Foam Filter Oils

Functional Products Inc.

Agenda

- Motorcycle Foam Filter Oils

1. What is a foam filter oil?
   - Purpose
   - Properties
   - Types

2. Formulating three types of foam filter oil

Why Use Filter Oil?

- Foam filter oils (or air filter oils) are applied to the air intake filter of high performance motorcycles.
  - Repel Water
  - Trap Dust and Dirt
  - Maintain Airflow

- Ideally foam filter oil repels water and traps dust without decreasing airflow through the filter.

Desired Properties

- Hydrophobic
  - Base oil naturally repels water
- Tacky
  - Traps dust and dirt
  - Finger tack is often enough
- Does Not Block Pores
  - Coat the filter without forming clumps
  - Should not clump/overly thicken at lower use temp.
- Penetrate/Coat Filter
  - Lower viscosity gives easier application
  - Color shows that filter is coated
- Remain on Filter
  - Too low viscosity continues to leak after application

Types of Filter Oil

Three Types of Foam Filter Oil on the Market

1. Easy Application
2. Low VOC
3. Aerosol

Easy Application

- Low Viscosity Oils
  - Typically < 25 cSt @ 40°C
  - Readily penetrates filter for easy application
  - Commonly continues to leak after application

- High Tack
  - Only type to register on ductless siphon test

- Large Portion Organic Solvent
  - Allows low viscosity and evaporates leaving polymer coating on filter
  - High VOC
  - Low Flashpoint

Low VOC

- Medium Viscosity Oils
  - ≈ 200 - 250 cSt @ 40°C
  - Slower filter penetration than easy application oils
  - Leaking after application is rare

- Finger Tack
  - Sufficient to trap dust and dirt

- Small Portion Organic Solvent
  - Leads to higher viscosity
  - Low VOC
  - Higher Flashpoint

Aerosol

- Low Viscosity Oils
  - Typically < 40 cSt @ 40°C
  - Readily penetrates filter for easy application

- No Tack
  - Required to avoid clogging spray head
  - Repels water, polymer will still trap some dirt and dust
  - Has been known to get sucked from filter into engine

- Very easy, low mess application
- High flash point*
- Low VOC*

*Before adding aerosol component. Aerosol will reverse these trends.

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Filter Oil Formulations

- Competitive with easy application, low VOC, and aerosol filter oils on the market today:

Component	Easy Application	Low VOC	Aerosol
Functional V-158F	14.5	23	6.3
110N Gr. II	29.9	35.9	93.6
600N Gr. II	-	36	-
30 SUS Naphthenic Oil	55	5	-
Functional V-176	0.5	-	-
Colorant	0.05	0.05	0.05
BHT (AO)	0.05	0.05	0.05
Pour Point (D97, C)	-48	-27	-24
Finger Tack	Yes	Yes	No
String Length (DS)	5 mL	0 mL	N/A
Flash Point (D92, C/F)	94/200	199/390	-

Foam Filter Oil Comparison

- Comparable viscosities and pour points
  - Easy application, no low temperature clogging
- Higher flash point
  - Safer to Handle

Easy Application Foam Filter Oils

	Functional Products	Competitor "C"	Competitor "D"
KV40 (D445, cSt)	23.2	22.7	14.4
KV100 (D445, cSt)	7.4	5.8	4.8
VI (D2270)	321	218	303
Pour Point (D97, C)	-48	< -42	< -42
Finger Tack	Yes	Yes	Yes
String Length (DS, mL)	5	22	10
Flash Point (D92, C/F)	94/200	< 35/95	< 35/95

Foam Filter Oil Comparison

- Lower Pour Point than Competitor “A”
  - Less likely to clog at low temperature
- Higher Flash Point than Competitor “B”
  - Safer to Handle

Low VOC Foam Filter Oils

	Functional Products	Competitor “A”	Competitor “B”
KV40 (D445, cSt)	219.6	241.5	195.7
KV100 (D445, cSt)	31.3	26.9	43.1
VI (D2270)	186	145	273
Pour Point (D97, C)	-27	-21	-27
Finger Tack	Yes	Yes	Yes
String Length (DS, mL)	0	0	0
Flash Point (D92, C/F)	199/390	210/410	65/149

Foam Filter Oil Comparison

- Competitive with current products on market

Aerosol Foam Filter Oils

	Functional Products	Competitor "E"
KV40 (D445, cSt)	36.5	38.4
KV100 (D445, cSt)	7.2	7.3
VI (D2270)	165	158
Pour Point (D97, C)	-24	-24
Finger Tack	No	No
String Length (DS, mL)	N/A	N/A
Flash Point (D92, C/F)	-	240/464*

*Measurement of liquid state without aerosol components

Summary

- Foam Filter Oils
  - Hydrophobic oil repels water
  - Tacky material traps dirt and dust
  - Remains on filter and prevents reduction of air flow

- Functional Products formulates safe, effective oils for:
  - Easy Application
  - Low VOC Content
  - Aerosol Application