Metal Removal Fluids - An End User's Perspective

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A little of this end user's (GM) history

General Motors Research

- Engine oil guy
  - Field tests, engine tests
  - Specifications (GM initial, service fill, US Military)
  - Rigorous approval systems
  - This is what I was accustomed to!

Mid-Career Course Correction

- GM started focusing more on manufacturing
  - I was asked to lead a group on lubricants for manufacturing
  - What GM specifications were being used for plant lubes?

  - Donuts, ball caps and pizza!!!!!
  - Well, OK there was the GM LS2 standard
    - Not revised in a dozen years
    - No one was really using it anyway
  - So, there was much work to do!

General Motors Research➔ Worldwide Facilities

Needed to engage plants

- Talk to plant people, find out what their perennial problems are (they are not usually shy)!
- Don’t be perceived as a “corporate pigeon”

- Build credibility by returning to plant if requested
- Tap plant knowledge and get them to share ownership
- Start with high volume fluids (hydraulic fluids) with some well defined tests
- Write hard specs, approval process, approved products list
- Document reduced maintenance, purchasing costs

What the heck does that have to do with MRFs?!

- LS2 then moved on from hydraulic and other fluids to MRFs
- Generated key specs for straight oils and all three aqueous fluid groups
- Several parameters were left “as agreed upon between user and supplier”
- Key points
  - Bench tests aren’t sufficient, but will eliminate some problem fluids
  - Parts quality and tool life trials have to be run
  - No changes can be made to product without pre-approval
  - Education of plant people is critical!!

LS2 MRFs (performance example)

These tests to be run on	the undiluted	concentrate				
LY-00- _-11	1,2	3,4	5	6	7	8
Description	soluble oil		semi-syn		synthetic	
Four Ball EP						
Load Wear Index, kg	Report	45 min	Report	45 min	Report	45 min
Weld Load, kg		200 min		200 min		200 min
Emulsion Stability	Report				NA	
Corr. - Iron Chips						
Breakpoint	Report					
Cu Corr. Max	1B	Report	1B	Report	1B	Report
Corr. Effect on Al	1 Max					
Run using Al 319, 356,	380, 383, 390					

Initial performance specifications for MRFs

- Straight, soluble, semi-synthetic, synthetic
- Hard specs and limits were developed for well-defined properties
  - Iron, aluminum and copper corrosion
  - Compatibility with seals
  - Foaming tendency, filterability
- Some not so well defined
  - Misting tendency
  - Machining properties
  - Tramp oil rejection

What else has always been (and will always be) important to end users

- Worker health, safety and environment
  - No bad odors, excessive misting (hypersensitivity pneumonitis), dermatitis, potentially carcinogenic base oils
  - Biostability
  - Chlorinated MRFs a concern
  - Waste treatment must have input
  - Some locally regulated compounds
  - Worker acceptance

Health and safety always first!

What is next in importance?

- Tool life – must run carefully controlled trials
- Parts quality – requires very careful monitoring of surface finish, dimensions, etc.

- Cost
  - large companies are notorious for “silos”
  - must take into account, tool life costs, maintenance costs, waste treatment costs, etc., and minimize over the whole system (sometimes requires plant controller intercession)

What do the end user's need from suppliers?

- Supplier Stability
  - Can supply product(s) on demand
  - Technical Support – lab and onsite
  - Quality Control
  - Financial Stability
  - Current with new technologies (i.e., MQL)
  - Help in reducing end user system costs

What do suppliers need from end users?

- Clear expectations
- Shared risk and reward (chemicals management contracts)
- Well-defined and carefully measured plant trials (no unjustified change aversion allowed)
- All plant and corporate stakeholders involved in decisions

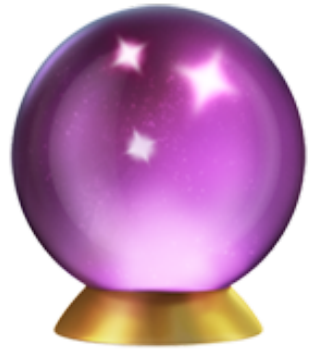
MRF Group in GM Powertrain

- Plant machining people
- Health and Safety
- Toxicology
- A fluid person
- Chemical managers
- Divisional oversight
- Waste treatment

- Consolidate products
- Met regularly

So what now?

- What's come to the forefront
  - More attention to: ingredients
  - Biostability (inherent vs. biocidals)
  - Lower environmental footprint
  - System life cycle costs
  - MQL
- More competition to machining
  - Additive manufacturing
  - What else?
- Sustainability



So how do we define sustainability?

- Environmental
  - Product provided is environmentally friendly as is the supplier's process for producing the product
  - The end user uses the product in the most environmentally and worker friendly way (e.g., low misting, no major challenges for waste control, etc.)
- Cash Flow
  - Both fluid supplier and end user experience sustainable cash flow (in some cases, a financial mandate may be used to help initially, but this cannot be required long term)

THANKS FOR LISTENING!

Any Questions or Comments?

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