*Progress is gradually being made in the search for coatings with superior abrasion, improved tear resistance and a low coefficient of friction. As standards change, new products point the way to the future path of pipeline technology.*

# Coatings: 2000 and beyond

Chris Alliston and Jim Banach, Specialty Polymer Coatings

The pipeline coating industry has undergone a metamorphosis, which began in the late 1970s. Prior to that time, most pipeline companies used coal tar, asphalt enamel or cold tape coating systems, applied over-the-ditch. However, long-term performance was suspect, and the pipeline industry needed better performance from such systems.

## Coating systems then

In the early 1970s, some companies began using mill-applied, fusion-bonded epoxy (FBE) coating systems, requiring a blast-cleaned surface and stringent quality control. New mills were built and existing mills were modified to accommodate this 'new' high-performance coating. By the mid to late 1970s, FBE had become the standard for mainline pipe construction.

Throughout the 1970s, an ancillary industry evolved to supply coatings for field girth welds, valves and fittings to comply with FBE performance. Urethane and shrink-sleeve coating systems were also accepted by pipeline companies for use on girth welds where the mainline was coated with FBE. Additionally, 100 per cent solids urethane gained acceptance as a coating for valves and fittings.

In the mid to late 1980s, US transmission companies began transmitting higher volumes of gas through their lines, raising the operating temperature above the previous 55°C threshold. Pipeline companies were not readily accepting polyurethane coatings due to their isocyanate component, and the trend at the time was towards isocyanate-free coatings. The performance bar for 100 per cent solids pipeline coatings was, therefore, raised. Liquid epoxies were developed to meet industry requirements, which were used mainly for girth weld coatings, valves and fittings, slip bore/directional drill coatings and as pipeline rehabilitation coatings for the failed over-the-ditch applied systems.

In the early 1990s, FBE coatings were developed to perform at higher temperatures. Liquid epoxy systems were compatible with the new breed of FBE coatings. In the late 1990s, liquid epoxy systems became the coating of choice for field girth welds, valves and fittings where the mainline coating system is FBE. Recent developments in epoxy coating systems have made bonding to three-layer polyethylene or polypropylene feasible with pull-off strengths in excess of 1000psi on properly prepared polyolefin surfaces. Liquid epoxies have essentially replaced shrink sleeves as the coating of choice for girth welds on three-layer systems.

*Liquid epoxy pipeline coatings can withstand many conditions.*

## Coating systems now

With stringent VOC regulations now in place, epoxy resin manufacturers have made considerable progress in the development of low viscosity products. These advances have led to the development of liquid epoxy coatings that are suitable for high temperature application, damp and/or wet surfaces, low temperature cure capabilities or extended pot life capabilities.

While Polyurea is not new, improvements with application equipment and formulations have made this a feasible alternative to both urethanes and epoxies. Polyurea has heat resistance of up to 175°C, fast set times based on substrate temperature, and application temperatures as low as -40°C without affecting tack-free time. Polyurea's reaction is so fast that foaming, bubbling or pinhole defects normally associated with moisture do not occur, making it ideal for use in high humidity environments. This coating has exceptional abrasion and impact resistance, excellent adhesion and superior chemical resistance. Polyurea is typically manufactured with aromatic isocyanate prepolymers.

Other interesting innovations include coatings based on inorganic/organic hybrid polymer. One such product available is a patented epoxy siloxane hybrid coating with excellent corrosion resistance and gloss/colour retention. ▪

### AUTHORS

Chris Alliston is vice-president and general manager at Specialty Polymer Coatings, an industry leader in the research and development of 100 per cent solids liquid coating technology. Jim Banach is the international sales manager.