

Tube producer switches to water-soluble lubricant, eliminates trichloroethylene use

Situation

An Aluminum tube producer needed a cost-effective substitute for trichloroethylene, which the company used for removing drawing lubricants from its products. The British government's Solvent Emissions Directive (SED) limits trichloroethylene use to less than 1 metric ton per year, effective October 2007. It also sets limits on exposure to the chemical's fumes.

The company worked with a solvent and lubricant manufacturer, John Neale Ltd., to explore several processes, including nonvolatile organic compound (VOC) solvent degreasing, aqueous degreasing, and thermal degreasing. It also considered switching to a water-soluble lubricant, if it could find one that would have the high film strength and viscosity needed for drawing aluminum tube.

Non-VOC decreasing is a proven method, but the extra processing step and the time needed for drying the tubes are disadvantages, so the company considered this option to be a backup plan if all others failed.

The lubricants proved difficult to wash off with aqueous degreasing. Thermal degreasing was effective at 160 degrees C (320 degrees F) in an acceptable dwell time. Still, the most attractive approach was switching to a water-soluble formula. Tests showed the components dried rapidly when the water tank operated at a temperature higher than 60 degrees C (140 degrees), and of course water doesn't have the hazards associated with solvents—flammability, toxicity, and residues—and is readily recycled using reverse osmosis filtration.

Resolution

John Neale Ltd.'s development work, which included research into available water-soluble chemistries and existing patents, revealed a particular chemistry with the necessary characteristics. Small-scale washability tests and Hille press tests on a few samples revealed that the chemistry had potential. A large-scale trial determined that the lubricant, applied manually, could be used for successfully drawing all the tube produced by the tube company. The company determined the formula, named Superdraw PIB-S, to be compatible with all the sizes and reductions.

The company emptied one draw bench, cleaned it, and filled it with the new lubricant. The product worked immediately, and required nothing more than a small adjustment in the operating temperature for optimal forming.

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Abstract: In an effort to eliminate its use of industrial solvent trichloroethylene, aluminum tube producer considered several degreasing methods, including aqueous, thermal, and non-VOC solvent. It also considered switching to a water-soluble lubricant. In the end, the last option proved to be the most cost-effective, but it took a newly developed formula to do it.