Ti.Pi.Ci.
Technology in Protective Coatings

div. Ti.Pi.Ci. LABORIS

HEAT resistant WATERBORNE paints

With the right chemistry, solvent emissions can be reduced by as much as 80%

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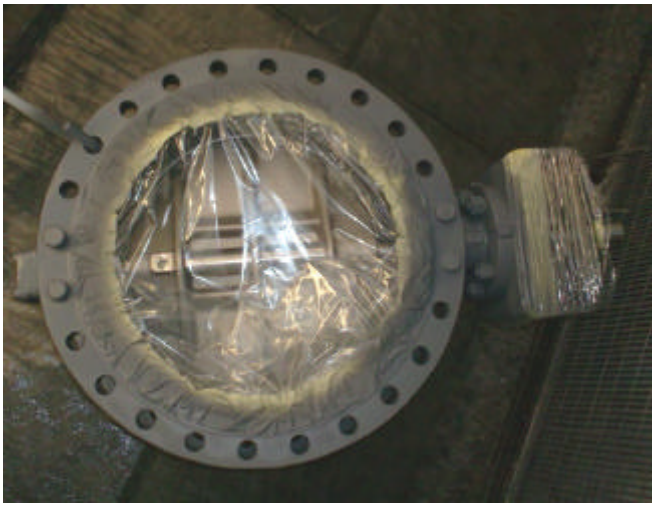
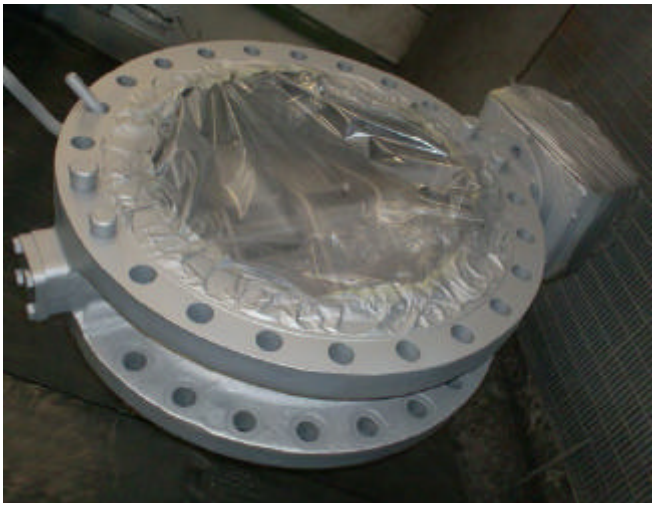


HYDROTHERM® 400 Primer (Fig.1)



HYDROTHERM® 400 Finish (Fig.2)

Silicone resins are tri-dimensionally, mesh-fenced compounds with a high molecular weight.
As in quartz, the composing elements of their structure are silicone and oxygen. Unlike the structure in quartz, in silicone resins the fourth oxygen atom is replaced by one from the organic group R.
From a chemical point of view, silicone resins are usually classified between inorganic and organically pure substances.
Silicone resin paints are coatings which have similar positive characteristics to those achieved when binding minerals with synthetic resins. Thanks to this, silicone resins paints are better than both systems in many aspects.
Despite all these peculiar characteristics, the most interesting as far as the protective coatings market is concerned, is their high temperature resistance. All coatings formulated for the protection of iron structures, and designed to operate at temperatures of up to 600°C, are silicone resin based. TIPiCi sas through Division LABORIS research and tests have developed a wide range of heat resisting waterborne protective coatings, branding them with the trademark HYDROTHERM®.
The company formulated its first waterborne system twenty years ago. It was specifically created for an international oil and gas client, a leader in the engineering and manufacture of high quality valves for cryogenic systems. The company needed a two-layer, one component system, (primer and finish) that could resist a wide range of temperatures between -40°C and +400°C.
Furthermore, the customer needed a quick drying system that didn't require any oven baking in order for it to harden.
Non-toxic pigments were selected to obtain the goal, producing the most environmentally friendly product possible for the marine environment. The company also persuaded the customer to replace its old painting systems with more advanced waterborne systems to reduce solvent emissions into the atmosphere.
A system was formulated comprising of HYDROTHERM® 400 Primer (Fig.1) and HYDROTHERM® 400 Finish (Fig.2).
Nowadays, this system is used on structures by engineering and oil and gas industries worldwide. The introduction of this waterborne painting system allowed the client to obtain new quotes on the world market beyond what it would have achieved with its old system. This was due to the coatings large contribution to safeguarding the environment, and its own operator's health.

The large gap between solvent emissions is highlighted in Tables 1 and 2.

Table 1: Waterborne silicone paint VOC level		
PRODUCT	**Dry film Thickness**	**VOC g/l**
HYDROTHERM® 400 Primer	80 micron	78,14
HYDROTHERM® 400 Finish	50 micron	73,05

Waterborne silicone paints in the HYDROTHERM® range must also be thinned with fresh water, which brings a further VOC reduction after the thinning.

Table 2: Solventborne silicone paint VOC level		
PRODUCT	**Dry film Thickness**	**VOC g/l**
Solventborne Silicone Primer of International brand	50 micron	380
Solventborne Silicone Finish of International brand	50 micron	450

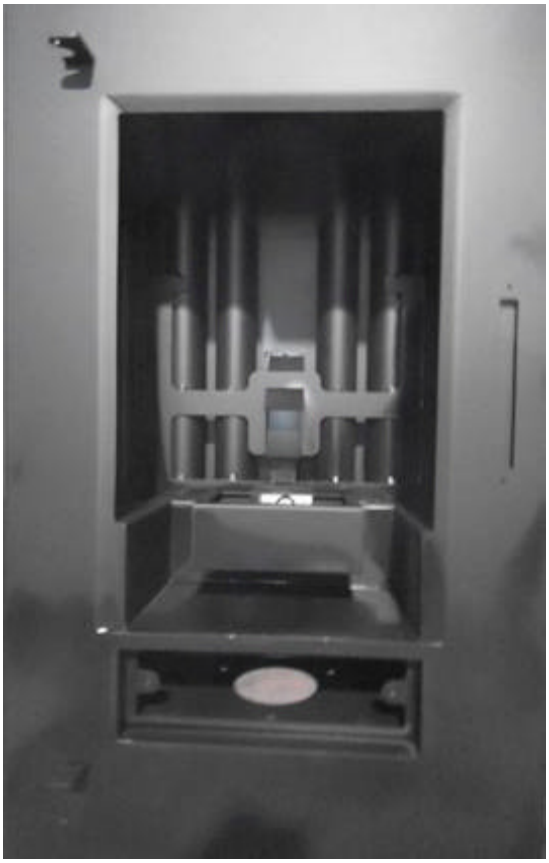
In case of solvent-borne silicone paints, thinning with an organic solvent causes a further increase in VOC emissions.

THE NEXT STEP

The next step was to formulate a waterborne silicone product that could be applied in a single coat with quick drying time, which could still operate in temperatures up to 600°C. This represents the latest development required by the most common international standards.
After considerable research by Division LABORIS, TiPiCi entered the market with a third waterborne silicone paint called HYDROTHERM® 600 (Fig.3), which has found interesting uses in the valves and flow-control market sectors.

THE NEXT STEP WAS TO FORMULATE A WATERBORNE SILICONE PRODUCT THAT COULD BE APPLIED IN A SINGLE COAT WITH QUICK DRYING TIME, WHICH COULD STILL OPERATE IN TEMPERATURES UP TO 600°C.

HYDROTHERM® 600 (Fig.3)



HYDROTHERM® MT (Fig.4)

However, zinc powder protective primers still dominate in the protective coatings market. It was for this reason that the company came up with the innovative idea of completing the waterborne silicone products range by introducing a zinc rich primer into this sector. The company launched HYDROTHERM® Zinc, a waterborne two-component, silicone zinc-rich primer, for protection of carbon steel structures exposed to operating temperatures up to 400°C.
HYDROTHERM® Zinc is supplied with zinc powder ASTM D520 Type 2, with a metallic zinc percentage of 77% (by weight) on dry film thickness.

HEATING SECTOR

Another industrial sector characterised by the high consumption of silicone paints, is the heating market. Each year, thousand of litres of organic solvents are discharged into the atmosphere because of solvent-borne silicone paint applications used on stoves, chimneys and other heating elements.
TiPiCi's response to find a solution to solve this matter is in the form of HYDROTHERM® MT and HYDROTHERM® 600 MIO.
Both products are single component, fast-drying, waterbased silicone topcoats, for direct application on carbon and stainless steel.
HYDROTHERM® MT was formulated for operating temperatures up to 500°C, and provides a slightly textured surface. (Fig 4)
HYDROTHERM® 600 MIO was formulated for operating temperatures up to 600°C and provides a more pronounced textured surface. HYDROTHERM® 600 MIO is also available in various colours.

WEALTH OF EXPERIENCE

TiPiCi has a wealth of experience when it comes to highperformance, waterborne, silicone coatings, having served the protective coatings industry for more than 20 years. It has developed important worldwide experience from the flow control market through to the heating sector, satisfying customers by improving their production processes. This has resulted in some cases, by customers reducing their solvent emissions by as much as 80%.