HOUGHTON
Fluid Technology & Service Worldwide

Can the Industry maximize front end efficiency and profitability while minimizing environmental impact?

Houghton, a major supplier of lubricants, washer chemistry, effluent treatment chemicals and chemical management spend their time and energy trying to do just that.

The DWI industry has seen a plethora of technologies in lubricants and washer chemicals and at regular intervals are assailed with another supplier offering " ground breaking" technology or "guarantees to reduce direct or applied costs.
Have we as an industry gone as low as we can with either direct or applied costs? Have we reached the pinnacle of our technical ability?
We certainly believe that we are getting close to the knuckle on applied costs but the floor is the limit on direct cost – only when a completely analytical view is taken can a true comparison be made between materials.

Applied chemistry, Tribology and manufacturing are all extremely specialized fields requiring a combined knowledge of all three fields plus process engineering in order to apply the various specialized chemicals utilized in manufacturing and then to maximize profitability.

The cupper is probably the hub of the DWI process and as such the lubricant applied must be chosen carefully. In this process we are looking to produce "Hydrodynamic" or "Thick Film" lubrication:

Hydrodynamic Lubrication
'Where the contacting surfaces are non-conformal and the loads are high enough to cause elastic deformation of the surfaces, the entrained lubricant is pressurised in the region of deformation, and this film maintains the surface separation.'

In essence we are trying to utilize the chosen lubricant to create a film that will stop the metal of the tooling from touching the metal being deformed – in this case the aluminium or steel coil. This, to a certain extent, is also true when producing the redrawn cup. The general move in the industry from emulsion technology in the cupper to neat oil is probably the single greatest move towards achieving this goal. Conversely the DWI machine involves much higher workforces and requires a process known as boundary lubrication:

Boundary Lubrication
'A state of partial lubrication which may exist between two surfaces in the absence of a fluid oil film, due to the existence of adsorbed mono-molecular layers of lubricant on the surfaces.'

In this case we are aware that the speed of interaction between the tool and forming can is too fast to effectively supply hydrodynamic lubrication, by using boundary lubrication we produce a chemical reaction that binds the lubricant to the tooling thus consistently ensuring low friction points at the point of deformation. The effective application in tribology, using knowledge and technical ability, to attain that fine balance between maximum lubricity and economic viability is more important than the choice of material to fulfill these rolls. This ability to minimize friction between metals is further reduced by contaminants and their effect on the lubricant medium; usually water.

The control, or lack of, in the lubricant medium will define the effectiveness of the next step in the process – the preparation of the produced can for decoration, internal coating and, in some cases, protection of the metal against pasteurization or retort treatment –commonly known as the washer process.

As with Tribology the application and control of the washer process will determine applied costs and the supply of a quality can to the filler that will fulfill both mechanical and aesthetic values required for the retail market.

Houghton International has, with this in mind, focused on continual research and development and employing leading technical specialists to ensure that Houghton customers get the maximum benefits from the process. This philosophy is further enhanced by Houghton's knowledge of chemical management. Houghton with their Fluidcare program are one of the world leaders in chemical management using a mixture of technical knowledge and logistic control to reduce cost per unit by means other than reduction of quality of material or as it is applied. In some cases this Fluidcare approach can be, and indeed is, applied to the DWI industry – in other cases the experience and philosophy is utilized to maximize the logistic and technical support Houghton gives to their customers.

Houghton has also perfected the aforementioned "ground breaking" technologies in both the lubricant and washer processes.

Lubricants:
In all lubricants there are 2 main phases that make up the drum of material that is supplied to the end user. These 2 phases can be best described as the water and oil phase, strictly speaking the water phase contains more than just water and the oil phase may be synthetic in nature and as such contain no actual mineral oil.

The water phase contains all of those goodies necessary for the good running of the coolant system – corrosion inhibitors, cobalt leaching inhibitors, biostability agents, rejection agents, binding agents etc.

The Oil phase contains the lubricity agents necessary for the ironing process.

If we dissect traditional technology there are 2 main points of interest:

1. The binding agent – this is that part of the formulation necessary to keeping the formulation from "splitting out" while waiting to be used. This binding agent is designed to hold the material together, this also will hold onto aluminium and tramp oil making it more difficult to keep the coolant clean and with maximum lubricity. Eliminate the binding agent and contaminants reject readily.
2. The binding agent accounts for a substantial proportion of the materials cost.

Houghton has designed a 2-phase material that splits the oil and water phase and adds them to the coolant system as individual components. This 2-phase system allows the plant to set the water phase according to the plant needs – e.g. the amount of biostability agent necessary to allow biostability. This frees the plant to set the lubricity phase or oil phase to maximize lubricity according to the size of can, speed of bodymaker or alloy malleability. In the case of single phase materials when more lubricity is needed the entire package is increased volumetrically often causing dermatological issues from components of the water phase being in abundance, transversely when the plant tries to reduce costs a lower concentration will reduce volumetrically components in either phase which will cause issues with biostability, corrosion, cobalt leaching or lubricity.

This design has further been enhanced by altering the oil phase so as to be able to be used as both Cupperlube and gear/hydraulic oils. This has taken traditional contaminants and changed them into a makeup source.

As the oil phase is mainly ester derived from sustainable technology the whole process is designed for maximum lubricity with minimum impact on cost and the environment.

The washer is a much more difficult and time consuming area to reduce environmental impact and as such Houghton looked to a strategic partnership to outsource research and development for a cutting edge economically viable environmentally friendly chemistry leaving the Houghton Team free to concentrate on the lubricant advances.

This found Houghton worked hand in hand to address the removal of that most hazardous and sensitive material in the process – Hydrofluoric Acid. The new range of Houghton washer chemicals apply a mixture of biodegradable surfactants that reduce COD levels and no Hydrofluoric acid.

The elimination of HF in the washer process has many advantages. The most obvious advantage is that of removing a material from the plant that is extremely dangerous and increasingly the target of Health and Safety as well as governmental regulation.

A normal washer process will see the etching away of material from the can of between 4 and 13mgs. The elimination of this etching using HF free materials reduced the burden on the effluent system of between 3 and 13 kg of aluminium per million cans. This is further enhanced by a chemistry that runs at typically higher pH values thus reducing the amount of lime needed for pH neutralization and thus sludge production.

The elimination of etching in the process increases the internal and external mobility of the can allowing reduced oven temperatures, lower internal lacquer weights while reducing decorator spoilage through easier loading on the mandrills.

Finally the produced can is much brighter giving translucent inks a much greater reflectivity.

This new range of technology while slightly higher in price than traditional technology offers real savings in overall applied costs and at the same time benefiting the quality of can produced, improved efficiencies, work place safety and environmental impact.

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