

# LUBRIZOL 9990A

A Universal Multi-Purpose  
Power/Transmission  
Performance Package

Lubrizol 9990A provides excellent extreme pressure protection for maximum gear life and capacity for wet brakes and power-take-off clutches, excellent wet brake noise suppression and filterability characteristics. Lubrizol 9990A was able to achieve these results while meeting requirements for corrosion and rust inhibition, water tolerance, and temperature operating range. This data is supported in the form of approvals from major manufacturers and extensive (over 200,000 hours) field service trial experience.

## \*Acceptance of Lubrizol 9990A to OEMs

A = Approved  
R = Recommended

### TRACTOR OEMs

#### John Deere

Factory Fill/Private Label	A
Quatrol™**	A
J20C, J14A	A
J20D*	A

#### New Holland (Ford)

FNHA-2-C-201.00 (M2C134-D)	A
FNHA-2-C-200.00*	A
M2C41-B, M2C48-B, M2C53-A, M2C134-A	R
M2C134-B, M2C134-C, M2C86-B	R

#### Massey-Ferguson

M1135, M1141, M1143	A
M1110, M1127, M1129-A	R

#### Case International

MS-1209 – HyTran ULTRA	R
MS-1207 – HyTran Plus	R
JIC-145/MS-1210, JIC-185/MS-1204	R
MS-1205, MS-1206, B-6	R

Kubota A

White Farm	
Q-1826	A
Q-1705, Q-1766, Q-1802	R

Steiger A

Versatile A

Deutz-Allis R

Landini R

Fiat-Hesston R

\* Acceptance is based on finished formulations

\*\* Quatrol is a registered trademark of Deere and Company

## Acceptance of Lubrizol 9990A to OEMs (continued)

### TRANSMISSION OEMs

<u>ATD Allison C-4</u>	A
Caterpillar TO-2	R

### HYDRAULIC OEMs

Denison HF-O, HF-1, HF-2	A
Sperry Vickers I-286-S, M-2950-S	R
Sundstrand Hydraulics	R
Plessey-Sundstrand	R

## Typical Physical and Chemical Characteristics Lubrizol 9990A

### Physical Characteristics:

Specific Gravity @ 15.6°C (60°F)	1,070
Pounds per U.S. Gallon @ 15.6°C	8.91
Pounds per IMP. Gallon @ 15.6°C	10.70
Viscosity @ 100°C, cSt	15.5

### Chemical Characteristics:

#### Weight Percent of:

	Minimum	Typical	Maximum
Calcium	5.40		6.60
Phosphorus	1.80		2.20
Sulfur		4.6	
Zinc	2.24		2.74
Boron	0.14		0.20
Nitrogen		0.09	

### Lubrizol 9990A Treatment Levels

	% By Volume	% By Weight
Lubrizol 9990	4.95	6.00
Lubrizol 9990A*	4.95	6.00
Lubrizol 9992**	19.00	20.00
Lubrizol 9993**	12.30	13.45

\* Contain Anti-Foam

\*\* Contain Viscosity Improver and Anti-Foam

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## Summary of Lubrizol 9990A Performance Data

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### Tractor Testing

### Performance vs. Specification

John Deere

Spiral Bevel/Final Drive Gear Wear	Exceeds Requirements
Brake Chatter	Exceeds Requirements
Brake Capacity	Exceeds Requirements
PTO	Exceeds Requirements
Quatrol™	Exceeds Requirements
J20C	Exceeds Requirements

New Holland (Ford)

Jenkins Cycle Test	Exceeds M2C134-D
3000 Gear Wear	Exceeds M2C134-D
7710 IPTO	Exceeds M2C134-D
4610 IPTO	Exceeds M2C134-D
6610 Brake Chatter	Exceeds M2C134-D

Massey-Ferguson

ASTM/CEC Final Drive Gear Wear	Exceeds M1141
Chatter and Torque	Exceeds M1141
PTO Clutch	Exceeds M1141

### Transmission/Final Drive Testing

Allison C-4 Transmission

C-4 Clutch Friction Test	Exceeds ATD C-4
C-4 THOT	Exceeds ATD C-4
Anti-Wear	Exceeds ATD C-4
Seal Testing	Exceeds ATD C-4

Caterpillar Clutch (TO-2)

Exceeds CES TO-2

CRC L-20

Exceeds API GL-4 High Torque Requirements

### Hydraulic Testing

Denison

P-46 Piston Pump	Meets HF-0
T-5D Vane Pump	Meets HF-0

Vickers 35VQ25A Pump

Meets I-286-S and M-2950-S

Sundstrand 22 Axial Piston Pump

Acceptable for use in Sundstrand Hydraulics

Plessey-Sundstrand

Acceptable for use in Plessey-Sundstrand Hydraulics

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# LUBRIZOL 9990

## AGRICULTURAL OEM PERFORMANCE

### JOHN DEERE

Historically, John Deere JDM J20, Quatrol™\*, and HY-GARD™\* fluids have been used in all John Deere agricultural equipment. Lubrizol 9990-based products have been approved by John Deere against their factory-fill specification. In addition, multiple Lubrizol 9990-based hydraulic/transmission fluids have been approved for meeting worldwide Quatrol and other J20 service-fill applications. Laboratory performance tests documenting these approvals are shown below.

#### JOHN DEERE JDM J20 TEST RESULTS

PERFORMANCE TEST	RESULTS		REQUIREMENT
<b>JDQ95 Spiral Bevel &amp; Final Drive Performance</b>			Gear wear protection equal to or better than reference fluid JDM J20C/D
Assessment	Pass		
<b>JDQ96 Brake Torque Variation and Friction Retention</b>	<u>Lubrizol 9990</u>	<u>Reference</u>	Equal to or better than reference
Capacity, Nm	4,092	3,968	
Torque Variation	9,176	14,880	
Relative Capacity, Nm	135,284	138,446	
Assessment	Pass		
<b>JDQ94 PST Clutch Performance</b>			
Initial Friction Coefficient	0.120		0.15 max
Final Friction Coefficient	0.088		0.080 min
Stall Time (Sec.)	1.94		5.00 max
Assessment	Pass		
<b>JDQ84 Hydraulic Pump Performance</b>			
Flow Degradation, %	0.6		10 max
Assessment	Pass		

\*Quatrol and HY-GARD are Registered Trademarks of Deere and Company

# LUBRIZOL 9990

## AGRICULTURAL OEM PERFORMANCE

### NEW HOLLAND FORD

New Holland recommends hydraulic/transmission fluids meeting FNHA-2-C-201.00 (M2C134-D) specification. Lubrizol 9990-based hydraulic/transmission fluid is approved against the FNHA-2-C-201.00 (M2C134D) specification. Two performance areas of concern in Ford tractors are gear wear protection and brake chatter suppression.

Gear wear protection is evaluated in the Ford 3000 Gear Wear Test. A key result is the amount of pitting along crucial gear surfaces. Lubrizol 9990 allowed no pitting (0 inches) after 100 hours of testing. Other additive systems typically allow up to eight inches of pitting after 100 test hours.

Brake chatter suppression is an important performance feature for any hydraulic/transmission fluid. Historically, New Holland tractors have extensively employed sintered bronze wet brake discs, which are susceptible to high brake noise levels under heavy braking conditions. The FNHA-2-C-201.00(M2C134-D) specification outlines a brake chatter test procedure for simulating actual chatter noise encountered in heavily loaded tractors performing brake assisted turns and high-speed stops. This brake chatter test was conducted in a Ford 6610. Lubrizol 9990-based hydraulic/transmission fluid exhibited superior wet brake chatter suppression compared to competitive systems evaluated.

Lubrizol 9990 provided outstanding gear wear protection and superior wet brake chatter suppression without sacrificing PTO clutch performance as shown by the Ford 4610 and 7710 IPTO test results.

### NEW HOLLAND FNHA-2-C-201.00 TEST RESULTS

PERFORMANCE TEST	MID-CONTINENT BASE STOCK	REQUIREMENT
<b>Ford 3000 Gear Wear</b>		
Total Pitted Length, in. Assessment	0.0 Pass	Equal to or better than the reference oil
<b>Ford 7710 IPTO</b>		
Engine Stall Time, sec. Assessment	0.90 Pass	3.0 max
<b>Ford 4610 IPTO</b>		
Engine Stall Time, sec. Assessment	1.50 Pass	3.0 max
<b>Ford 6610 Brake Test</b>		
Assessment	Pass	Equal to or better than the reference oil
<b>Brake Capacity</b>		
<b>SAE J1041 Brake Safety Test</b>		
Minimum Stopping Distance, ft.		
Effectiveness test	24.5	25 max
Fade test	30.5	31 max
Assessment	Pass	
<b>Hydraulic Pump Protection</b>		
<b>Plessey-Sundstrand</b>		
Flow Degradation, % Assessment	0.0 Pass	5.0 max

# LUBRIZOL 9990

## AGRICULTURAL OEM PERFORMANCE

### MASSEY-FERGUSON

Massey-Ferguson currently requires hydraulic/transmission fluids to meet M1141 and M1135 for factory- and service-fill approval. Lubrizol 9990-based hydraulic/transmission fluid has shown excellent wet brake chatter suppression in independent laboratory testing. Brake chatter suppression was obtained without sacrificing PTO clutch performance. In addition, gear wear protection was excellent as shown in the ASTM/CEC Final Drive Gear Wear Test.

### MASSEY-FERGUSON M1141 TEST RESULTS

PERFORMANCE TEST	MID-CONTINENT BASE STOCK	REQUIREMENT
<b>ASTM/CEC Final Drive Gear Wear</b>		Gear wear protection equal to or better than Permatran III reference oil
Average Sun Pinion Wear, In.	0.0002	
Lubrizol 9990		0.0003
Permatran III		
Assessment	Pass	
<b>Chatter/Torque</b>	34.6% less chatter than Permatran III reference oil.	
	10.1% less torque than Permatran III reference oil.	
Assessment	Pass	
<b>PTO Clutch</b>	43.6% more input torque to the flywheel than Permatran III reference oil	
Assessment	Pass	

# LUBRIZOL 9990A

## Powershift Transmission Performance

Lubrizol 9990A is a multi-purpose power transmission performance package. Although Lubrizol 9990A was developed for agricultural hydraulic/transmission oils, this performance package can be used in powershift transmissions and industrial torque converters in off-highway equipment.

The Allison C-4 specification was developed to meet higher Allison transmission division customer expectations and replace the 12-year-old type C-3 specification. The newer C-4 specification includes a higher temperature, more severe oxidation requirement and a new non-asbestos clutch friction test. It also incorporates a fluorelastomer seal compatibility test and a more demanding anti-foam and copper corrosion requirement.

The following data provides the basis for Lubrizol 9990A C-4 approval for Allison Powershift transmissions:

<b>Allison Type C-4 Resin-Graphite Friction Retention Test Results</b>			
<u>PARAMETER</u>	<u>LUBRIZOL 9990A</u>	<u>C-4 LIMITS</u>	<u>ASSESSMENT</u>
Slip Time			
@ 5,500 Cycles, Seconds	0.68	0.73 max	Pass
Mid-Point Friction Coefficient	0.108	0.103 min	Pass
<b>Non-Asbestos Friction Retention Test Results</b>			
<u>PARAMETER</u>	<u>LUBRIZOL 9990A</u>	<u>C-4 LIMITS</u>	<u>ASSESSMENT</u>
Slip Time			
@ 5,500 Cycles, Seconds	0.43	0.67 max	Pass
@ 10,000 Cycles, Seconds	0.43	0.57 max	Pass
Mid-point Friction Coefficient			
@ 5,000 Cycles	0.116	0.072 min	Pass
@ 10,000 Cycles	0.117	0.085 min	Pass

# LUBRIZOL 9990A

## Powershift Transmission Performance

<b>Oxidation Resistance (4L60E Transmission Oxidation Test)</b>					
<u>PARAMETER</u>	<u>LUBRIZOL 9990A</u>	<u>C-4 LIMITS</u>	<u>ASSESSMENT</u>		
Parts Condition Summary	No Sludge	Free of Sludge	Pass		
Differential TAN	1.14	4.0 max	Pass		
Differential Carbonyl Absorbance	0.58	0.75 max	Pass		
Transmission Components Bushings Bearings Gears	No Failures	No Failures	Pass		
<b>Vickers Vane Pump Wear (Modified ASTM D2882 Procedure) (1000 psi; 174°F; 100 hr.)</b>					
<u>PARAMETER</u>	<u>LUBRIZOL 9990A</u>	<u>C-4 LIMITS</u>	<u>ASSESSMENT</u>		
Weight Loss Cam Ring	3.5 mg.				
Vanes	0.0 mg.				
Total	3.5 mg.	15 mg.	Pass		
Based on the following Caterpillar To-2 friction test results, Lubrizol 9990A can be recommended for use in Caterpillar Powershift transmissions.					
<b>Caterpillar To-2 Friction Test Results</b>					
<u>TEST NUMBER</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>TO-2 LIMITS</u>	<u>ASSESSMENT</u>
Test Cycles x 10 <sup>3</sup>	15	15	15		
Stopping time Increase, %	7.2	10.4	12.7	15% max	Pass
Wear Inches x 10 <sup>4</sup>					
Bronze	24	19	31	100 max	Pass
Steel	30	25	28	40 max	Pass

# LUBRIZOL 9990A

## Hydraulic Pump Performance

Lubrizol 9990A is a universal multi-purpose power transmission performance package. Although Lubrizol 9990A was developed for agricultural and industrial/construction hydraulic/transmission oils, this performance package can be used in industrial and mobile hydraulic systems.

### Wide Range of Application

Hydraulic oils formulated with Lubrizol 9990A may be used in:

- A broad range of industrial hydraulics ranging from severe hydraulic systems to general lubrication applications. These include machine tools, presses, central systems, gear cases and various bearing systems.
- Mobile loading and continuous mining equipment where high speeds, loads and temperatures are encountered.

### Operating Advantages

- Proven field performance
- Outstanding thermal and oxidative stability
- Low copper activity
- Good detergency
- Excellent rust protection
- Good filterability
- Good antifoam characteristics

### A Proven Formulation

Hydraulic oils formulated with Lubrizol 9990A provide the performance characteristics necessary to meet or exceed all major hydraulic equipment manufacturer and user requirements:

- Sperry Vickers I-286-S (Industrial), M-2950-S (Mobile Equipment)
- Denison HF-O, HF-1, HF-2
- Sundstrand Hydraulics
- Cincinnati Milacron P-68, P-69, P-70

### Economy and Flexibility

- Inventory reduction—one multi-purpose performance package can be used in agricultural equipment, construction equipment, and industrial and mobile hydraulics.
- Long fluid life
- Reduced machine maintenance—increased productivity
- Useful in a wide range of high VI base stocks



# LUBRIZOL 9990A

## Hydraulic Pump Performance

<b>Summary of Lubrizol 9990A Hydraulic Pump Performance</b>			
		<b>BASE STOCK SOURCE/ISO GRADE</b>	
<b>TEST</b>	<b>REQUIREMENT</b>	<b>MID CONTINENT ISO 68</b>	<b>CANADIAN ISO 46</b>
Denison Pump T5D Vane Pump 46 Series Piston Pump Denison Assessment	HF-O Pass HF-O Pass	Pass Pass HF-O Approved	
Vickers 35 VQ-25 Pump (3000 psi, 2400 rpm, 200°F [93.3°C]) Ring and Vane Weight Loss, mg. First 50 Hour Test Second 50 Hour Test Third 50 Hour Test	90 90 90		45 53 64
Sundstrand Model 22-2132 Variable Displacement Piston Pump (5000 psi, 3100 rpm, 180°F[82.2°C] with 1.0% water contamination) Flow Degradation, %	10 max	0.6	
Plessey-Sundstrand Pump Flow Degradation, %	5.0 max	0.0	

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## AGRICULTURAL OEM PERFORMANCE

### Lubrizol 9990 FIELD PERFORMANCE

Lubrizol 9990 has been successfully field tested in 250 tractors and combines for more than 200,000 hours. This field test includes one year, 63 primary tractor test units required for John Deere JDM J20 approval. The John Deere test portion is conducted in three different climatic locations using three different Lubrizol 9990-based hydraulic/transmission fluids. In addition, non-primary John Deere tractors were field tested as well as New Holland, Ford, J. I. Case, International Harvester, Massey-Ferguson and Kubota tractors.

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