

# CLARITY<sup>®</sup> SYNTHETIC HYDRAULIC OIL AW FOR CURRENT GENERATION OF HITACHI-JOHN DEERE EXCAVATORS

The current generation of hydraulic excavators from Hitachi Construction Machinery Co. Ltd. and Deere-Hitachi Construction Machinery Corporation require the use of advanced hydraulic oil formulation technology.

- They do not provide approvals for fluids or publish fluid specifications.
  - They recommend fluids meet the JCMAS HK specification.
  - Clarity Synthetic Hydraulic Oil AW meets or exceeds JCMAS HK.
- Clarity Synthetic Hydraulic Oils AW are compatible. To obtain the full benefit and performance of the product, the following guidelines are recommended:
    1. **Drain, flush, and fill.** Advantage of this approach is you are extracting maximum value from the product.
    2. **Drain and fill.** This second recommendation allows improvement over the in-service base fluid.
    3. **Top-off.** Customer will not receive meaningful benefit until they can switch over completely and use one of the above two procedures.



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## KEY JCMAS HK SPECIFICATION DETAIL COMPARISON CLARITY SYNTHETIC HYDRAULIC OIL AW ISO 46 AND HITACHI GENUINE HYDRAULIC OIL SUPER EX 46HN

Analytical Test	Specification Requirement	Clarity Synthetic Hydraulic Oil AW 46	Hitachi Genuine Hydraulic Oil Super EX 46HN****
ISO Viscosity Grade	ISO VG 46	ISO VG 46	ISO VG 46
Viscosity, D445, cSt			
40°C	41.4 – 50.6	46.8	47.5**
100°C	6.8 min	9.3 (exceed)	7.6**
Viscosity Index	120 min	186 (exceed)	125**
Density @ 15°C, D1298	-	0.84	0.86**
Low Temperature Viscosity, Brookfield, cP			
-20°C	5000 min (-20°C)	1820 (exceed)	<5000
-30°C		5430 (exceed)	8350*
Foam Testing, D892			
Sequence I			
Tendency/Stability, ml	50/0 max	Pass	Pass
Sequence II			
Tendency/Stability, ml	50/0 max	Pass	Pass
Sequence III			
Tendency/Stability, ml	50/0 max	Pass	Pass
Sonic Shear Stability, ASTM D5621	10 max	Pass (exceed)	Pass
Oxidation Stability, D4310 D943 1000 hr, mgKOH/g	1.0 max	Pass	Pass
***Rotating Pressure Vessel Oxidation Test (RPVOT), D2272, minutes	-	628	522*
Elastomer Compatibility, NBR			
Change in hardness, Shore A, pts	-25 min	Pass	Pass
Change in volume, %	30 max	Pass	Pass
Filterability	Pass	Pass	Pass
Load Carrying Capacity (4-Ball), N	1235 min	1962 (exceed)	Pass
4-Ball Wear, D4172, (40 kg, 60 min, 1200 rpm), mm	0.6 max	Pass	Pass
Load Carrying Capacity, FZG	8 min	12 (exceed)	Pass
High Pressure Piston Pump, Vane pump	Pass	Pass	Pass
Friction Characteristic, micro clutch Coefficient	0.08 min	Pass	Pass

\* Bench test data for market sample of Hitachi Genuine Hydraulic Oil Super EX 46HN.

\*\* Published Data for Hitachi Genuine Hydraulic Oil Super EX 46HN Typical Properties.

\*\*\* Test is not part of JCMAS HK Specification.

\*\*\*\* Same fluid used by John Deere in Factory Fill for Excavators.

Table 1

# CLARITY® SYNTHETIC HYDRAULIC OIL AW FOR CURRENT GENERATION OF HITACHI-JOHN DEERE EXCAVATORS



Clarity Synthetic Hydraulic Oils AW have similar or better performance properties as compared to the published Hitachi Construction Machinery Co. Ltd. and Deere-Hitachi Construction Machinery Corporation factory fill oils.

Clarity Synthetic Hydraulic Oils AW are formulated with synthetic base stocks and a proprietary ashless additive system that provide exceptional oxidation stability, water separability, foam suppression, and protection against wear, rust and corrosion. The combination of base stocks, additives, and viscosity index improvers are unique and allow for improved hydraulic response time (productivity), fuel efficiency, longer oil life, and increased operating temperature range. The response time and efficiency occur across the span of the equipment's operating temperature, which allows it to function in a wide range of ambient temperatures.

Our premium hydraulic fluids are long-life lubricants, with a dramatically longer oxidation stability life (ASTM D943 test) than conventional hydraulic fluids. A longer oxidation stability life equates to longer oil service life, which can improve the customer's bottom line. This level of oxidation stability is especially applicable in high efficiency (high speed, high temperature, high output) applications where reservoirs may be smaller and severe stress is placed on the hydraulic fluid.

## CLARITY SYNTHETIC HYDRAULIC OILS AW MEETS OR EXCEEDS THE FOLLOWING INDUSTRY OR MANUFACTURER'S REQUIREMENTS.

- JCMAS HK multi-grade (Meets performance requirements for equipment requiring this OEM specification particularly John Deere Construction and Hitachi excavators) (ISO 32, 46)
- DIN 51524-3 (HVLP, part 3) (ISO 32, 46, 68)
- ISO 11158 L-HV (ISO 32, 46, 68)
- ASTM D6158, HV (ISO 32, 46, 68)
- Eaton-Vickers 35VQ25A, M-2590-S, I-286-S (ISO 32, 46, 68)
- Fives-MAG Cincinnati, Cincinnati Machine P-68, P-69, P-70 (ISO 32, 46, 68)

## CLARITY HYDRAULIC OIL AW

- JCMAS HK single grade (Hitachi/John Deere Construction) (ISO 32, 46)
- DIN 51524-2 (HLP, part 2) (ISO 32, 46, 68)
- ISO 11158 L-HM (ISO 32, 46, 68)
- ASTM D6158, HM (ISO 32, 46, 68)
- Eaton-Vickers 35VQ25A, M-2590-S, I-286-S (ISO 32, 46, 68)
- Fives-MAG Cincinnati, Cincinnati Machine P-68, P-69, P-70 (ISO 32, 46, 68)

## RANDO® HDZ

- JCMAS HK multi-grade (Hitachi/John Deere Construction) (ISO 32, 46)
- DIN 51524-3 (HVLP, part 3) (ISO 32, 46, 68)
- ISO 11158 L-HV (ISO 32, 46, 68)
- ASTM D6158, HV (ISO 32, 46, 68)
- Eaton-Vickers 35VQ25A, M-2590-S, I-286-S (ISO 32, 46, 68)
- Fives-MAG Cincinnati, Cincinnati Machine P-68, P-69, P-70 (ISO 32, 46, 68)

# Formulated for savings

Our entire line of premium hydraulic fluids have been designed to best meet your operation's needs. Each is precisely formulated to help maximize performance and savings.

Environmentally Sensitive

Clarity® Synthetic Hydraulic Oil AW

OEM Approval

Rando® HDZ

Productivity

Rando® HD

Fuel Efficiency

Long Oil Life

Figure 1: Premium Hydraulic Lineup



## Changeover Procedures from Hitachi Genuine Hydraulic Oil Super EX to Clarity Synthetic Hydraulic Oil AW or Clarity Hydraulic Oil AW.

Highlighted below are 3 procedures that provide guidance on transitioning from Hitachi Genuine Hydraulic Oil Super EX 46HN to Clarity Synthetic Hydraulic Oil AW 46 or Clarity Hydraulic Oil AW 46.

**Procedure A** is considered the “best” and involves a complete drain and flush of the system. With any switch to a new product a complete flush will provide the full benefit of the Clarity Synthetic Hydraulic Oil’s performance in the application.

**Procedure B** is considered “better” and involves just a complete drain and fill. To maximize the use of this option, it is best to drain completely as possible, to maximize the benefits of switching products.

**Procedure C** involves a top-off until either changeover procedure A or B can be implemented at the next opportunity.

### PROCEDURE A – DRAIN AND FLUSH

**Step 1.** Operate the hydraulic system under normal operating temperature and conditions for minimum of 1 hour. Then shut the hydraulic system down. The lubricant in the system should be warm/hot when initiating the lubricant change.

**Step 2.** Drain the entire system as best as possible and try to include draining oil in all hoses and lines, hydraulic pump, reservoir, and filters.

**Step 3.** Thoroughly clean the hydraulic system if needed. Examine and replace all worn seals. Replace filters and strainers. Flush the system, this process can involve extensive circulation, warm up, drain, flush and filter replacement. In all cases, the manufacturer’s change-out and flushing recommendations, including all relevant safety precautions, should be closely followed during the conversion. Flushing with the new fluid is the best approach. If switching hydraulic fluids, Clarity Synthetic Hydraulic Oil AW 46 is the first choice and Clarity Hydraulic Oil AW 46 is the next best choice.

**Step 4.** Refill the entire system to the correct level with fresh Clarity Synthetic Hydraulic Oil AW 46 and operate system under normal operating conditions. Check the viscosity of the final filled fluid to develop a baseline for in-service monitoring.

### General guidelines for any fluid changeover.

- Always confirm that the product selected is consistent with the OEM recommendations for the application.
- Follow OEM recommended lubricant flushing and change-out procedures, if available, including all relevant safety precautions.
- Properly dispose of used oil.

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## PROCEDURE B – DRAIN AND FILL

**Step 1.** Operate the hydraulic system under normal operating temperature and conditions for minimum of 1 hour. Then shut the hydraulic system down. The lubricant in the system should be warm/hot when initiating the lubricant change.

**Step 2.** Drain the entire system as best as possible and try to include draining oil in the hoses, lines, hydraulic pump and motor, oil cooler, valves, reservoir, and filters. Examine and replace all worn seals. Replace filters and strainers.

**Step 3.** Refill the entire system to the correct level with fresh Clarity Synthetic Hydraulic Oil AW 46 and operate system under normal operating conditions.

**Step 4.** Monitor the system and check the final viscosity of the fluid after change-out. It is possible after change-out that the filters may need an earlier replacement than expected depending on the previous fluid used.

## PROCEDURE C – TOP-OFF

Add new oil on top of in-service oil. This procedure should be considered only when there is no opportunity to change-out the fluid immediately, but will be implemented at the next immediate opportunity.

For all the change-out procedures, after the oil change-out, it is recommended to routinely monitor the hydraulic operation and filter life, closely monitor and evaluate the oil condition on a periodic basis to ensure proper performance, and take any corrective action that may be needed, including changing filters.

For additional information, please refer to Technical Bulletin LTB-47 Hydraulic Fluid Changeover Procedure.

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## FAQ

### 1. Hitachi/Deere oils are emulsifying oils. Does that mean we do not have a comparable product?

The JCMAS HK specification does not state whether the oil used is water emulsifying or demulsifying. Our Clarity Synthetic Hydraulic Oil AW line is formulated to have excellent demulsibility characteristics (water separation). If water content is determined to be above 1000 ppm, measures should be taken (as with any hydraulic fluid) to remove the water contamination to prevent degradation of additives and base fluids.

### 2. Will using a non-Hitachi/Deere product will nullify the warranty?

Typically no, assuming there isn't a specific service or other contract with the customer. Most customers for practical reasons will take delivery of the equipment, wet. This means it is filled with the OEMs factory fluid. The customer has a strong preference for one oil supplier and normally would request our suggested replacement product. We would recommend Clarity Synthetic Hydraulic Oil AW or Clarity Hydraulic Oil AW.

### 3. Is Clarity Synthetic Hydraulic Oil AW our only product that meets JCMAS HK specification?

Our Clarity Synthetic Hydraulic Oil AW is our first choice when comparing to factory fill products and meeting JCMAS HK multi-grade specification. Our next choice would be Clarity Hydraulic Oil AW 32 and 46 grades, which will meet JCMAS HK single grade specification and is ashless matching to the factory fill product as well. Alternatively, Rando HDZ 32 and 46 grades also meet the JCMAS HK multi-grade specification.

### 4. Can Clarity Synthetic Hydraulic Oil AW and Clarity Hydraulic Oil AW be used in other hydraulic applications?

Clarity Hydraulic oils are designed for use in mobile and fixed plant hydraulic vane-, piston-, and gear-type pumps. The protection provided by these oils make them especially suited for high performance industrial applications utilizing axial piston pumps where pressures may exceed 5000 psi.

Always confirm that the product selected is consistent with the original equipment manufacturer's recommendation for the equipment operating conditions, local laws and regulations, and customer's maintenance practices.

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**Caltex Reliability** — The RBL™ Program is our commitment of business support and reliability: Caltex's lubrication expertise combined with superior products and a tailored service program work together to help your business Run Better Longer.