Sequence X Severity Task Force

Meeting Minutes

11/16/21

Attendance

- ~~Michael Deegan~~
- Rich Grundza
- Christian Porter
- Christine Eickstead
- ~~Amol Savant~~
- George Szappanos
- Jason Soto
- Alfonso Lopez
- Travis Kostan
- ~~Pat Lang~~

Agenda 11/16/21

- Procedure corrections – George Szappanos
- Review Oil Analysis Plots - Travis
- Superseded Part numbers

Meeting Minutes

- Attached are procedure revisions presented by George Szappanos
  - Need to remove redundancy in driveshaft spec
  - Need clarification on CHST rounding
  - Pressure calibration
  - Humidity calibration
  - Blowby diagrams

- Discussion of the procedure revisions took all meeting to finish. All changes are to be sent to the panel in an e-ballot for approval

- The review of oil data and hardware part numbers was not done due to time constraints.

Seq X procedure revisions

Prepared by George Szappanos

The Lubrizol Corp

10/29/2021

Need to remove redundancy in driveshaft spec

- Replace info in section 8 (pink, obsolete) with detail from section 6 (green, current)
- then remove 6.8 completely

6.8 *Driveline:*

6.8.1 Use the flywheel, clutch, pressure plate, bell housing, and clutch spacer listed in Table A5.7 (see also X1.24).

6.8.2 *Driveshaft*—Grease the driveshaft every test. The driveshaft specifications are as follows:

(1) Driveshaft angle degree: 1.5° ± 0.5°;

(2) Installed length from flange to flange: 450 mm to 790 mm;

(3) 1410 series flanges; 1550 joints;

(4) Driveshaft stiffness: 0.1° to 0.3°/136 N·m (100 ft·lbf).

6.8.2.1 P/M MSI-41/55S-22 from Machine Services Inc.[8] (see Table A5.7 and X1.33) has been found to be a suitable driveshaft.

8.21.4 *Clutch and Pressure Plate:*

8.21.4.1 Obtain the clutch, pressure plate and spacer from OH Technologies[20,7] or Test Engineering Inc.[29,7]

8.21.4.2 Put the flat side on the clutch toward the engine.

8.21.4.3 Put the spacer between the flywheel and pressure plate.

8.21.4.4 Torque the pressure plate bolts to 25 N.m to 33 N.m.

8.21.4.5 Replace each clutch after every 6 runs.

8.21.5 *Driveline:*

8.21.5.1 *General*—Use 1410 series flanges and grease the driveline before every test.

8.21.5.2 *Driveline Specifications*—These are as follows:

(1) driveline angle: 1.5° ± 0.5°;

(2) installed length from flange-to-flange: 595 mm ± 13 mm;

(3) pilot: 69.9 mm (2.75 in.);

(4) bolt circle: 95.25 mm (3.7 in.);

(5) stub and slip: 88.9 mm (3.50 in.) by 2.11 mm (0.083 in.).

8.21.6 *Dynamometer*—Use Midwest dynamometer model 1014A.[31,7]

Need clarification on CHST rounding

- Should be using ASTM E29 (round only the final result, using full precision on intermediate results)

ASTM E29

7.3 *Calculation of Test Result from Observed Values*—When calculating a test result from observed values, avoid rounding of intermediate quantities. As far as is practicable with the calculating device or form used, carry out calculations with the observed values exactly and round only the final result.

8.20.8 *Chain Elongation Calculation:*

8.20.8.1 Determine the average chain length for the three measurement ranges.

NOTE 3—828 data points/measurements are collected every time a chain is measured. The 828 total points are divided into three subsets (276 points per subset).

8.20.8.2 Determine the average of those three subset average measurements. This average provides the final average chain length and the initial average chain length which are required when calculating the chain elongation in Eq 2 (see 12.1.1).

12.1 *Timing-Chain Elongation:*

12.1.1 Use the following equation to calculate the chain elongation (that is, the change in timing-chain length) from hour 0 to EOT:

$$CE = 2(L_f - L_i) / L_{nom} \times 100 \quad (2)$$

where:

CE = the chain elongation from hour 0 to end of test, %,
L_f = final average chain length (see 8.20.8), mm,
L_I = initial average chain length (see 8.20.8), mm, and
L_{nom} = the nominal chain length = 1095.375 mm (43.125 in.).

Pressure calibration

- Should remove the green highlighted, as it may conflict with DACA standards
- "ASTM Research Report"?

8.24.1.2 The accuracy and resolution of the pressure-measurement sensors and the complete pressure measurement system shall meet the requirements of the Data Acquisition and Control Automation (DACA) II Task Force Report.[38]

8.24.3.1 Calibrate all pressure measurement sensors prior to a reference oil test.

8.24.3.2 The MAP pressure measurement system shall indicate within 0.1 kPa of the laboratory calibration standard.

8.24.3.3 All other pressure measurement systems shall conform to the guidelines in ASTM Research Report.[39]

8.24.3.4 The calibration standard shall be traceable to NIST.[37]

Humidity calibration

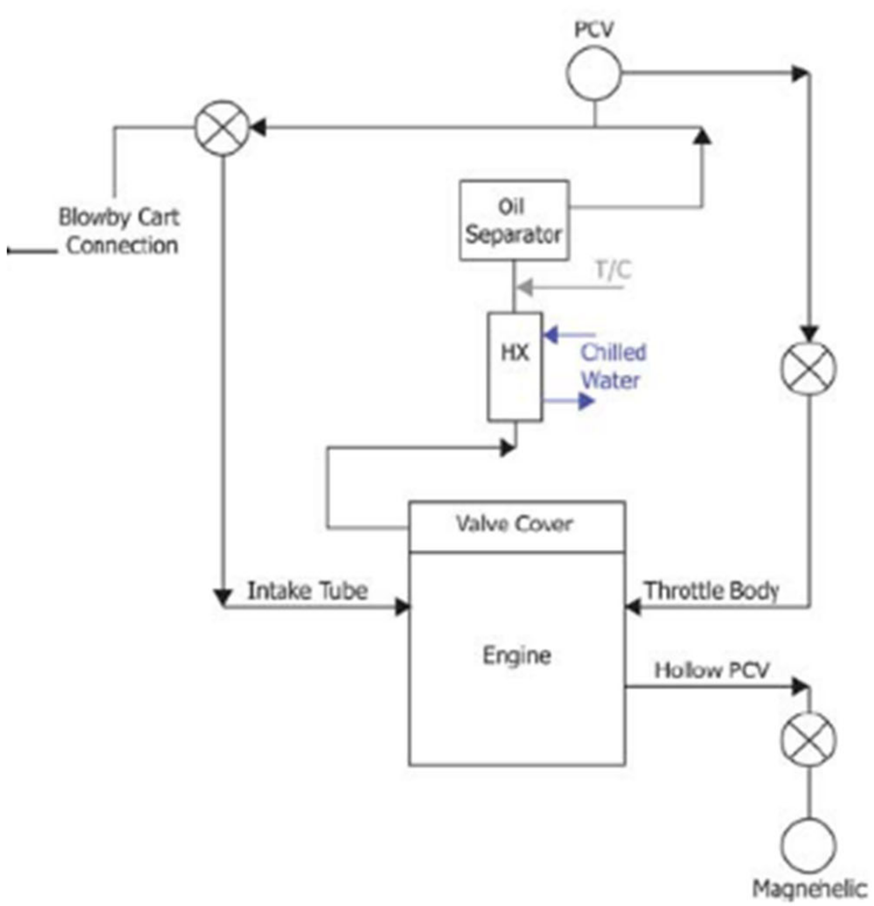
- Calibration required? Every ref test?
- How to do calibration?
- Reword: "…while maintaining the intake/air pressure, temperature, and humidity specified in Table 2". And remove the redundant specification (in green).

8.22.1 *Air Supply System:*

8.22.1.1 Ensure the supply system is capable of delivering 110 L/s of conditioned air, while maintaining the intake/air quantities detailed in Table 2. Condition the intake air to 32 °C ± 0.5 °C, 11.4 g/kg ± 0.8 g/kg humidity, and pressurized to 0.05 kPa ± 0.02 kPa. The test stand intake air duct system is not specified.

Blowby diagrams

Reconfigure the LH diagram (cart) to eliminate the 2-way valve (like the JTEC setup) and consolidate both into one diagram



· Measuring Blowby Flowrate

normal

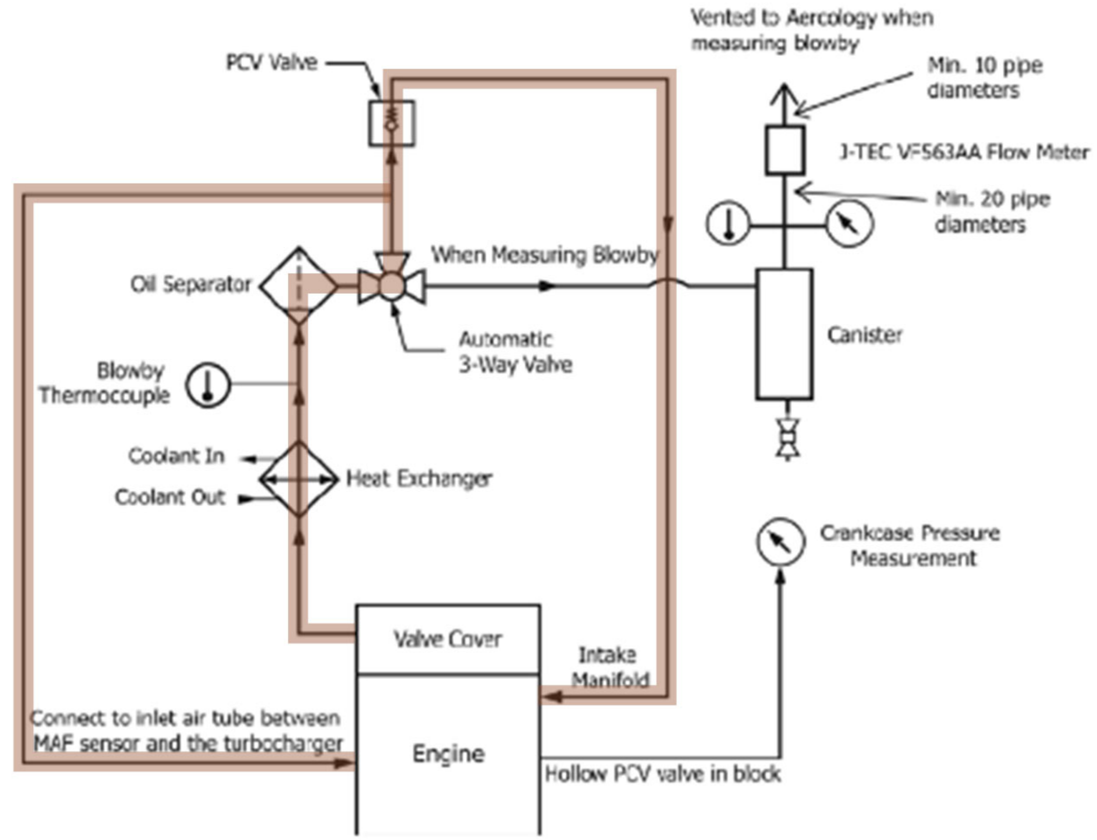


FIG. 3 J-TEC Flowmeter Setup for Measuring Blowby Flowrate

measuring

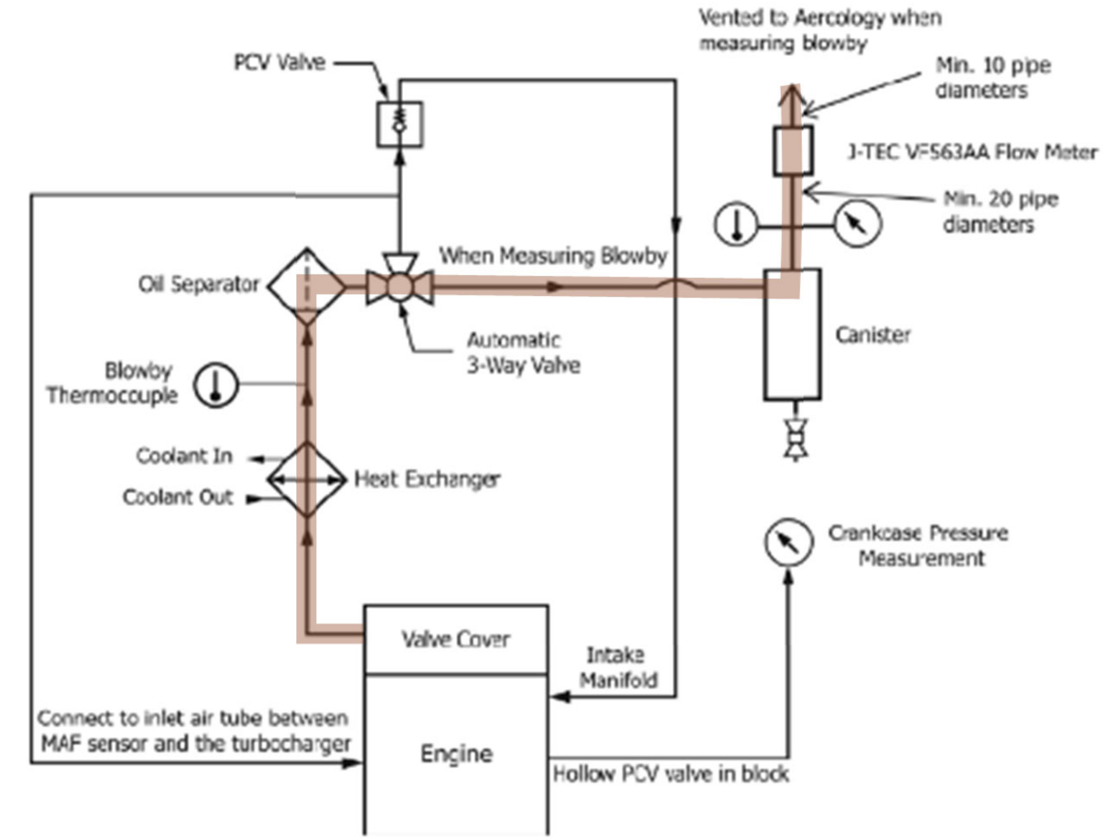


FIG. 3 J-TEC Flowmeter Setup for Measuring Blowby Flowrate

Blowby

- Remove need to calibrate or measure BLOWBY COOLANT FLOW
- Replace "blowby cart apparatus" with "sharp edge orifice", to allow for alternate devices
- Add requirement to calibrate measurement device prior to reference test

8.25.3 *Calibration of Flowrate Devices:*

8.25.3.1 Calibrate the flow meters used in the measurement of fuel flowrate, the engine-coolant flowrate and blowby heat exchanger coolant flowrate prior to a reference oil test. Calibrate as installed in the system at the test stand with the test fluid. Calibrate with a turbine flow meter or by a volume/time method at Stage 1 and 2 operating conditions.

8.26 *Blowby Flowrate:*

8.26.1 Measure the blowby flowrate using either the blowby cart apparatus shown in Fig. 2 or the J-TEC flowmeter setup shown in Fig. 3 (the blowby procedures are given in 10.5.2).

8.26.1.1 Details of the crankcase ventilation system are shown in Fig. 4. The critical dimensions are detailed below:

Blowby cont’d

- Remove “in the case…”
- Remove need to zero CCP
- Remove need to mount orifice plate vertically
- Remove duplicate paragraph

8.26.2 The measurement system routes the blowby into the atmosphere through an external, sharp-edged orifice in the case of the cart apparatus or through a J-TEC flowmeter VF563AA.[42,7]

8.26.2.1 When using the cart apparatus, maintain crankcase pressure during operation of the system at 0.0 Pa $\pm$ 25 Pa to minimize the potential for crankcase leakage.

8.26.2.2 Mount the orifice plate or the J-TEC flowmeter in a vertical position.

8.26.2.3 In the case of the cart system:

(1) Determine the blowby flowrate by measuring the differential pressure drop across the sharp-edged orifice using an inclined manometer or differential pressure sensor. The differential pressure drop sensor shall have a range from 0 kPa to 1 kPa.

(2) Determine the blowby flowrate by measuring the differential pressure drop across the sharp-edged orifice using an inclined manometer or differential pressure sensor. The differential pressure drop sensor shall have a range from 0 kPa to 1 kPa.

(3) The complete orifice assembly (P/N RX-116-169-A1) can also be purchased from OH Technolgi[20,7] provide additional information.

Blowby cont’d

- Bleeder valve?
- No need for 2-way valve
- Simplify: “open 3-way valve to divert blowby gas to blowby measurement device”
- Add formula for correction
- Consolidate the JTEC and SEO sections into one

10.5.2 *Blowby Cart Procedure:*

10.5.2.1 Connect the blowby measurement device to the pressurized air source.

10.5.2.2 Open the flow valve (bleeder valve) completely.

10.5.2.3 Connect the blowby apparatus flow line to the 3-way valve located between the oil separator and intake tube.

10.5.2.4 Position the 2-way valve to divert air to the manometer from the hollow PCV valve.

10.5.2.5 Position the 2-way valve in between the PCV and throttle body to keep air from entering the throttle body.

10.5.2.6 Position the 3-way valve to divert intake manifold vacuum from the engine PCV to the exhaust plumbing of the blowby apparatus meter.

10.5.2.7 Adjust the flow valve (bleeder valve) to maintain crankcase pressure at 0 kPa to 0.025 kPa.

10.5.2.8 Record the differential pressure across the blowby meter orifice, the blowby gas temperature, and the barometric pressure.

10.5.2.9 After completing the measurements, return the engine to normal operating configuration.

(a) First, reposition the 3-way valve and both 2-way valves to ensure porting of the intake vacuum to the engine PCV.

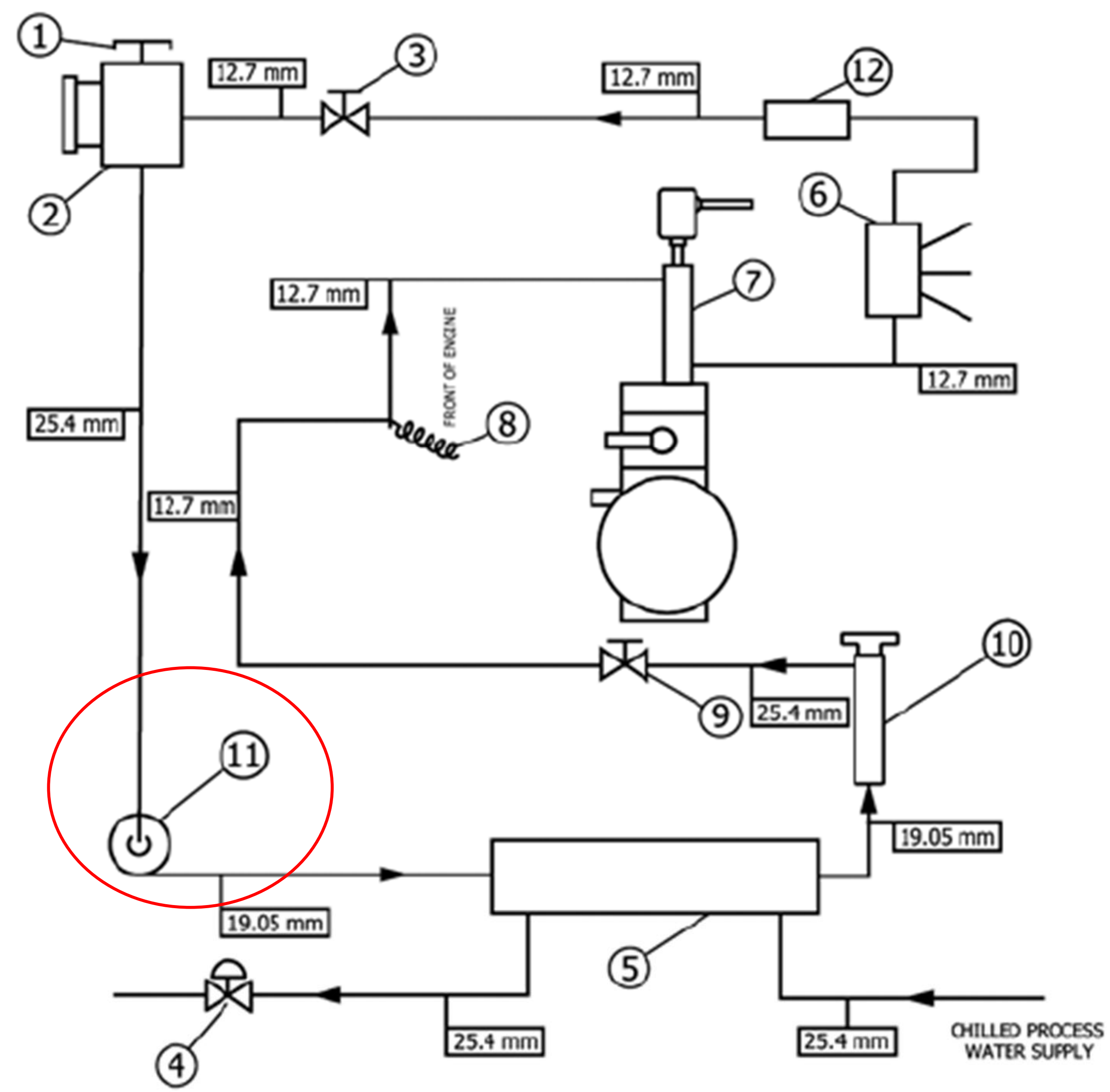
(b) Then disconnect the blowby apparatus hose from the closed port of the 3-way valve.

10.5.2.10 Calculate the blowby flowrate and correct the value to standard conditions (38 °C, 100.3 kPa) using the calibration data for that orifice.

Blowby cont'd

- Remove PN (wrong)
- add flow rate specification to section 8.21.12 Blowby Heat Exchanger and Oil Separator or 8.26 Blowby Flowrate:

NOTE 1—Legend:
(1) Vented reservoir cap
(2) Coolant reservoir (fabricated)
(3) Pressure control valve (optional)
(4) Chilled process water control valve
(5) System heat exchanger
(6) F and P Co. flowrator tube, FF-1-35-G- 10/448D053U06
(7) CCV Heat Exchanger
(8) Inlet temperature sensor
(9) Flow control valve
(10) External heat source
(11) Electric coolant pump DAYTON 6K581A
(12) ABB Kent-Taylor flow element, 1330LZ08000-8375A



Designation: D8279 – 19

Standard Test Method for Determination of Timing-Chain Wear in a Turbocharged, Direct-Injection, Spark-Ignition, Four-Cylinder Engine

12. Test Results

12.1 *Timing-Chain Elongation:*

12.1.1 Use the following equation to calculate the chain elongation (that is, the change in timing-chain length) from hour 0 to EOT:

$$CE = 2(L_f - L_i) / L_{nom} \quad (1)$$

where:

CE = the chain elongation from hour 0 to EOT, mm,
L_f = final average chain length (see 8.20.8), mm,
L_I = initial average chain length (see 8.20.8), mm, and
L_{nom} = the nominal chain length = 1095.375 mm (43.125 in.).

Validation:

	A	B	C	D	E	F	G	H	I
1	TRN62GZ2C	value	flag?	cond0	cond1	cond2	cond3	cond4	calculation field
54	**Summary results**	**total issues:**	**0**						
55	EOTCHAIN	0.1671	0	FALSE	FALSE				0.16696
56	TEOTCHST	-1.78916	0	FALSE	FALSE				-1.78916
57	CHAIN_CF	0	0	FALSE					
58	CHAINCOR	-1.78916	0	FALSE					-1.78916
59	CHAIN_SA	0.02118	0	FALSE					
70	TCHAINFL	-1.76798	0	FALSE					-1.76798
71	CHAINFNL	0.1707	0	FALSE	FALSE				0.1707
72	ACBLWRT2	66.1	0	FALSE					
73	TOTOCON	291	0	FALSE					
74	EOTSOOT	1	0	FALSE					
75									

In this particular example, the calculation value of "0.16696" is based on the rounded values that are stored as fields in the database (not the raw / observed values). The reported EOTCHAIN value of "0.1671" is based on the full precision, observed intermediate values in accordance with ASTM D29 section 7.3. The discrepancy between reported and 'calculation field' values is due to ASTM rounding that occurs on the intermediate fields which lose precision.

7.3 *Calculation of Test Result from Observed Values*—When calculating a test result from observed values, avoid rounding of intermediate quantities. As far as is practicable with the calculating device or form used, carry out calculations with the observed values exactly and round only the final result.

George Szappanos, 10/8/2021