SynMax Performance Gear Lube
Extreme Heat Condition Endurance Test
Transmission & Rear Axle

The car pictures used in this presentation is for the purpose of illustration not for endorsement
SynMax University – www.synmaxperformancelubricants.com
Transmission & Rear Axle Endurance Test

A Private Testing Firm was asked with providing a solution for transmission and rear axle endurance durability performance testing under extreme heat temperatures found within GT Production Endurance Road Racing Desert conditions (120 F) found in Arizona & Nevada.

Two equally prepared cars with temperature telemetry sensors were provided. Both cars ran at the same time same conditions.

Both days had equal temperature (115F average) in afternoon.

Ambient temperature range: 100 f to + 120°f

Max speed 155+mph. Sign off requirements

Transmission not to exceed 300°f Intermittent 280°f Extended
Rear Axle not to exceed 300°f Intermittent 280°f Extended
Transmission & Rear Axle Endurance Test

• Testing Requirements

• (Open Throttle) testing:
  • 15 Minutes of pre condition at 85mph to stabilize component temperatures..
  • Accelerate to Maximum speed allowed by race conditions
  • (155mph) at circle track (oval)
  • hold for 30 minutes followed by a
  • 15 internal road coarse then 30minute (soak).
  • (38°C to 49°C or 100°F to 120°F).
PROBLEM CREATING INCREASED DRIVE-TRAIN TEMPERATURES:

GT production specification to achieve / maintain aero and mechanical grip stabilization at the high continual speeds of 155 mph required an advanced aerodynamic package was then placed upon the lower front and edges of the car to reduce and control undercar airflow turbulence.

This reduction of undercar airflow caused very high operation temperatures above set corporate specifications (undercar airflow is normally used to keep the drive-train cool by air passing over & around the Transmission & Rear Axle case housings by naturally transferring heat from outer case to the air).

Because of this, the Transmission and Rear Axle were exceeding the set corporate temperature limits during the Maximum speed test (155 mph) at ambient temperatures above 110°F. The temperature limits were exceeded both at the climate chamber and during track testing.
Transmission & Axle Endurance Test

• Next steps:

• Requirement is a lubricant that would allow higher operating temperatures of the components.

• SynMax Performance Lubricants supplied a fluid capable of operation at 320°F for extended periods.

• Series of 10 maximum tests were performed and no failures reported.

• The transmission and rear axle were sent back to the suppliers for evaluation. Rear axle supplier reported no problems with either the bearings or ring and pinion.

• Transmission supplier reported no bearing or gear problems.

• Transmission supplier did report that the composite cages holding the bearings were showing signs of thermal fatigue, and recommended installing a cooler.

• The team decided that a cooler for both the transmission and rear axle would give the vehicle a greater safety margin and be more in line with corporate guidelines.
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• **Manual Transmission & Gear Lube Products Tested:**
  
  - Base line of current corporate approved OE products
  - OE (Mobil Standard Type) Manual Trans. Fluid (Synthetic Mercon V ATF type)
  - OE (Mobil Standard Type) Gear lube (Synthetic 75W140)

• **SynMax Performance Lubricants Products Tested:**
  - SynMax MTL 70 – (SAE30) Manual Transmission Fluid - Full Synthetic
  - SynMax Super 90 – Hypoid EP Gear Lube (SAE 90)- Pure Synthetic
**Transmission Maximum Test:**

- **15 Min of pre condition at 85mph to stabilize component temperatures.** Accelerate to Max competition speed allowed - hold for 30 min oval open throttle- followed by a 15 min road course  Testing Sign Off 140°C or 284°F

- **OE Base fluid** -Low Max (85 mph) test in (Min 5) 100°C or 212°F (Min 15) 108°C or 226°F
- **SynMax fluid** -Low Max (85 mph) test in (Min 5) 65°C or 145°F (Min 15) 90°C or 194°F

- **OE Base fluid** -Full V-Max (155 mph) test in 10 min (Min 25) raised to 170°C or 340°F
- **SynMax fluid** -Full V-Max (155 mph) test in 18 min (Min 43) raised to 170°C or 340°F

- **Transmission was taken apart and evaluated – SynMax even at extreme temperatures protected components still like new creating no wear or metal fatigue – BUT composite components could not handle extreme temps even though oil worked without failure**

- It was then determined even though the SynMax fluid was working much better, still needed increased heat transfer for lubrication cooling Advanced Transmission Cooler was required.

- **SynMax fluid** -Low V-Max (85 mph) test in (Min 15) 82°C or 180°F
- **SynMax fluid** -Full V-Max (155 mph) test in (Min 45) 102°C or 216°F - PASS
- **SynMax fluid** -Idle V-Max Hot Idle test in (Min 45 to 50) settled to 138°C or 280°F - PASS
• **Rear Axle V-Max Test 3:73 Gear:**

  • 15 Min of pre condition at 85 mph to stabilize component temperatures. Accelerate to Max mum competition speed allowed by climate chamber (175mph) hold for 30 min oval followed by a 15 min road course.
  • Testing Sign Off 145°C or 293°F

• **OE Base Lube** - Low Max (85 mph) test in (Min 5) 105°C or 221°F (Min 15) 115°C or 239°F
• **SynMax Lube** - Low Max (85 mph) test in (Min 5) 95°C or 203°F (Min 15) 105°C or 221°F

• **OE Base Lube** - Full V-Max (155 mph) test in 11 min (Min 26) raised to 155°C or 311°F
• **SynMax Lube** - Full V-Max (155 mph) test in 18 min (Min 43) raised to 151°C or 304°F

• Rear Axle was taken apart and evaluated – SynMax even at extreme temperatures protected components still like new creating no wear or metal fatigue – BUT composite components could not handle the extreme temps even thought oil worked without failure

• It was then determined even though the SynMax Lube was working much better, still needed increased heat transfer for lubrication cooling Advanced Rear Axle Cooler was required.

• **SynMax Lube** - Low Max (85 mph) test in (Min 15) 90°C or 194°F
• **SynMax Lube** - Full Max (155 mph) test in (Min 45) 131°C or 268°F - PASS
• **SynMax Lube** - Idle Max Hot Idle test in (Min 45 to 50) settled to 125°C or 257°F - PASS
Transmission & Rear Axle Endurance Test

- **Testing Summary:**
  - Original test requirement was for a lubricant / fluid to be presented capable of operation at 320°F for extended periods.
  - SynMax Performance Lubricants was the only manufacture to respond and supply a fluid which could handle such conditions and requirements.

- **SynMax Performance Lubricants Products Tested:**
  - SynMax MTL 70 – (SAE30) Manual Transmission Fluid - Full Synthetic
  - SynMax Super 90 – Hypoid EP Gear Lube (SAE 90)- Pure Synthetic

- These SynMax Products (MTL 70 & SUPER 90) provided better performance, wear and durability as compared to the OE synthetic products as stated within the test information provided in this presentation.

- **SynMax Average cooler temperature difference was 20°F+**
  - SynMax (without special coolers) took a much longer time (almost double) to reach same highest temperature as compared to the OE product.
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PRESENTATION END
For Technical, Test and Brochure information on how “The Aerospace Advantage for Motorsports” can work for your race team or commercial needs go to: www.SynMaxPerformanceLubricants.com