

PLAYING ROULETTE WITH 303 YELLOW BUCKETS THE STAKES ARE HIGH AND THE ODDS ARE NOT IN YOUR FAVOR

No Specifications on Labels, Failure to Meet OEM Specifications, Wide Variations in Properties and Quality

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There has been a significant amount of talk about “303” tractor hydraulic fluid (THF) over the past year, and for good reason. This is because although THFs labeled as 303 have commonly been seen in the market for decades, and for some considered the product of choice due to price, three states (including Missouri, Georgia, and most recently North Carolina), have issued stop-sale orders for tractor hydraulic fluid labeled, claimed or implied as meeting THF 303. The reasons for the orders are that there are no known specifications available for such fluids, the designation was discontinued in 1974 and subsequently replaced with the current JDM-J20C specification. And in the words of Stephen Benjamin, director, Standards Division with the North Carolina Department of Agriculture and Consumer Services, “the lack of any specifications does not provide the purchaser with information for its intended use, nor the ability to test the product for meeting those specifications.”

Whereas you can be sure the actions taken by these states are in the best interest of consumers, not surprisingly, some (including both buyers and sellers) of 303 question the reasons for the actions and believe it forces consumers to buy more expensive THF. In short, they argue that 303 also known as the “yellow bucket” are economical and they have never had any problems or complaints using them, or about them. In fact, from time-to-time, a farmer can be heard saying “I’ve been using the ‘yellow bucket’ for decades and never had a failure.” Similarly, some lubricant marketers say they never receive complaints about the products.

Although such arguments by anecdote can be seemingly persuasive, the fact is that catastrophic oil related failures are relatively uncommon and when they do occur, it can be an expensive and time-consuming task to prove the oil was at fault. Instead, what can happen when a 303 fluid is used is that the equipment suffers from damage to the spiral gear in the final drive, excessive wear in the planetaries, improper and poor shifting, seal leakage, and improper operation of the wet brakes. Further there can be problems starting the equipment, oil starvation, hot operation problems such as high pump leakage, and the oxidation resistance of the THF may be very poor and this could lead to deposits, sludging, and thickening. These issues can result in significantly increased maintenance costs and downtime, and shortened equipment life.

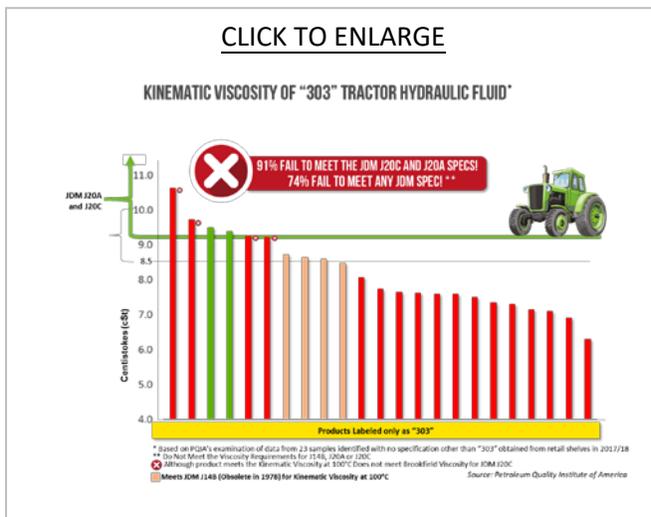


- **91% FAIL TO MEET J20C AND J20A SPECIFICATIONS**
- **74% FAIL TO MEET ANY JDM SPECIFICATION**
- **60% CHANCE OF LOWER ANTI-WEAR PROTECTION THAN J20C**
- **73% CHANCE WILL OFFER LESS DETERGENCY THAN J20C**
- **100% CHANCE OF NOT KNOWING IF IT MEETS THE REQUIREMENTS OF, OR IS SUITABLE FOR USE IN A TRACTOR**

* Based on examination of data from 37 samples obtained from retail shelves in 2017/18

Again, however, when problems do occur, it would be difficult to prove it was caused by the THF, let alone one sold by a specific supplier. But whereas it is challenging to tie equipment failures to the THF, what's not hard to prove is that the properties of 303s currently in the marketplace are all over the map. Moreover, a large percentage of them do not meet specifications commonly required by tractor manufacturers.

To appreciate the extent of the problem and reasons for concern, consider that although each of the ten J20C samples of THF examined by PQIA meet the viscosity requirements for that specification, 21 out of 23 (or 91%) of the samples of 303 PQIA examined failed to meet the viscosity requirements for the current J20C specification, and J20A which has been obsolete since 1989. What's more, if you go back to J14B, a specification obsolete since 1978, 17 (or 74%) of the "303" samples still fail to meet the viscosity requirements. In addition to failing the John Deere specifications, the viscosities of the "303" samples examined also come up short in applications where other OEM lubricant specifications are called for, including: AGCO, Case, New Holland, Massey-Ferguson, White, and Kubota.

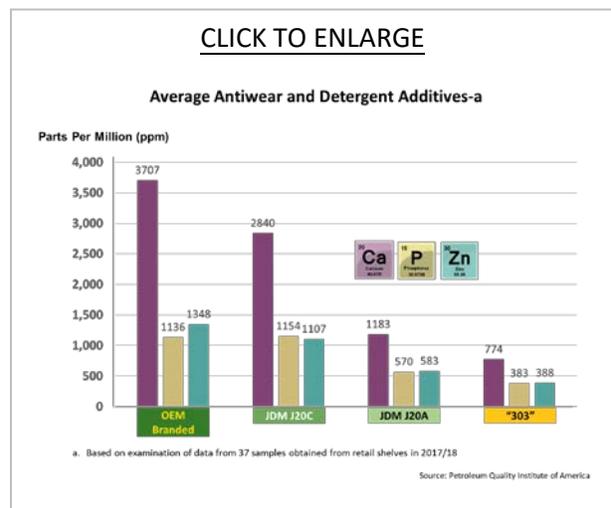


Understanding the importance of fluid viscosity to the proper operation of a tractor, and that it's a relatively easy specification to meet and test to ensure it's inline, it's disconcerting that such a high percentage of 303s fail to meet the viscosity requirements for the leading tractor manufacturers. But then again, since there are no specifications for a 303 fluid, there is technically nothing to stop one from putting nearly anything in a yellow bucket and selling it as 303 THF.

Whereas some manufacturers label 303 buckets with warnings about its limited use and fill them with product presumably formulated

for older tractors that at a minimum will do no harm, many yellow bucket labels show no warnings, and in addition to issues with viscosity, there are other reasons for concern when you look at the data. This point becomes apparent when one looks at variations in the levels of anti-wear and detergent additives in the 303s examined.

The most common anti-wear additive used in THF is zinc dialkyldithiophosphate (ZDDP) and the amount present in a product can be seen by looking at the phosphorus and zinc in the oil. The average level of phosphorus and zinc in the data from ten samples of THF examined and claiming to meet J20C is 1,154 parts per million (ppm) and 1,107ppm, respectively. Although there is no specification for zinc and phosphorus in J20C (or most other OEM specifications for that matter), it is concerning that



the average levels in the 303 products examined is roughly 60% lower than the average for products meeting the current J20C specification, and 30% lower than the obsolete J20A. The lower levels of anti-wear protection seen in the 303s examined could potentially result in damage to the spiral gear in the final drive, excessive wear in the planetaries, and other wear related issues resulting in increased downtime and maintenance cost, and shortened equipment life.

A similar concern is seen in the level of detergent additive in the 303s examined. Calcium sulfonate is the most common detergent additive in THF and the amount in a product is assessed by looking at the concentration of calcium in a sample. The average level of calcium in the 303s examined is 774ppm. This is 73% below the average of the J20C samples examined, and 35% below that for the average seen in the J20A samples. And strikingly, two of the samples have no meaningful levels of calcium/detergent. The lower levels of detergent seen in some of the 303s examined could lead to deposits, sludging, thickening, shortened service intervals, increased maintenance cost, and shortened equipment life.

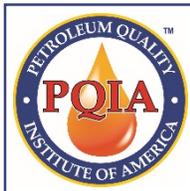
Fact is, however, other than saying the anti-wear and detergent additive levels in the majority of the 303s examined are significantly below that seen in J20C and J20A, who knows if the lower average is good or bad for older tractors? Maybe the average of the 303s examined provides a performance level acceptable for an economical fluid formulated for use in older tractors and such fluids can and should be marked with the familiar 303 label that identifies it as such. Maybe some equipment owners are comfortable using higher and lower viscosity THFs due to the climate in their locale. But considering the wide variations in viscosity, anti-wear and detergent additives and the absence of any known specifications, viscosity declarations, or warning about its limited use on the labels, equipment owners are playing roulette with yellow buckets when they buy "303s," and based on the data from the samples examined, the odds are:

- 91% chance the 303 on the shelf will not meet the J20C or J20A specification
- 74% chance it will not meet J14B (a specification obsolete since 1978)
- 60% chance it will have lower anti-wear protection than J20C
- 73% chance it will offer less detergency than J20C

But what should be the most concerning and compelling number to consider among the odds is the 100% chance of not knowing if a "303" THF meets the requirements of, or is suitable for use in a tractor when the product label fails to provide the purchaser with information about the specifications the product meets and its intended use.

For these reasons, the Petroleum Quality Institute of America supports the actions by the states of Missouri, Georgia, and North Carolina to remove THF products from the market that fail to provide buyers with the information needed to make an informed buying decision, and prevents states, PQIA and others from testing the fluids to help ensure compliance with specifications. In addition, PQIA encourages other states to follow the lead of MO, GA, and NC in stopping sale on these products while providing lubricant manufacturers and marketers time to clear the system of 303 and label their products appropriately.

Further, PQIA encourages the lubricants industry to adopt an existing manufacturer's specification as the minimum requirement to meet the needs of tractor owners looking to service older equipment with an economical fluid, and to include warnings on labels of product only meeting obsolete specifications. Because in the absence of this, the unfortunate reality is that consumers' equipment will remain at risk and the 303s will continue to unfairly tilt the playing field against responsible lubricant manufacturers and marketers.



The Data

Based on Viscosity Alone for the "303" Samples Tested, 91% of the 23 Samples Fail to Meet JDM J20C

BULLETIN

YOU'RE PLAYING ROULETTE WITH 303 YELLOW BUCKETS

TEST RESULTS

	FAILS							
Product label	303	303	303	303	303	303	303	303
Calcium	985	304	390	365	250	261	15	170
Phosphorus	486	210	180	252	93	150	188	212
Zinc	585	8	206	54	105	63	228	225
Magnesium	1	1	2	7	1	10	0	6
KV@100°C	7.1	6.3	7.6	7.4	10.6	9.5	7.3	7.7

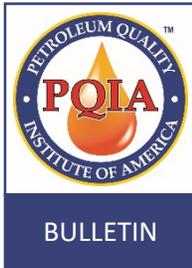
TEST RESULTS

	FAILS	FAILS			FAILS	FAILS	FAILS	FAILS
Product label	303	303	303	303	303	303	303	303
Calcium	1847	413	1438	1351	1015	3	667	960
Phosphorus	744	297	550	559	433	199	361	513
Zinc	771	302	639	566	440	234	359	523
Magnesium	28	34	26	18	23	1	28	116
KV@100°C	8.7	8.1	9.4	9.7	8.6	6.9	7.5	8.6

TEST RESULTS

	FAILS						
Product label	303	303	303	303	303	303	303
Calcium	648	1575	1547	821	852	907	1017
Phosphorus	310	620	633	617	380	372	461
Zinc	308	712	722	652	362	361	509
Magnesium	27	20	24	19	28	73	5
KV@100°C	7.6	9.2	9.3	7.6	7.6	7.1	8.5

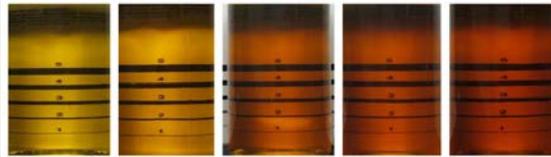
- Fails to Meet Kinematic Viscosity at 100°C for J14B or Brookfield Viscosity for JDM J20C
- Meets Kinematic Viscosity at 100°C for J14B (obsolete since 1978)



The Data

All Products Examined Labeled as Meeting J20C, Meet the Kinematic Viscosity Requirements of the J20C Specification. Two Products Labeled as J20A Fail to Meet the Viscosity Requirements of the of J20A Specification.

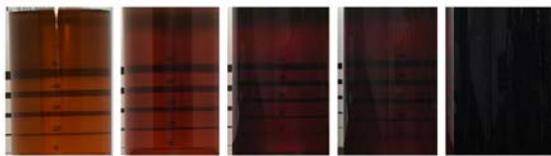
TEST RESULTS



Product label	J20C	J20C	J20C	J20C	J20C
Calcium	3614	3720	649	659	3770
Phosphorus	1401	1400	442	455	1210
Zinc	1537	1570	24	28	1391
Magnesium	3	3	7	6	108
KV@100°C	9.4	9.1	9.3	9.3	9.6

Although two products labeled as meeting J20C meet the viscosity requirements, they have significantly lower levels of anti-wear and detergent additives.

TEST RESULTS



Product label	J20C	J20C	J20C	J20C	J20C
Calcium	3643	4000	3310	3337	3627
Phosphorus	1062	1501	1281	1323	1427
Zinc	1304	1647	1302	1348	1402
Magnesium	102	12	11	16	23
KV@100°C	9.4	9.8	9.3	9.3	9.6

TEST RESULTS

	FAILS		FAILS	
Product label	J20A	J20A	J20A	J20A
Calcium	655	1670	731	1678
Phosphorus	505	708	345	722
Zinc	463	753	359	756
Magnesium	135	40	18	41
KV@100°C	7.8	9.4	6.6	9.4

Note: In addition to meeting the proper viscosity profile, OEM specifications require tractor hydraulic fluids to pass a multitude of performance tests, including: gear wear, load carrying and extreme pressure capacity, oxidative and thermal stability, water tolerance, proper friction, hydraulic pump durability, seal performance, and others. It is important to note that the data PQIA examined is limited to the viscosity profile of the samples and selected organometallic additives, and as such, although the viscosity of a product may meet the requirements of the specification, this should not be interpreted as meaning the product meets the specification.

Samples examined by the Petroleum Quality Institute of America (PQIA) include those secured and tested by a third party for PQIA, and samples secured and tested by the Missouri Department of Agriculture in 2017 and 2018.