CAST POLYMER
Connection
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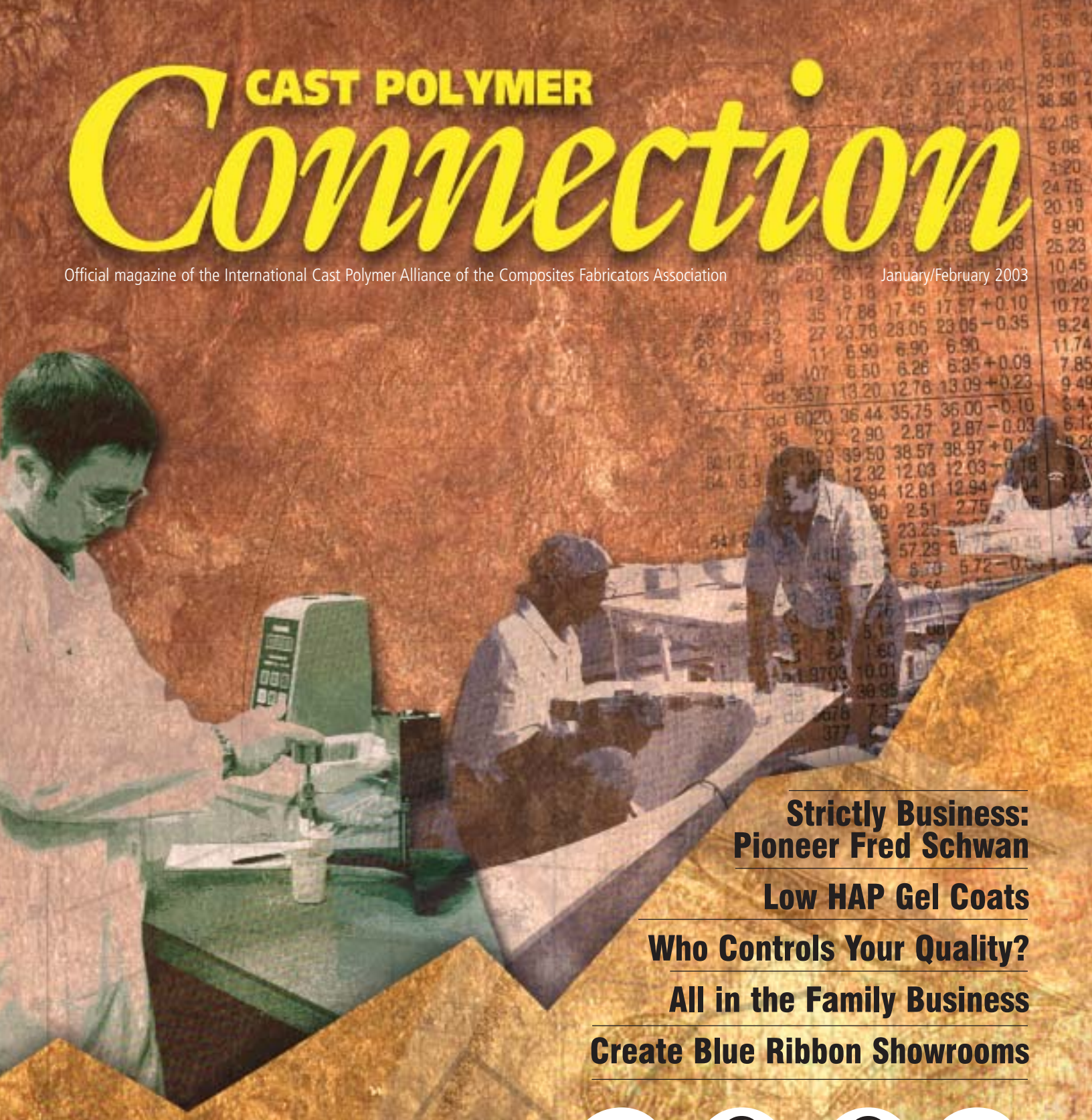

Strictly Business: Pioneer Fred Schwan

Low HAP Gel Coats

Who Controls Your Quality?

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State of the Industry

Photos courtesy of HK Research

A chemist checks for thermal shock of low HAP products.

The Skinny on Low HAP Gel Coats

By Richard V. Higgins, CCT

With the advent of increased concern regarding employee safety as well as increasingly stringent governmental regulations, the gel coat industry has responded with new and improved polymers that contain lower levels of Hazardous Air Pollutants (HAP). The driving governmental regulatory groups most concerned with HAPs include OSHA, EPA and local governmental bodies like the South Coast Air Quality Management District in southern California.

The U.S.-EPA already published its preliminary version as 40CFR Part 63 authorized by the Clean Air Act Amendments of 1990 for comment. This is what is commonly referred to as the Composites MACT, or NESHAP. The final version is expected sometime this spring, and manufacturers will have two years to comply. Among its requirements, the rule states that the HAP content of gel coats not exceed the following:

- White/off white pigmented gel coat—265 lb/ton = 30 percent HAP
- All other pigmented gel coating—377 lb/ton = 37 percent HAP
- Clear production gel coating—504 lb/ton = 44 percent HAP

Removing a panel for color testing after weathering.

Evaluating test results.

Initial attempts

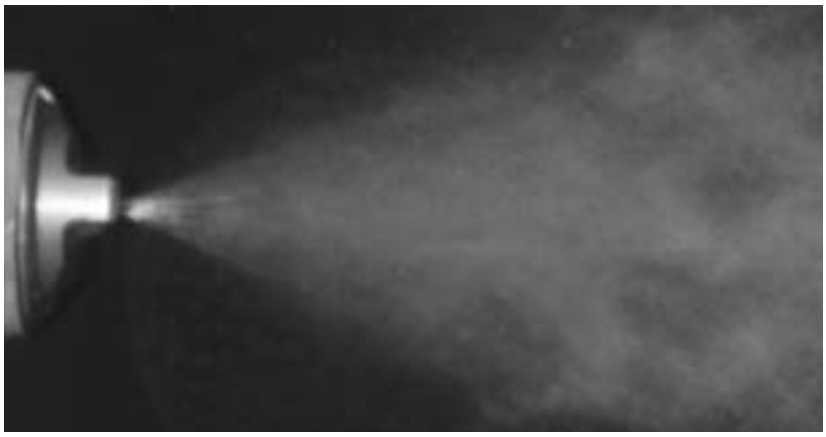
Over the past two years, the cast polymer industry, as well as the entire composites industry, watched the introduction of the low HAP gel coat products with various degrees of apprehension. Some of the initial products offered to the industry were difficult to process under typical manufacturing conditions, and the gel coat industry has since responded with products that handle even better than their high HAP predecessors.

The initial low HAP gel coat offerings often were based on the "old standard" polyester resins that were formulated into gel coats with lower monomer (HAP) content and higher filler levels.

Some gel coat producers tried alternate monomers and non-HAP solvents with the following results:

- Alternate monomers do not reduce viscosity as effectively as styrene, and the handling characteristics suffered;
- They typically exhibited inferior physical properties;
- They demonstrated poor thin film cure—and stayed tacky;
- Non-HAP solvents could be entrapped in the gel coat film, leading to problems such as poor weathering; and
- Higher costs to produce.

Technician scaling up production of low HAP gel coat.



Perfecting sprayability.

Gel coat manufacturers determined that the traditional monomers (that are HAP) would have to be used to meet the end users' overall requirements, albeit at a lower level. These traditional monomers are effective as diluents and perform well at ambient manufacturing temperatures typical in the composites industry. They are **Styrene Monomer** and **Methyl Methacrylate Monomer** (MMA).

Gel coat producers that offered clear cultured marble gel coats had a more difficult time developing the low HAP systems because the basic polymer composition of these products is polyester resin and monomer with no fillers to increase the product's density. The polyester backbone of the cultured marble clears often was based on a high molecular weight NPG® Isophthalic resin. By its very nature, it was an extremely viscous product. Without the diluent affect of the monomer, these systems simply could not be applied in conventional equipment. Therefore, it

Preparing a vanity top for testing.

Evaluating the new low HAP polymer's data.

A technician checks the polymer's HAP level.

A chemist tests the low HAP polymer.

was necessary to develop completely new polymers that would yield the desired end-use handling characteristics and finished product properties.

The challenge

The clear gel coat challenge was considerable. Products needed to be designed for:

- Lower MW and lower viscosity;
- Meeting current thermal shock standards;
- Good handling characteristics;
- Quick and through cure at room temp;
- Reduced "in-box and face-face" yellowing;
- Good hardness and abrasion resistance; and
- Good clarity and low color.

And, in the case of the pigmented low HAP gel coats for the composite industry at large, the gel coats needed to be designed for low color change and good water resistance and weathering properties.

Needless to say, this development work kept many chemists and engineers occupied for a considerable period of time. We are pleased to report that these low HAP products not only are available, but are often superior in both handling and finished product properties when compare to their high HAP predecessors.

The increased "transfer efficiency" of the newer "low HAP" systems provide an unexpected advantage to the end user—considerable reduction in gel coat usage. For the cultured marble manufacturer, the improvement typically will yield 18 more 32" vanities per drum of clear gel coat when compared to the older high HAP products. Other advantages of the clear low HAP gel coats include:

- Better "in box" or "face-to-face" yellowing properties;
- Equivalent thermal shock characteristics;
- Equivalent or better stain and chemical resistance; and
- Better color and transparency in clears.

The end result of several years of development has resulted in better products that are easier to process *and* produce less HAP emissions. **CPC**

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