



RPUG 2018 CONFERENCE - SOUTH DAKOTA

30 Years On The Road To Progressively Better Data

Rapid City September 18-21

QUICK-LOCK SKID TEST

An Intermediate Step to Better Resolution

By
John Andrews
MDOT



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OBJECTIVE

- **Provide a method that:**
 - Has a network sample resolution of 0.1 mile or closer
 - Has 0.02 mile (105 ft.) resolution for special situations
 - Provides equivalent results to ASTM E-274 test

NON-LOCK vs QUICK-LOCK

- **Non-Lock:** (average value 33-67% lock-up)
 - **POSITIVE** – Shortest test (0.01 mile capability)
Consumed least resources per test
Correlated best with anti-lock brake systems
 - **NEGATIVE** – While system wide relationship to E274 was excellent, the values for specific locations had significant variability
(It is measuring a slightly different metric)
- **Quick-Lock:** (0.3 sec. averaging time)
 - **NEGATIVE** - 25% longer than Non-Lock – Limits # tests per mile
 - **POSITIVE** – The same metric as E-274 test is being measured
Less resources per test than E-274 (<30 ft. drag vs 70 ft. drag)

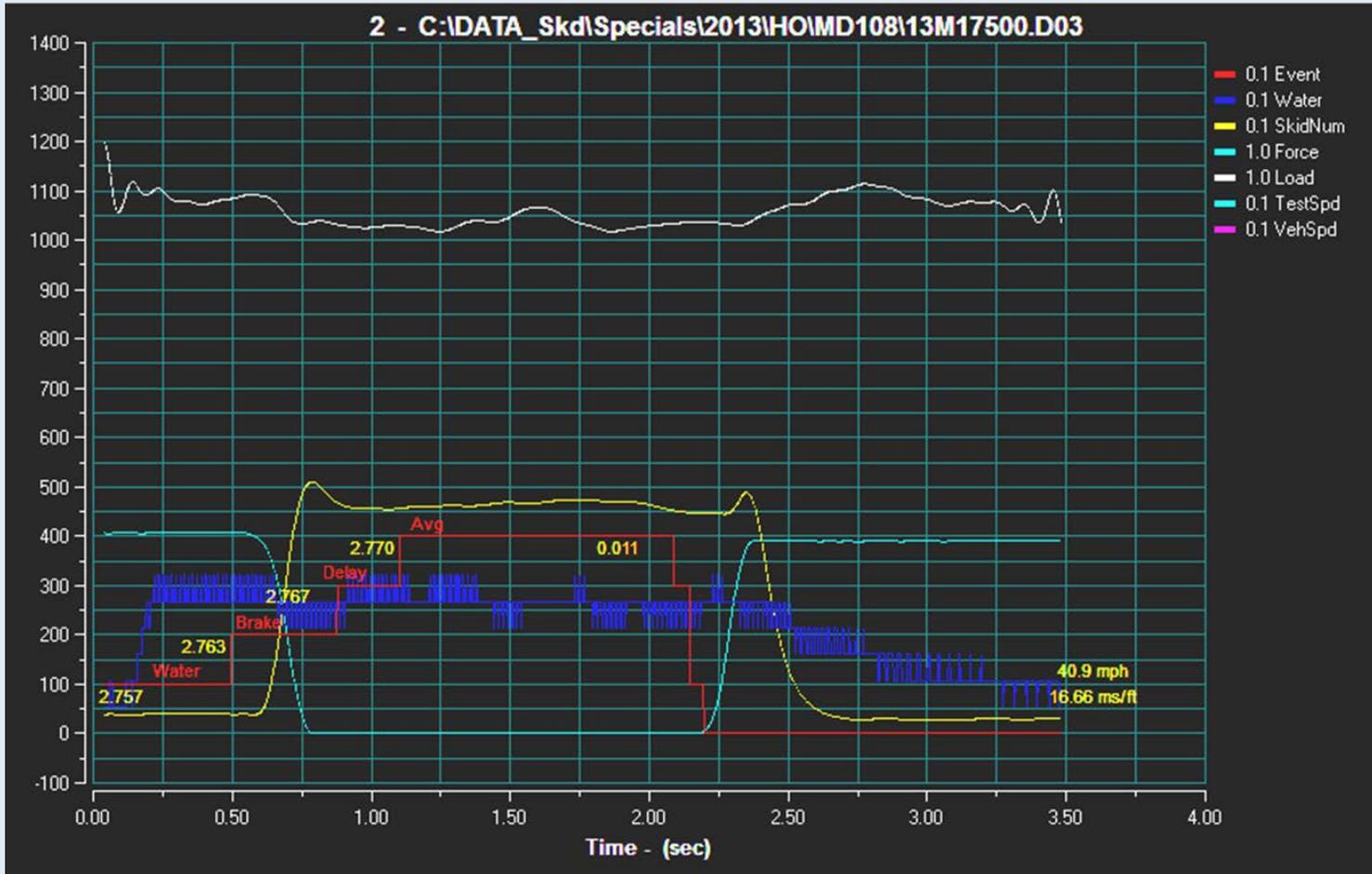
The TRUCK



EQUIPMENT UPGRADES

- Required:
 - Fast – race quality calipers and pads
 - High performance brake discs
 - High capacity compressor (included with Cummins)
 - 1 KHZ data sample rate or faster
- Included:
 - Temperature sensors (rotor, tires, pavement, air)
 - Hydraulic pressure sensor (brake system)

E-274 TEST GRAPH



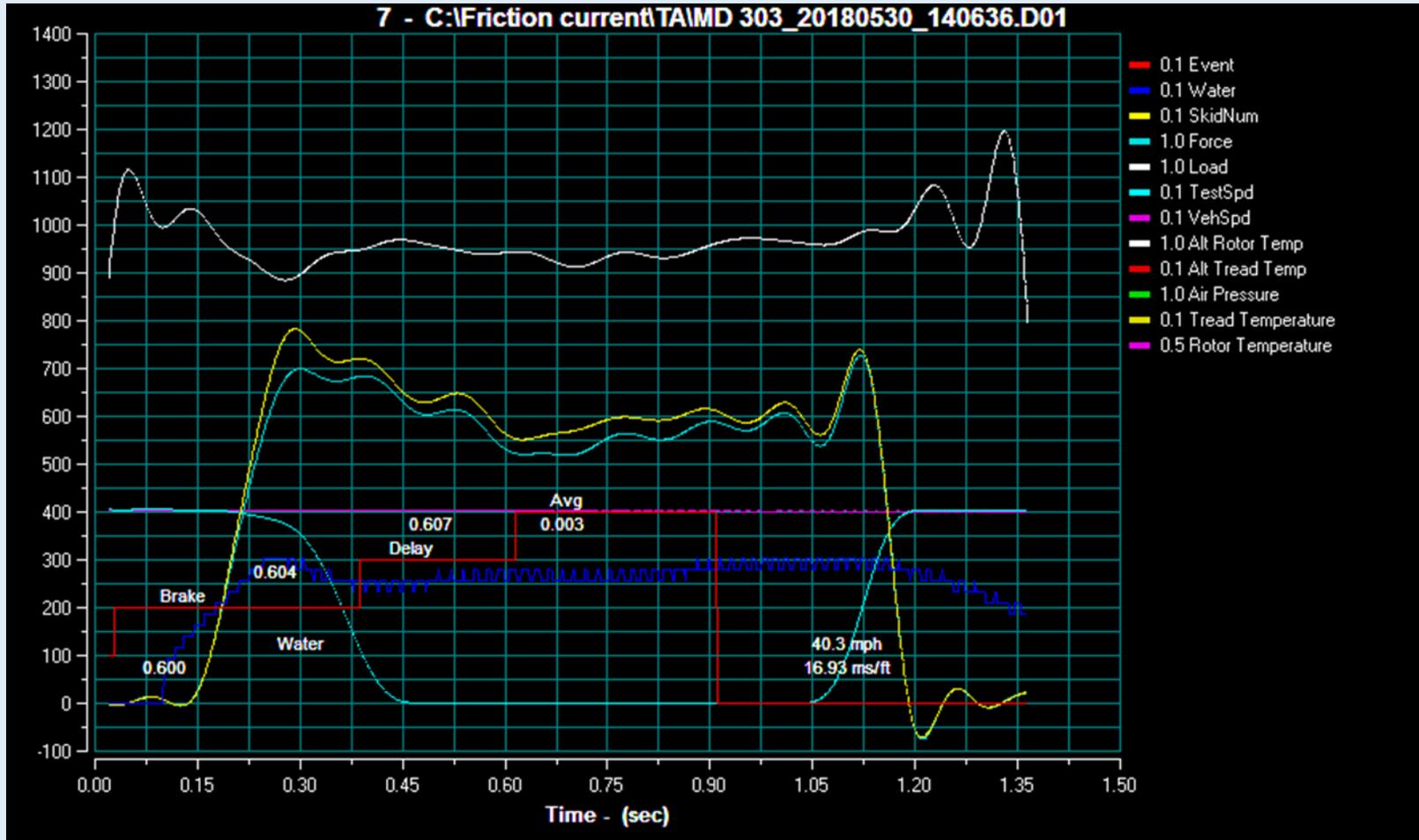
Phase	Current E-274	Quick-Lock
Pre-Water	0.5	0.25
Brake	0.63	0.25
Delay	0.2	0.2
Avg.	1.0	0.3
Recover	0.63+	0.25
TOTAL	2.5+	1.25



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QUICK-LOCK TEST GRAPH



WATER CONSUMPTION

- **ASTM – 274:**
 - 1.3 gallons / test
 - 780 tests / tank (1000 gal.)
 - @ 5 tests / mile – 156 miles/ fill

- **QUICK LOCK**
 - 0.63 gallons /test
 - 1580 tests / tank
 - @ 10 tests / mile -158 miles /fill

TEST PROTOCOLS

- **PREVIOUS with Standard ASTM E-274: (150 ft./sequence)**
 - Roads over 1 mile – 0.2 mile Test Spacing
 - Roads 1.0 mile or less – 0.1 mile Test Spacing
 - Special Tests - .05 mile (264 ft.) spacing
- **CURRENT with Quick-Lock Test: (75 ft./sequence)**
 - Roads over 2 mile – 0.1 mile sample spacing
 - Roads 2.0 mile or less 0.05 mile sample spacing
 - Specials – 0.02 mile (106 ft.) sample spacing

TEST LOOP PROPERTIES

- **~13 Miles mixed routes south of BWI Airport**
- **45 Sections – Selected by:**
 - **pavement type**
 - **when paved**
 - **calibrated (referenced) sections**
 - **transition zones**
 - **other surface impacts**
- **17 less than 0.15 miles – ignored for skid study purposes**
- **28 remaining cover 11.7 miles – used for this study**

AVERAGING TIME STUDY RESULTS

Avg. Time	Avg. SN
• 1.00 Sec. (Standard E-274) –	39.3
• 0.50 Sec. -	39.1
• 0.25 Sec. -	38.8

RESOLUTION STUDY RESULTS

CONSTANT 0.25 sec. AVERAGING TIME

0.2 mile spacing – 38.8

0.05 mile spacing – 38.9

RESOLUTION COMPARISON CHART

COMPARE RESOLUTION



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CONCLUSION

The QUICK_LOCK test provides:

Equivalent values to the ASTM E-274 test

Double the resolution of the ASTM E-274 test
for network testing.

Triple the resolution for special testing

QUESTIONS

?

SKID RESISTANCE MATTERS

MEASURE IT

and

MANAGE IT

THANK-YOU