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# *Evaluating FUCH'S Cutting Fluid and Anti Corrosion Oil for Nacam Corporation*

**Background:** ZF Steering System Nacam Corporation, a division of Bosch, is a company that continually strives to enhance the quality and standards related to the steering systems market. The company currently uses a FUCH'S cutting fluid and anti corrosion oil in their process and these products will tested against Cortec products for corrosion protection.

**Purpose:** Evaluate FUCH'S Anticorit H25 RP Oil and FUCH'S Ecocool ALS 518 cutting fluid, and compare the protection given by these products to that of various Cortec products. Furthermore, examine the effectiveness of a Cortec additive to FUCH'S cutting fluid.

**Method:** Modified ASTM D 1748 Humidity Cabinet (120°F, ~100% relative humidity)

**Materials:** FUCH'S Anticorit H25 RP Oil
FUCH'S Ecocool ALS 518 Cutting Fluid
VpCI-126 Blue Film bags (10, 4"x6")
VpCI-130 Foam
Cortec M-435
VpCI-418L
1010 Carbon Steel panels
Aluminum panels

**Procedure:** The following procedure was followed:

1) Panels were prepared in the following ways, prior to testing:

| | FUCHS Ecocool ALS 518 Cutting Fluid | FUCHS Anticorit H25 RP Oil | VpCI-126 Blue Film | VpCI-130 Foam | 0.5% M-435 | VpCI-418L Rinse | $H_20$ Rinse | Carbon Steel Panel | Aluminum Panel |
|---|---|---|---|---|---|---|---|---|---|
| **A9** | X | | | | | | | X | |
| **B9** | X | X | | | | | | X | |
| **C9** | | | X | | | | | X | |
| **D9** | X | | X | | | X | | X | |
| **E9** | X | | X | | | | X | X | |
| **F9** | | | X | X | | | | X | |
| **G9** | X | | X | | X | | | X | |
| **H9** | X | | | | | | | | X |
| **I9** | X | X | | | | | | | X |
| **J9** | | | X | | | | | | X |
| **K9** | X | | X | | | X | | | X |
| **L9** | X | | X | | | | X | | X |
| **M9** | | | X | X | | | | | X |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **N9** | X | | X | | X | | | | X |
| **O9** | | | | | | | | | X |
| **P9** | | | | | | | | X | |

2) After coating, panels were allowed to air dry.
3) After drying, panels C9-G9 and J9-N9 were packaged in VpCI-126 Blue Film.
4) After conditioning, all panels were placed in ASTM D 1748 humidity chamber.
    a. Panels were visually inspected periodically.
5) After 1008 hours, panels were removed from chamber.
6) Panels were visually inspected and photographed.

**Results:** The following results were found:

| Panel | Time to Failure (Hours) | Total Corrosion (% Surface Area) |
|---|---|---|
| A9 | 192 | 10 |
| B9 | 288 | <10 |
| C9 | 792 | <1 |
| D9 | DNF* | 0 |
| E9 | DNF* | 0 |
| F9 | 456 | <1 |
| G9 | DNF* | 0 |
| H9 | 144 | >95 |
| I9 | 72 | >95 |
| J9 | 168 | 75 |
| K9 | 192 | 50 |
| L9 | 888 | <1 |
| M9 | 456 | 10 |
| N9 | 528 | <1 |
| O9 | <24 | >95 |
| P9 | <24 | 50 |

DNF – Did not fail during 1008 hours of testing.

**Conclusion:** Corrosion on the carbon steel panels was most severe in cases where no VpCI-126 Blue Film was used. Panels A9, B9, and P9 (control) showed the worst corrosion of the group. Of the panels packaged in VpCI-126 Blue Film, very little corrosion was visible on panels C9 and F9, and no corrosion was visible on D9, E9, or G9. All three of the corrosion free panels had the FUCHS cutting fluid removed before packaging. Overall, the effectiveness of VpCI-126 was evident, as was the need to remove the cutting fluid, or at least treat it with M-435.

The aluminum panels showed more dramatic results. The three panels not packaged in VpCI-126 (H9, I9, O9) were left with severe white corrosion after testing. White corrosion was also present on much of the surface of panels J9 and K9. However, the corrosion present was not nearly as severe at that of the previous three panels.

Panels L9, M9, and N9 showed very little white corrosion. The FUCHS liquids were either removed, or were not involved in the testing of these panels.

Testing showed that on its own, the FUCHS cutting fluid is corrosive. It would be best to either rinse the fluid off, or use M-435 as an additive.

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