Lab Services

Functional Products Inc.

April 2nd 2019

Why Functional Products?

- Un-bundled approach
  - We'll help you formulate with the additive packages you trust

- Support with VM, additives, packages (HF, gear, industrial, etc.)
  - Get everything you need on one truck

- Short supply chain and diverse packaging options

- Custom products in matter of weeks instead of years

- **Complimentary lab services**
  - Testing, optimization, training
  - Lubricant design from generic starting point or your exact components

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Common Test Methods:
• String length by ductless siphon (Functional Products test method)
• -70C cold bath / Brookfield
• -65C air bath / environmental chamber
• Kinematic viscosity (ASTM D445) by capillary tube 20C and 100C; calculate VI
• ASTM D97 pour point (manual tilt test using air bath / environmental chamber) to -85F
• Four-ball EP weld load for oil or grease (ASTM D2596)
• Four-ball wear at 20 or 40 kgf with coefficient of friction (ASTM D4172)
• Timken OK Load
• Copper strip corrosion (ASTM D130)
• Demulsibility (ASTM D2711)
• Kurt-Orbahn diesel injector shear (ASTM D6278), usually 30 cycles
• Sonic Shear – 40 min (D2603 / D5621)
• KRL – 20 hour
• Turbidity/clarity measurement (FNU units, 0 - 1000)
• pH testing
• TAN/TBN acidity/basicity
• Low temperature kinematic viscosity (D445)
• Brookfield viscosity (D2983 low temperature)

• Grease tests
o Cone penetration for grease – 1⁄4 scale (ASTM D1403) and full scale (ASTM D217)
o Worked penetration (60 – 100k stroke)
o Water spray-off (ASTM D4049)
o Dropping point (ASTM D566)

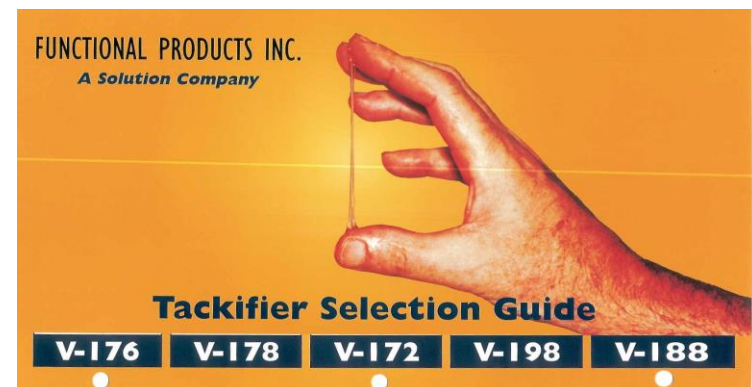**FUNCTIONAL PRODUCTS INC.**
Innovative Chemistry for Lubricants

- ISO 9001:2015 with Design
- Let us do the search and so you can do the research

1. Tackifier Optimization

2. PPD Ladder

3. Product Development

4. Total Formulation

ISO 9001:2015 CERTIFIED

SMITHERS
QUALITY ASSESSMENTS

w/ Design

Tack Optimization

- Functional Products ductless siphon equipment
  - Competitive analysis
    - Bar & Chain / Way Oil / Oven Chain / Bike Chain

  - Functional will measure tackiness of your formulation and competitors
    - Recommend tackifier and treat rate to meet or beat tackiness

  - Send 500 mL of each formulation

- Lower costs
  - Customer using another brand's tackifier
    - Functional supplied double-strength product saving $43,000/yr

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- If you need to meet a specific pour point, low temp Brookfield, etc.

  - Functional run a pour point ladder screening to determine:
    - Best PPD and wt% to use

  - Send:
    - 250 mL of current formulation
    - 500 mL of current formulation *minus PPD*
    - 250 mL of current PPD

  - Customer saved >$100,000/yr on lower treat plus lower cost

	Target Pour	Pour point w/ Functional PD-620 (°C, D97)								
		0.0%	0.1%	0.2%	0.3%	0.5%	0.7%	1.0%	1.5%	2.0%
SAE 30	-33	-18	-27	-27	-30	-30	**-33**	-33	-	-
SAE 20W50	-33	-21	**-33**	-33	-33	-36	-36	-39	-	-
80W90 GL-5	-36	-21	-21	-30	**-36**	-36	-36	-36	-	-
85W140	-30	-18	-	-	-24	-24	-24	-27	**-30**	-30

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- 22 SSI liquid OCP VM in non-API synthetic engine oil

  - Displaced VM in high end Gr. III with equivalent OCP in food grade white oil
  - $320,000/yr savings by reformulating

- High viscosity / low temp. lubricants for downhole

  - Displaced VM with economical base oil + polymer
  - $660,000/yr in savings by reformulating

<u>Total Formulation</u>

- If you want to add a completely new product line, Functional can help

  - We're able to build your formulations from the ground up
    - Using the components you already have available
    - Suggesting the latest fluids, additives you need
    - Developing new products to fit

  - Tech support to accelerate your brand in the market
  - Tolling pilot batches

- Interested in biobased / readily biodegradable products?
  - New strategies to save *20%* on cost for HF, bar & chain, saw guide oil

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- Functional School & customer training

- NLGI India

- ILMA

- ELGI

- STLE

- NLGI

- ASTM

- CLGI

- KSTLE

- ILMA

- UEIL

- ASTM

Summary

- Projects
  - Tackifier Optimization
  - PPD Ladder
  - Product Development
  - Total Formulation

- Testing available

www.functionalproducts.com for TDS/SDS, articles, presentations