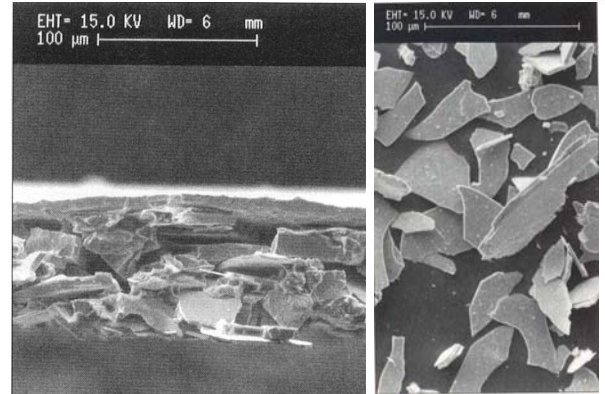


MIO Coatings – What Are They?

5.2.1

What is MIO?

Micaceous **I**ron **O**xide (MIO) is **iron oxide** in a form that resembles **mica**, a highly structured, layered mineral. Minerals with this highly layered structure are termed **lamellar**. When MIO pigments are ground into smaller, finer particles, they tend to cleave along their layers, revealing flat, shiny faces that act like **tiny mirrors**. These tiny mirrors reflect UV light, protecting the resin from degradation and give the coating an attractive “sparkle”. The lamellar shape also offers additional barrier protection. So, for many reasons, MIO pigment is outstanding for the protection of steel.



What colour is MIO?

The natural colour of MIO pigment is a dark, charcoal grey. Some MIO coatings also contain aluminium flake (another lamellar pigment) to lighten the colour.

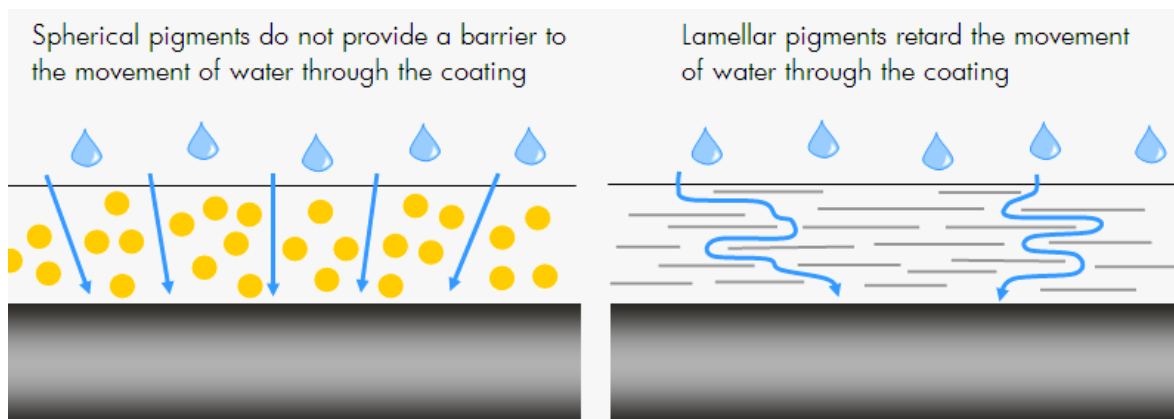
How Does MIO Work?

Steel is chemically **unstable** - it rapidly **rusts** in the presence of **oxygen**, **water** and **salts** to form **iron oxide** (rust). Iron oxide is **chemically stable**, as it cannot rust any further. Therefore iron oxide is an excellent pigment, and MIO even better, for use in protective coatings for steel. Furthermore, the lamellar shape of this particular form of iron oxide offers greatly enhanced **barrier protection**.

The lamellar nature and shiny surface appearance of MIO pigments also offer UV protection to the underlying resin system. Epoxy and enamel based coatings normally chalk on exposure to UV, however, in coatings pigmented with MIO, only the resin on the surface of the uppermost MIO particles are exposed to UV and will chalk. The chalky material will

How Does A Lamellar-Pigment Based Coating Form A Barrier?

Most pigments used in the coatings industry are roughly spherical in shape when viewed under the microscope. These pigments may contribute to opacity, colour, abrasion-resistance or other properties, or they may be mere fillers. Lamellar pigments, such as glass flake and micaceous iron oxides, are used specifically for their ability to greatly enhance the coating's barrier properties. The flakes themselves provide a “tortuous path” for any molecule that may be detrimental to the substrate, as shown schematically below.



MIO Coatings – What Are They?

5.2.1

Major Structures Protected by MIO

- *Westgate Bridge Melbourne*
- *Sydney Harbour Bridge*
- *Eastlink Freeway Overpasses*
- *Sydney Casino*
- *Lady Eleanor Schonell Bridge Brisbane*
- *ULR Motors Showrooms*
- *Melbourne Museum*
- *Emmerich Rhine Bridge Germany*
- *North Sea Oil rigs UK*
- *Tower Bridge UK*
- *Severn Suspension Bridge UK*
- *Eiffel Tower France*
- *Auckland Harbour Bridge NZ*
- *Hawkesbury River Bridge*



What To Consider When Using MIO Coatings

MIO coatings were designed for protection of steel, **NOT** as decorative finishes! Nevertheless, MIO coatings are widely used specifically for their sparkly finish and “industrial” look. If the MIO coating is required as a **decorative finish**, the following points must be noted:

- **COLOUR VARIATION BETWEEN BATCHES** – The major pigment in the paint is actually **natural** micaceous iron oxide. This **naturally occurring mineral** is mined from a number of sources, and therefore **colour variation can occur** between batches depending on the exact source of the MIO. Variations in colour consistency may be minimised by using the same batch of paint.
- **PERCEIVED COLOUR VARIATION ON A SAMPLE** – MIO has a strong “flip” typical of metallic finishes – that is, the **colour varies depending on the viewing angle**. The colour can appear very light in one angle, but appear much darker at another angle. Therefore, trying to match an MIO (or any metallic finish) with a solid colour is difficult as it all depends on which angle you view the sample!
- **COLOUR AND TEXTURE VARIATION** – Brush, roller and spray all have very different appearance, because each application method results in the MIO particles being deposited on the surface very differently. Differences in **spray equipment** (conventional versus airless spray), **spray tip size**, **fan size**, **spray distance** and other spray technique variations can all result in significant differences in colour, texture and sheen level of the final finish. Even the **direction of spray** (using the one spray technique) is important; applying the paint over two panels, in the same direction, then turning one panel 180 degrees will result in apparent colour variation between the two panels due to “flip”. Also, spray **overlapping** can be obvious.
- Application by roller or brush generally results in a **vastly different finish** from that of spray application, as the MIO pigment particles are highly irregular in shape, and therefore **inhibit the natural flow-out** of the wet paint. The brush hairs align the MIO particles rather than dispersing them randomly and uniformly as spray application does. For this reason, MIO paints exhibit higher brush-marking, roller-marking and stipple than other types of paint.
- **VARIATION IN TOUCH UP APPEARANCE** – Touch-ups are usually difficult to blend in with any type of paint, but with MIO coatings, this problem is compounded by the texture of the MIO pigment. Touch-up appearance can be greatly improved, however, by using the same application method as that used originally (eg. a touch up spray unit for sprayed areas, or a roller with the same nap as that used for the rolled areas).
- **POSSIBLE VARIATION IN APPEARANCE BETWEEN START OF JOB AND END** – As MIO pigment is heavy, it **settles** to the bottom of the container. Therefore, **thorough mixing before application**, and **frequent mixing during application** are **essential** to ensure a consistent finish.
- **COLOUR VARIATION ON UV EXPOSURE** – Colours **lighten** (and become more “sparkly”) with **exposure to UV** (sunlight). Whilst this phenomenon is very popular with some architects and designers, it can also present an aesthetic problem in areas that are partly shaded (such as under eaves) or receive variable amounts of sunlight. The north face will fade the most, whilst the south side will stay darkest. Alkyd MIO finishes show the greatest variation in

MIO Coatings – What Are They?

5.2.1

colour with time as the alkyd resin actually breaks on the surface of the uppermost MIO particles, and erodes away, exposing the MIO particle directly to UV light. Further erosion is greatly diminished, however, by the protection provided by the exposed MIO particle.

- **MARRING OR MARKING ON CONTACT** – In areas where people are likely to come in contact with the coating system (such as walls, columns, handrails, etc.) the flatter MIO finishes will mark very easily, rather like emery paper does when used. And just like emery paper, flat MIO finishes cannot be cleaned, as the cleaning cloth or sponge will shred and also leave a mark! Therefore flat and low sheen MIO coatings are unsuitable in easily accessible areas. The only way to reduce marring is to specify a semi gloss or gloss MIO finish as per below.

This Is Very Helpful, But What If I Still Want An MIO Finish?

Basically, if the marring issue (above) is of concern, you need to specify an appropriate MIO coating with a gloss to semi gloss finish, or, perhaps choose a coating that **looks** like an MIO!

Weathermax[®] HBR MIO

Weathermax[®] HBR MIO is a two-pack polyurethane MIO coating specifically for external use. Its polyurethane resin is highly resistant to degradation by UV rays, and the formulation offers a semi gloss finish that is resistant to marring. Of all the MIO coatings available, **Weathermax[®] HBR MIO** offers the best balance of properties for use as a decorative MIO finish both internally and externally. **Weathermax[®] HBR MIO** is available in Mid Grey. Other colours may be “Made-to-Order” depending on quantity required.

Durebild[®] STE MIO

Durebild[®] STE MIO is an epoxy MIO coating ideal for internal “high traffic” areas. Its surface tolerant epoxy resin offers a very tough, durable, marr-resistant semi-gloss finish. **Durebild[®] STE MIO** is available in Natural Grey and Mid Grey.

Quantum[®] FX

Quantum[®] FX polyurethane, whilst not an MIO finish can be specified in one of the “MIO-looking” colours such as FX39/005, FX39/091 or FX42/105. In fact, specifying **Quantum[®] FX** offers great design flexibility not available in MIO finishes. For more information regarding **Quantum[®] FX**, please refer to the Product Focus Tech Note 3.3.



QUANTUM FX39/005



QUANTUM FX39/004



QUANTUM FX42/105

For more information on different types of MIO coatings, please refer to Tech Note 5.2.2.

Conclusion

MIO coatings offer excellent corrosion protection and long-term durability. The use of MIO coatings as decorative finishes must be carefully considered, particularly in areas subject to wear and tear or exposed to UV light. In such situations, a polyurethane MIO coating with a gloss to semi gloss finish, such as **Weathermax HBR MIO**, or a coating that offers similar aesthetic appeal, such as **Quantum FX** should be used.

For more information, please contact the Dulux Protective Coatings Technical Consultant in your state.