ispezionate ogni 6 mesi.
 - b. Per zone costiere e/o industriali un'ispezione e pulizia trimestrale è richiesta.
3. Utilizzando un getto d'acqua fredda a bassa pressione, la batteria dovrà essere sciacquata, lavata con acqua addizionata con l'agente pulente Blygold Coil Clean e sciacquata nuovamente. Blygold raccomanda che questo procedimento sia ripetuto per tutta la vita dell'unità in quanto questo non solo mantiene le qualità anticorrosive del rivestimento, ma conserva e migliora l'efficienza operativa dell'unità.
4. Dopo ciascun lavaggio, la batteria deve essere ispezionata per ogni danneggiamento, fenomeno di corrosione o di deterioramento del rivestimento. Ogni difetto, danneggiamento o fenomeno di corrosione trovato sul manufatto dovrà essere riferito immediatamente all'applicatore qualificato Blygold che ha eseguito il lavoro.

Inspection and Maintenance Procedure

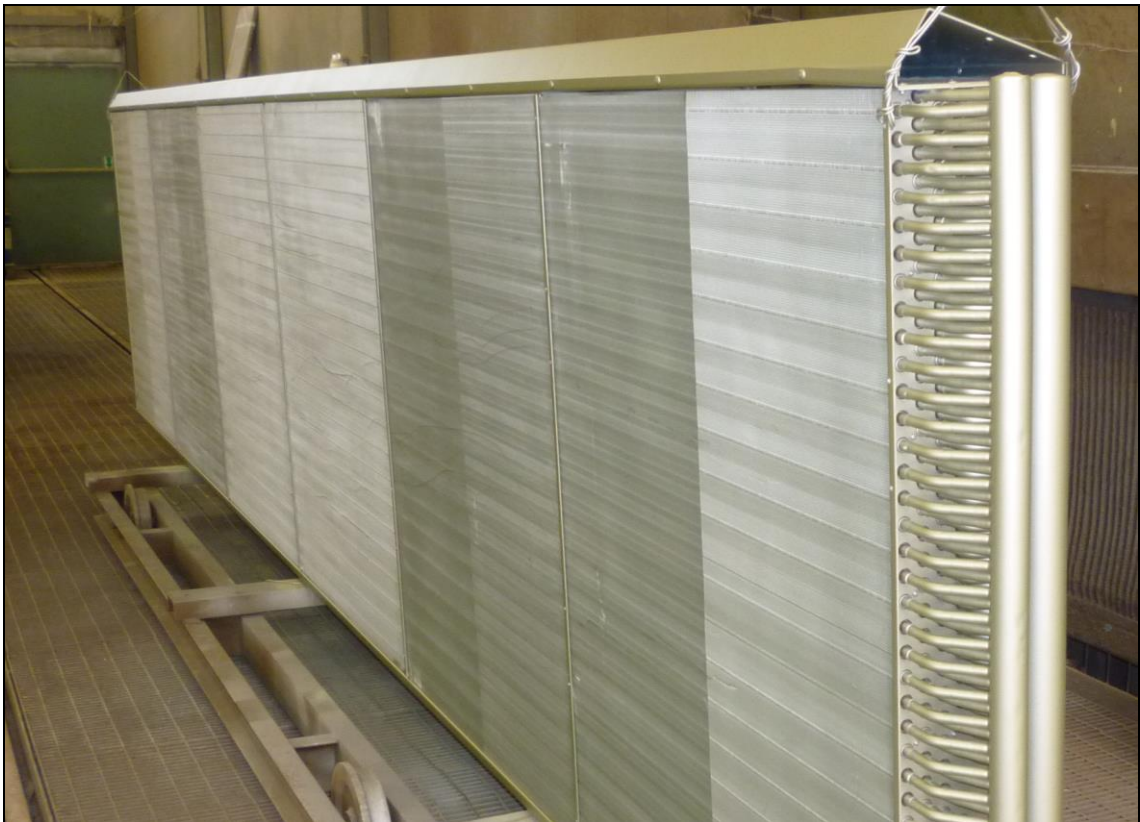
The following inspection and maintenance procedures are required as part of the terms and conditions of sales of Blygold products and technologies. Any defects, damage or corrosion found during inspections should be immediately reported in writing to the Blygold applicator, which has carried out the application.

Suggested Inspection and Maintenance Procedure:

1. Immediately after the unit is installed, the coated coil should be inspected for damage incurred in shipping or handling.
2. The coil should be cleaned and inspected periodically to ensure maximum efficiency of the coil and the coating. The frequency requirement of the cleaning process will vary depending on the conditions present at the installation site.
 - c. At a minimum, Blygold requires in-service coils be cleaned and inspected every 6 months, commencing immediately after installation.
 - d. For coastal/industrial area's a minimum of inspection and cleaning of every 3 months is required.
3. Using a low-pressure water jetting device, the coil should be rinsed with clean fresh water, washed with a solution of Blygold Coil Clean and water and rinsed thoroughly with clean fresh water. Blygold recommends this be done for the life of the unit as it not only will enhance the corrosion resistance capability of the coil, but also maintain and improve the operating efficiency of the unit.
4. After each wash, the coil should be inspected for any damage, onset of corrosion or deterioration of the coating. Any defects, damage or corrosion found during inspections should be immediately reported to the Blygold applicator, which has carried out the application.



Batterie in cabina di verniciatura durante l'applicazione del primer sul casing.



Batterie in cabina di verniciatura al termine dell'applicazione del ciclo Blygold.