US EPA Testing/Verification Report Summary: Replacing both Zinc Phosphate system and Chromate conversion coating system with 3-Step Picklex® Process.

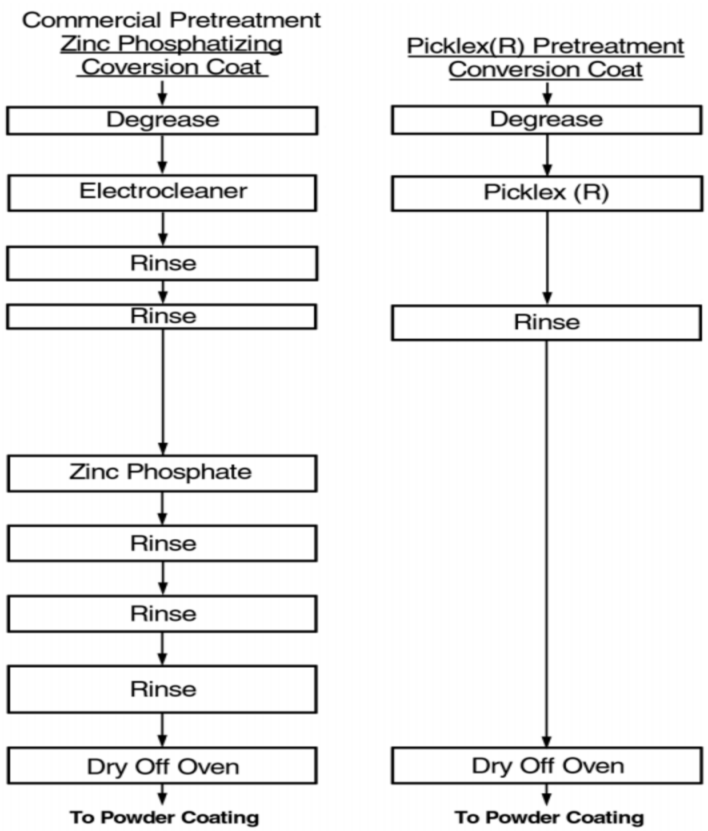

Fig. 1—Processes for commercial zinc phosphate and Picklex® conversion coatings on steel.

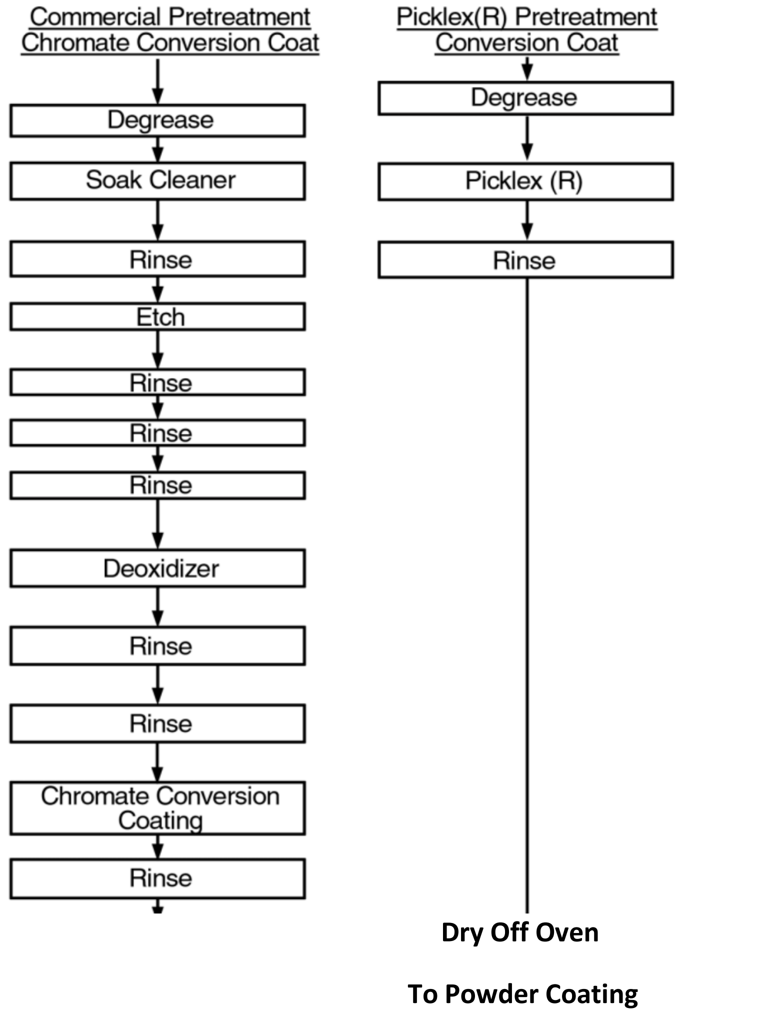

Fig. 2—Processes for commercial chromate and Picklex® conversion coatings on aluminum.

$230,000

Corrosion

Corrosion testing used exposure in a salt fog chamber following ASTM B 117 (*Standard Practice for Operating Salt Spray Apparatus*). Powder coated panels were scribed with an X, protected by tape on the edges and exposed in a standard salt spray cabinet for periods up to 1760h. All panels were inspected at 200h for signs of corrosion and returned to the salt spray cabinet for continued exposure. Table 5 shows the results. The length of salt fog exposure was determined by time of processing and project end date. Batch No. 1 test panels were observed to 1760h. Batch No. 2 test panels were observed to 1277h, while those for Batch No. 3 were observed to 144h. The failure point was defined for this study as loss of adhesion. Pressure-sensitive tape was placed over the scribed area on the dried panel and removed. If coating was removed with the tape, the panel failed.

Aluminum panels from Batch Nos. 1, 2, and 3 did not display loss of adhesion due to corrosion within the time frame of this study (1760h). More recent tests[7] showed no corrosion up to 2800h with a goal of 4000h. Steel panels from Batch No. 1 did not show loss of adhesion until 1376h. This compares with similar panels from Batch No. 2, which showed loss of adhesion by 608h.

In comparing groups A versus B and J versus K (all groups from Batch No. 1), we found that the salt fog results show that the laboratory process test results were verified in the field. During Phase I and II, equivalent corrosion resistance was noted when comparing commercially pretreated panels versus Picklex® pretreated panels.

Table 9
Summary of Cost Reductions of Using Picklex® Instead of Conventional Pretreatments

Cost Reduction	Savings Relative to Chromate on Aluminum	Zinc Phosphating on Steel
Capital Cost Savings	$254,000	$230,000
Annual Operating Cost Savings	$ 46,000	$ 36,600

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About the Author

T. David Ferguson, CEF, is a senior engineer in EPA's Office of Research and Development, National Risk Management Research Laboratory, Cincinnati, OH. He has more than 25 years' experience conducting environmental engineering research at EPA. Ferguson is the author of the "Use of Fume Suppressants in Hard Chromium Baths–Quality Testing" and "Use of Fume Suppressants in Hard Chromium Baths–Emission Testing," and co-author of the Capsule Report "Nickel Plating Emission Issues/Control Technologies and Management Practices." He has been instrumental in coordinating EPA research and development with AESF, NAMF and other metal finishing and plating organizations.

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***NOTE**: During the above Evaluation by US EPA, only the Capital Cost and the Annual Operating cost were considered.*

There are other hidden Labor/Time/Cost involved, while using the Zinc phosphate & Chromate systems as shown below:

- *Total Production Time and related Cost due to a lot of Production Steps*
- *Down time (production loss) during Hazardous/Toxic Waste Disposal and filling the tanks with fresh chemicals (Picklex® 20 has Zero Disposal and no Down Time)*
- *Re-Work due to Quality failures*

The above items add up to a considerable additional Labor/Time/Cost Savings while using the Picklex® Process.

Complete EPA report will be produced upon request.