

CURING AGENTS FOR  
**DIRECT-TO-METAL (DTM) COATINGS**



Direct-to-metal (DTM) coatings provide an effective option for coatings in light industrial environments. DTM coatings require fewer coats of paint, which translates to increased productivity, ease of application, and lower application cost. Today, DTM coatings can also provide corrosion protection suitable for C3 environments (ISO 12944).

Amicure® IC133 and IC166 curing agents are newly developed by Evonik for DTM C3 coatings. The Amicure polycarbamide-based chemistry of these products furthers the technical evaluation of DTM coatings by providing speed of cure and low volatile organic compounds (VOC).

## Amicure IC133 and IC166 Curing Agents

Both Amicure IC133 and Amicure IC166 are polycarbamide curing agents. Amicure IC133 is slower-curing compared to Amicure IC166. Table 1 and Figure 1 show the basic properties and potlife of these two products. These polycarbamides are ideal for plural component spray systems. For information about how to adapt Amicure IC133 and IC166 curing agents for airless spray systems, please call 1-800-345-3148.

**TABLE 1: TYPICAL PROPERTIES**

|   | AMICURE IC133 (SLOWER) | AMICURE IC166 (FASTER) |
|---|------------------------|------------------------|
| Equivalent Weight                         | 256                    | 267                    |
| Viscosity @ 25 °C cP                      | 1734                   | 1500                   |
| Weight per Gallon                         | 9.26                   | 9.42                   |
| APHA Color                                | <50                    | <50                    |
| Tg (C) 7 day cure @ 25 °C                 | 55                     | 50                     |
| Gel Time (min) with MAK solvent (205 g/L) | 64                     | 22                     |

(MAK = methyl amyl ketone)

### ISO 12944 CORROSIVITY CATEGORIES

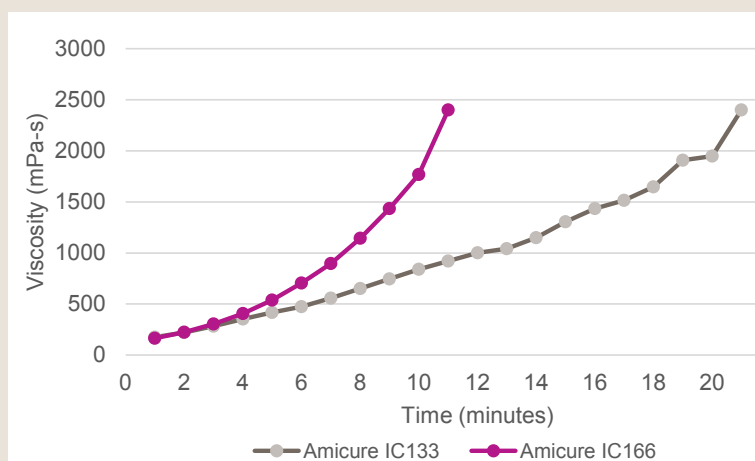
- C2:** Very low atmospheric-corrosivity
- C3:** Medium atmospheric-corrosivity
- C4:** High atmospheric-corrosivity
- C5I:** Very high (industrial) atmospheric-corrosivity
- C5M:** Very high (marine) atmospheric-corrosivity

### APPLICATIONS

Examples of applications where DTM coatings are often used are the following:

- Light industrial
- Storage tanks
- Fire escapes
- Structural steel
- Steel decking
- Railings
- Steel doors
- Machinery
- Conveyors

**FIGURE 1: POT LIFE OF POLYCARBAMIDES POLYISOCYANATE ANCAREZ ISO HDiT 1.05 NCO/NH**



## Polycarbamide technology compared to commercial 2K Polyurethane (PU)

Formulators often choose 2K polyurethane systems for DTM coatings for C3 environments for the corrosion performance and light (ultraviolet – UV) stability properties they offer. The data in Table 2 and Figures 2, 3 and 4 demonstrate these same benefits with Amicure IC133 and IC166 curing agents in addition to the benefits of speed, lower VOC, and improved aesthetic performance.

The formulation in Table 2, when formulated to a PVC of 17%, contains 77.5% volume solids and 86.5% weight solids and has a VOC level of 183 g/L. A typical commercial 2K PU at 17% PVC will have 53-61% volume solids and 58-71% weight solids but a VOC level of over 300 g/L.

**TABLE 2: FORMULATION**

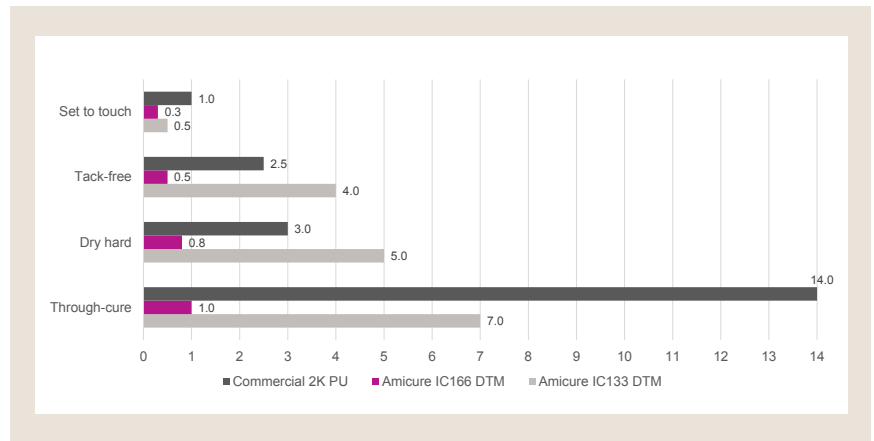
| RAW MATERIAL                   | WEIGHT |
|--------------------------------|--------|
| Amicure IC133 or IC166         | 100    |
| TiO <sub>2</sub> (Dupont R960) | 94.5   |
| Heucophos ZAPP                 | 20     |
| MAK                            | 44     |
| HDI Trimer (HDI T or N3300)    | 78     |

Figure 2 demonstrates how productivity can be increased, labor can be decreased, and throughput can be increased drastically using an Amicure IC133 or IC166 curing agent-based DTM coating compared to a 2K PU system. (All coatings were 3 mil dry film thickness). Further, no catalyst is required for a polycarbamide system.

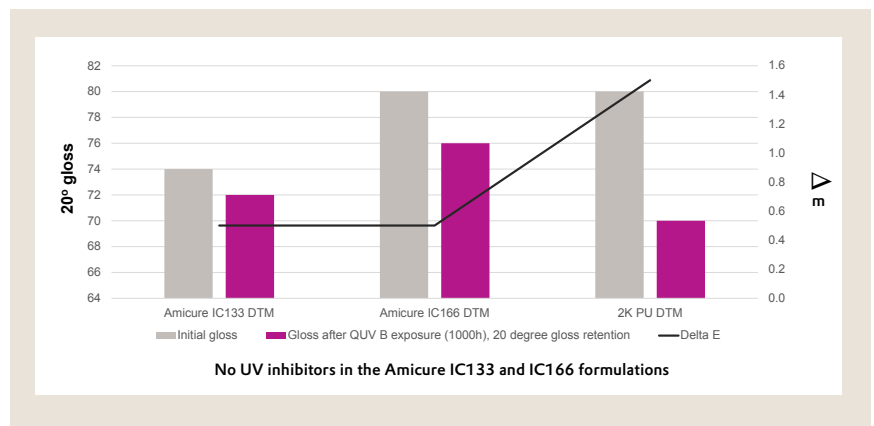
Figure 3 shows how polycarbamides outperform 2K PU systems in light stability and gloss, attributes that are typically associated with 2K PU.

Finally, Figure 4 shows the corrosion performance to 500h salt spray on several types of substrates. The Amicure IC133 and IC166 curing agents performed just as well as the 2K PU in the salt spray test. Similar performance was noted for corrosion creep (ASTM D1654), face blisters (ASTM D714) and adhesion (ASTM D1654).

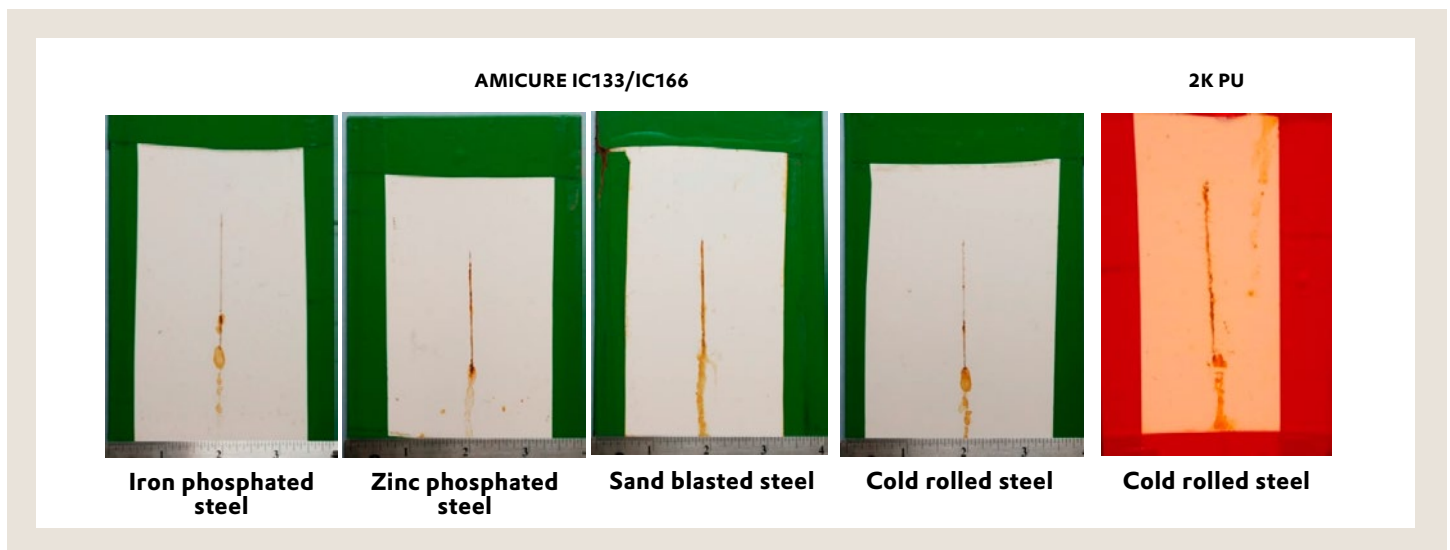
**FIGURE 2: DRY TIMES FOR DTM COATINGS (hours)**



**FIGURE 3: AESTHETIC PERFORMANCE**



**FIGURE 4: CORROSION PERFORMANCE**



## Summary

The benefits of DTM coatings are well known to applications and formulators alike. The Amicure IC133 and IC166 curing agents from Evonik further the technical field of DTM coatings for C3 environments by advancing the benchmark of performance in cure speed, formulated VOC level and light stability.

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