ATF Market Trends – Understanding the ATF Aftermarket

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Who Am I?

Kennon Artis

• ATF Marketing Manager, North America
  – Position and promote ATF additives, coordinate with regional and global team members

• Background
  – Non-chemical
  – CPG Marketer: Military, Procter & Gamble, Capital One, Business Owner
Afton Chemical has been a key player in the lubricant and fuel additive industry for more than 85 years.
Objectives & Agenda

Objectives
– Share latest ATF market trends
– Discuss Technical Imperatives for Using Vehicle-Specific ATFs

• Key Market Drivers
• OEM Approaches
• Automatic Transmission Hardware Dynamics
• Automatic Transmission Fluids and Trends
• Market Dynamics & Enforcement
The Backdrop

Government Regulations
- Exhaust emissions
- Fuel economy

Globalization
- Applicability across regions
- Broad platform varieties

Overall AT System
- Durability
- Reliability
[1] China's target reflects gasoline vehicles only. The target may be higher after new energy vehicles are considered.
Emissions & Fuel Economy - Global Drivers

- Improve Fuel Economy
- Change Engine Design
- New AT Designs
  - 6+ speed planetary AT
  - CVT
  - DCT
- Many & New ATF’s
OEM Market Approach
### OEMs Set the Pace for the ATF Market

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirements</th>
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| **Fuel Economy**                | • Advances / Changes in Hardware  
                                 | • Lower viscosity fluids                                                   |
| **Extended Drain Intervals**    | • ‘Fill for Life’  
                                 | • Improved fluid durability -- high quality ATFs                          |
| **Multi-Vehicle ATF**           | • More types of vehicles / fluids  
                                 | • Proliferate unique OEM Requirements                                      |
Impact of Transmission Trends on Fluids

**Multi-Vehicle ATF**
- More types of vehicles/fluids
- Unique OEM Requirements

**Fuel Economy**
- Advances/Changes in Hardware
- Lower viscosity fluids (< 6 cSt @ 100°C)

**Extended Drain Intervals**
- ‘Fill for Life’
- Improved fluid durability
ATF Industry Trends Affect OEMs

- Fuel Economy - Tremendous pressure to deliver
  - Hi-priority at all OEMs
  - Government-levied fines get OEMs’ attention

- OEM transmission designs are more demanding on ATFs
  - Higher torque
  - Smaller transmission sumps

- Establish ATF specifications
ATF Industry Trends Affect OEMs

• Reliance on additive / oil companies -
  – Formulations that enable the use of new hardware to improve fuel efficiency
    • Stable viscometrics
    • Synthetic/high quality base oils

• Two Paths to Greater Fuel Economy
  – Hardware development
  – ATF optimization
Hardware Dynamics
OEM Transmission Specifications

OEMs prefer unique ATFs

- Performance Parameters
- Regulatory Requirements
- Vehicle Type
- Vehicle Size

To ensure consistent quality, OEMs license their ATFs
New Transmissions Breakdown - NA

Step and CVT transmissions will remain the dominant platforms in NA

Source: IHS
North America Hardware Production

2010
18 M units

2015
20 M units

6-7-8 speed AT
DCT 2%
CVT 6%
20%
3-4-5 speed AT 72%

6-7-8 speed AT
DCT 5%
CVT 8%
3-4-5 speed AT 37%
50%

Ford and GM will jointly produce 9- and 10-speed transmissions beginning with the 2017 model year.

Source: Afton Estimate
ATF Market Complexity Increases

2012 U.S. Auto Sales

- Top 3 comprise 50% of sales
- Top 7 comprise 80% of sales

Source: Wards Auto
Fluid Trends
ATF Components

Base Oil
- 80-90%
- Viscosity & Low temperature fluidity
- Oxidative Stability
- Seal Compatibility

Additive Package
- 5 to 10%
- Dispersants
- Protection: EP, Wear, Corrosion, Foam, Oxidation
- Friction modifiers
- Seal swell agents

Viscosity Index Improver
- 5-15%
- Viscosity & Low Temperature fluidity
- Affect Operability Temperature Range
- Shear Stability

Affect Temperature Range
- Operability
What is an ATF?
Additive Component: Dispersant

What it provides:
- Protection against sludge and varnish build-up
- Can influence frictional characteristics

What happens if it’s not there?
- Deposits build up in hydraulic circuits
- Glaze on clutch plates
- Poor transmission performance
Role of Dispersants

Good

Poore
Additive Component: Friction Modifier

What it provides:
- Controls friction coefficient
- Balances torque transfer and smooth shifts

What if it’s not there?
- Sticking and slipping clutches
- Shudder
Friction

\[ \mu = \text{coefficient of friction} \]

Friction can be estimated and empirically calculated, but not measured.

- \( \mu \) too high \( \Rightarrow \) shudder, harsh launch or stall, parts damage
- \( \mu \) too low \( \Rightarrow \) slipping, heat, parts damage
Anti-wear / Extreme Pressure Pressure Agents

What they provide
Prevents wear of metal parts under extreme pressure conditions

What if they’re not there?
Gear and bearing failure
Pump efficiency reduction
Hardware Dependent Fluid Characteristics

Oil Pump / Valve Assembly / Torque Converter
- Hydraulic fluid
- Foam & aeration control
- Flow at low temperatures
- Protect seals

Planetary Gear Set
- Wear protection
- Corrosion inhibition

Clutch Plates & Bands
- Friction control
- Friction durability
- Dissipate heat

Electronics
- Harness compatibility
- Conductivity
AT Control Body

Good quality ATF provides sufficient protection against oxidation, minimizing carbon and varnish deposits and sludge to keep the control body clean to avoid plugging of small orifices that the fluid must pass through.
AT Forward Clutch Housing

Good Quality ATF

Poor Quality ATF
AT Forward Clutch Piston

Good Quality ATF

Poor Quality ATF
Internal AT Metal Part

Good Quality ATF

Poor Quality ATF
Foam Control

Poor Quality ATF

Good Quality ATF
Wear Protection

FZG Pass

Good Quality ATF

FZG Fail

Poor Quality ATF
Low Temperature Performance

Poor Quality ATF

Good Quality ATF
Complexity of Fluid Recommendations

A MV ATF would have greater coverage in 1997 than today.
ATFs’ Relentless Drive for Low Viscosity

Lower Viscosity = Fuel Efficiency

ATF Viscosity Trend

KV @ 100°C, cSt

- MERCON® V
- ATF +4
- MERCON® LV
- DEXRON®-VI
- Honda DW-1
- ZF Lifeguard 8
- Toyota WS
- Mazda FZ
- MB ATF 134FE
- GM/Ford ULV ATF


Values:
- 7.60
- 7.50
- 6.00
- 6.00
- 6.75
- 5.65
- 5.50
- 5.50
- 4.25
- 4.50
Lower the viscosity…

- What could possibly go wrong?

- Fluid durability is key
ATF Market by Type

• Over the years, this market has remained largely unchanged...
  – Unlicensed DEXRON®/MERCON® comprises half of the market
  – Multi-vehicle remains the second largest application in the market

All figures based on Afton proprietary research.
ATF Aftermarket Dynamics
NA ATF Aftermarket Portfolio

Multi-Purpose
- Higher shear stability
- JASO credentials
- Asian vehicles

Multi-Vehicle
- Pre-2006 vehicles
- DEX / MERC

Low-Vis ATFs
- Licensed
- DEXRON VI
- MERCON LV
- JASO credentials

Market Segment

Performance

market movement
Market Enforcement Actions
Enforcement Activities

- Ethics Committee
  - Currently tests PCMO & Tractor
- Letter to API:

PQIA: The Petroleum Quality Institute of America

“The independent resource for information and insights on the quality and integrity of lubricants in the marketplace”
Regulatory Actions

PQIA Website
– December 4, 2014

Michigan Arrests Phony Motor Oil

BY JOE BEETON • MARCH 5, 2014

Investigators from Michigan’s attorney general’s office have arrested four City Petroleum and Star Petroleum employees on felony charges for allegedly selling fraudulent motor oil to retailers.

The individuals arrested on Feb. 24 include City Petroleum owners Mousa Kaddouh, 58, and Joe Kaddouh, 34, all from Dearborn, and the Star Petroleum owner, Faraj, 36, of Canton.

All four individuals had been responsible for filling 55-gallon drums for motor oil distributors. The group is accused of KNOWINGLY selling motor oil that was labeled as synthetic but was in fact petrochemical. The individual was also accused of selling motor oil that was used oil rather than new oil. Both actions are in violation of Michigan law and are punishable by up to five years in prison.

M. Kaddouh, J. Kdouh, and Faraj were charged with POSSESSION OF ILLEGITIMATE PRODUCT/STOCK and were each charged with FELONY OFFICE OF LEGAL WEIGHS AND MEASURES. M. Kaddouh, J. Kdouh, and Faraj were each charged with FELONY OFFICE OF LEGAL WEIGHS AND MEASURES.


The banned products may no longer be sold in New Jersey. Retail establishments that continue to sell them will be subject to a civil penalty of at least $100 per package or container of the banned product - a penalty far in excess of the approximately $3 to $4 per quart bottle for which many of these products have been sold. A full

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The North America Aftermarket - Summary

- Next-Gen OEM Hardware
  - Proliferation of LV fluids

- Economic Rebound
  - Higher price LV ATF volume is taking hold
  - Anticipated growth in medium-duty segment

- Aftermarket Complexity will Continue
  - Confusion
  - ATF education is paramount

- Enforcement Actions to Increase
Stakeholder Education is Critical

Education has Tangible Benefits

**OEMs**
- Industry using fluids blended to the exacting standards of OEM vehicles – *better vehicle performance*
- Stakeholder access to quality, consistent ATF – *enhanced brand management*
- Fewer warranty claims

**Oil Companies & Retailers**
- Push to higher quality ATF’s – maintain / strengthen market image
- Assurance of quality fluids – more effective category management
- Satisfied drivers

**Drivers**
- Do the job right with the right ATF
- Fewer headaches
Passion for Solutions™ – Our Philosophy

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Questions / Discussion