BestLine International Research Inc.

Marine Vessel Application Test

BestLine Product Performance Evaluation

Products Tested:

BestLine Diesel Engine Treatment

BestLine Diesel Fuel Treatment

Vessel Tested:

F/V Pacific Challenger

F/V Pacific Challenger BestLine Product Test
Intent and Purpose

Intent:

The intent of this test is to measure and show any improvement in the reduction of engine fuel consumption that can occur with the use of the BestLine Diesel Engine Treatment as an additive in the current API CJ-4 Heavy Duty Diesel Engine Oil (HDDEO). It is also the intent of this test to measure any gains achieved in the reduction of fuel consumption with the combined use of BestLine Diesel Engine Treatment in conjunction with BestLine Diesel Fuel Treatment when used on heavy duty diesel engines in high load engine operations.

Purpose:

The purpose of this test protocol is to demonstrate how the performance of a heavy duty diesel engine oil (HDDEO) and #2 Ultra Low Sulphur Diesel fuel can be enhanced with the addition of the BestLine Diesel Engine Treatment and BestLine Diesel Fuel Treatment, respectively, as it relates to improved energy, improved lubrication and fuel efficiency in those vehicles operating with heavy duty diesel engines. It is important to recognize that the BestLine Lubricant group of products are full synthetic lubricants. Synthetic lubricants have been successfully used for some time.

BestLine's products have the ability to offer a very high viscosity index, low volatility, superior oxidation resistance, high thermal stability, excellent temperature fluidity, and low toxicity to the environment. These characteristics in a finished lubricant are very important in modern high-speed, high horsepower diesel engines. Further these characteristics benefit the long term goals of being less toxic to the environment while still providing maximum protection for automotive and industrial components. The BestLine Lubricant products are a specific combination:

- Polymerized Alpha –Olefins
- Hydro-isomerized hydro-treated severe hydrocracked base oil
- Optionally, Synthetic Sulfonates (product dependent)
- Optionally, Vacuum distilled non-aromatic solvents (product dependent)
- Optionally, Liquefied polytetrafluoroethylene (PTFE)

The BestLine synthetic lubricants, when tested, have demonstrated the ability to provide and exceed the anti-wear protection provided by the inclusion of ZDDP. ZDDP stands for Zinc Di-Alkyl-di-thiophosphates. This anti-wear agent was created in 1941 by Lubrizol as a wear reduction remedy during the early days of the automobile industry when there were lower demands on engine performance and there was little concern about the impact of ZDDP on the environment. Both modern and previous motor oils have depended upon the use of ZDDP as a means to protect against premature wear between bearing surfaces and steel-to-steel contact.

In view of the detrimental impact ZDDP on the environment as recognized by the manufacturer, the US EPA, and several states, it has become both very desirable and necessary to have available a replacement additive that can eliminate the need for ZDDP and still provide the same level of protection or better for engine components.

As recent tribological testing has verified, BestLine Lubricant products accomplish both of those goals. The testing established that not only did this PAO, Base Oil, and optionally synthetic sulfonate composition enhance lubrication, but according to the findings of the test, "the composition was also

found to modify the plastic response of the investigated steel and to influence the chemical reactivity of the worn surfaces."

Elements like Phosphorus (P), Sulphur (S), Manganese (Mn) and Zinc (Zn) were not detected in the test wear scars when the BestLine composition was added to oils that included ZDDP. What this means is that the BestLine composition inhibits the reaction of ZDDP and renders it unnecessary for reducing wear. In other words, the BestLine blend of PAOs and Base Oils is capable of acting as a complete substitute for ZDDP.

Ultimately, the addition of the BestLine Lubricants (containing the PAOs, a Base Oil, and sulfonate composition as found in BestLine's Diesel Engine Treatment) to motor oils, combined with the removal of all forms of ZDDP:

- reduces engine wear by providing superior lubrication,
- favorably modifies the plastic response of all steel elements it lubricate, and
- solves an important environmental problem.

Please note that the BestLine composition of PAO's, Base Oil and synthetic sulfonates is utilized in all BestLine products, including the BestLine Diesel Fuel Treatment.

As mentioned above, the additional purpose of this test is to create and provide reliable field data confirming product performance as indicated through our independent lab test results. Further, the field tests will confirm that the use of BestLine Diesel Engine Treatment in HDDEO motor oils and the use of BestLine Diesel Fuel Treatment in #2 Ultra Low Sulphur Diesel fuel does provide reduced friction through superior lubrication resulting in enhanced performance of the diesel engine indicated by improved engine and fuel efficiency and reduced fuel consumption. The test on the Pacific Challenger provides us the opportunity to create a unique set of field data since the vessel operates with two matched 1100 horsepower propulsion engines with synchronized throttles doing the same job in the same hull at the same time in the same environment.

F/V Pacific Challenger BestLine Product Test - Basic Protocol

Vessel Description:

The F/V Pacific Challenger is a 107' Trawler – Catcher vessel that primarily fishes in the Bering Sea, Gulf of Alaska and offshore coastal waters of Washington and Oregon State. The vessel is busy 10 months of the year and home ports in Seattle, WA. The Captain and Owner, Capt. Chris Peterson and his team are very aware of the cost of operations and the environmental stewardship responsibilities associated with their industry. They have built a very good reputation within the industry and are known for environmental efficiencies

Vessel Technical Specs

Length:	107'
Beam:	24'
Gross Tons:	338T
Payload:	600,000lbs
Vessel Type:	Trawler

Engineering/ Machinery Equipment Specs:

Main Engines:	(2) Caterpillar 3508B Electronic Controlled Engine - High Idle: 1800RPM
Rated HP	Each Engine is rated at 1100 Hp
Gensets:	(1) One Caterpillar 3408 450 kW Genset
	(1) John Deere 6068 99 kW Genset

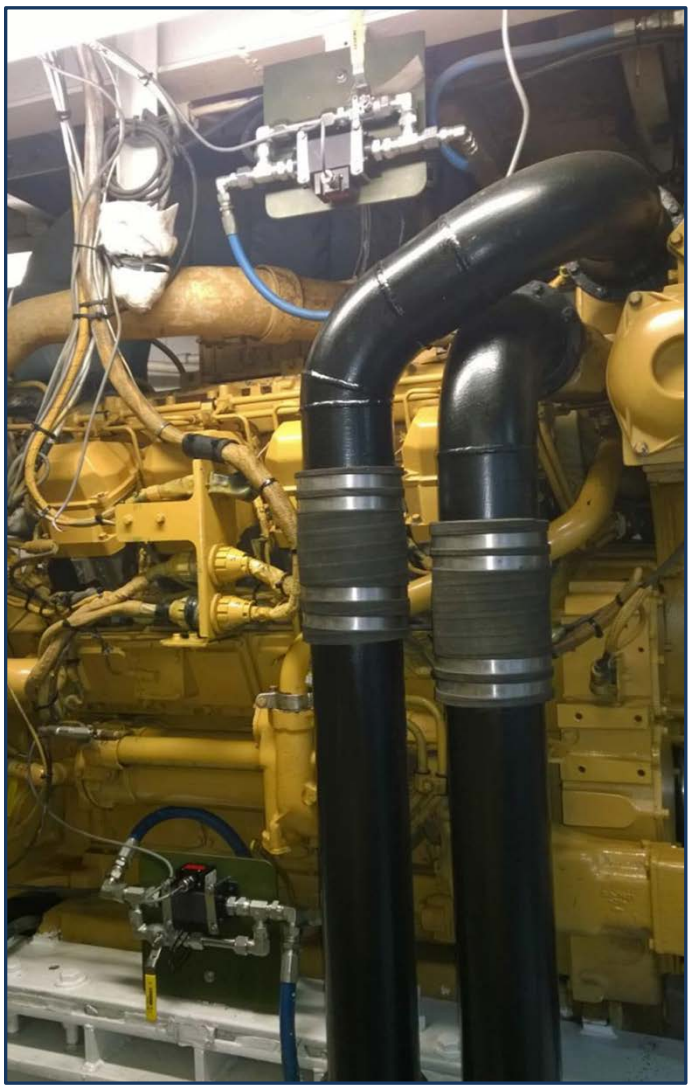
Engineering Notes:

1. All four engines are equipped with engine oil by-pass filtering equipment
2. Both Main Engine are equipped with Kral Fuel Consumption Measurement equipment
3. Each engine has its own isolated 800 Gallon Day for diesel fuel
4. Each engine is equipped with high capacity 60 gallon oil pan sumps
5. Engine Oil: Chevron Delo XLE Synblend SAE 10W30

Test Equipment:

1. Kral OME20 Flowmeters were installed on both Port & Starboard main engines in December of 2014. Both are factory calibrated with an accuracy of: 1/10th of one percent. The calibration sheets are attached in the appendix of this report.
2. Kral BEM500 Electronic Display Units were also installed on both main engines and work in conjunction recording pulse data for both the supply and return flowmeters on each engine as well as fuel temperature. Each unit provides a temperature corrected finished fuel consumption rate and fuel consumption totalization figures for the respective engine.
3. The Kral BEM810RD is a remote Display module located in the wheelhouse which receives the data from both BEM500's via Modbus; it then ties that data to the Vessel's GPS output signal and provides the wheelhouse with all the rate and totalization data for the BEM500's. It also give a vessel efficiency reading expressed as Gallons per Nautical Mile (G/Nm) in real time.

F/V Pacific Challenger Main Engines and Test Equipment



Port Main Engine Caterpillar 3508B
Rated at 1100hp

Port Main Engine ECM with Kral
BEM500's for both engines

Port Main Engine with Kral OME20
Supply Fuel Flowmeter

Port Main Engine with Kral OME20
Return Fuel Flowmeter

F/V Pacific Challenger Test Parameters and Protocol

Test Parameters:

1. The test parameters for Test Sequence# 1 were set up as follows:
    a. Synchronized Main Engine Speed: 1640rpm
    b. Combined Main Engine Loads: 89-92%
    c. Vessel Speed over Ground: 10.25 knots

Note the next series of tests will be done at lower loads and lower vessel / engine speeds. The entire sequence of test will be re-done to verify average repeatability.

Test Protocol:

2. **Baseline Test Sequence:**
    a. Both Baseline and Product Test run sequences were each done over a continuous one-hour period with data marks being recorded at five minute intervals. There are 12 five-minute intervals per hour.
    b. Data Recorded:
        i. Vessel Speed
        ii. Engine Speed
        iii. Engine Load
        iv. Fuel Consumption Rate - Fuel totalization was not recorded during the first testing sequence you. However, the interval consumption rates shown were averaged between the starting interval reading to the end interval reading to determine an average total of fuel consumed during the 5 minute interval. Please note that since these intervals were sequential, the ending interval reading of the first 5 min interval became the starting reading for the second 5 minute interval. This analysis procedure was done where indicated on the data sheets (Averaged vs Non-Averaged)

3. **Data Collection**:
    a. All data for the Test Sequences for both BestLine Diesel Engine Oil Treatment and Diesel Fuel Treatment were collected and recorded in the same manner as the Baseline data.

4. **Control Engine**: The Port Main Engine has historically burned more fuel than the Starboard Main Engine, so it was established as the Test Engine. The Strbd. Engine then became the Control Engine.
    a. The control engine is vital since both engines are in the same hull doing the same job at the same time. Any recorded differences with the control must be figured into the results of the test engine. During the test sequence if the Control engine burns more or less fuel than the test engine, those variances have to either be added or subtracted from the results of the test engine to reflect any environmental ambient changes experienced by the control engine that effected fuel consumption.

5. BestLine Diesel Engine Treatment Test Sequence:

a. BestLine'srecommended initial treatment for a diesel engine is a 15% solution of volume. In this case we used a little less, approximately a 12.5% solution. We removed 8 gallons of engine oil from the sump and replaced it with 8 gallons of BestLine Diesel Engine Oil Treatment. The engine was run for one hour period prior to recording the test numbers to insure that the treatment was mixed into the oil and circulated throughout the engine oil system.

b. The BestLine Diesel Engine Treatment test sequence was run in the same manner and procedure as the baseline and the results were record from both the Port Test Engine and Starboard Control Engine.

6. BestLine Diesel Fuel Treatment Test Sequence:

a. The recommended dosage for the BestLine Diesel Fuel Treatment can range from 1 oz. per ten gallons to 3 oz. per ten gallons of fuel. For the purposes of this test we elected to run a 2 oz. per ten gallon mix. We placed 1.5 gallons of BestLine Diesel Fuel Treatment in the Port Engine Day Tank to mix with 800 gallons of #2 Ultra Low Sulphur Diesel Fuel (15ppm or lower of Sulphur). Mix ratio equated to just over 1.9oz./10 gallons of diesel fuel.

b. The BestLine Diesel Fuel treatment was allowed to mix with the fuel in the day tank for a three (3) hour period prior to running the test sequence to insure that we had a thoroughly mixed tank and that the treat was able to circulate through the test engine's fuel system before any test numbers were recorded.

c. The BestLine Diesel Fuel Treatment test sequence was run in the same manner and procedure as the baseline and the results were record from both the Port Test Engine and Starboard Control Engine.

Test Results:

The following pages show the test data numbers that were acquired from the F/V Pacific Challenger. It is important to note that in the baseline test some performance anomalies were noted between the two main engines, where the Port main engine appeared to burn more fuel than the Starboard main engine. As mentioned above we elected to make the Port Engine the test engine and the Starboard engine became the Control engine. All of these tests were conducted in one hour segments during the same 24 hour period.

Definitions:

GPH	Gallons of fuel consumed per Hour
RPM	Engine speed – Revolutions per Minute
G/NM	Gallons per Nautical Mile (Based on input from vessel G.P.S)
% of Load	Represents the Amount of Engine Load (work) the engine is performing, based on the calculations of the engine computer

Test Result Summary Table:

	Baseline Data Test Results	Non-averaged 90% Load Test Results	Averaged 90% Load Test Results	Full-averaged 90% Load Test Results	Average of All Test Results
Net Gain with BestLine Diesel Engine Treatment:	**5.57%**	**2.20%**	**1.64%**	**1.38%**	**2.70%**
Net Gain with BestLine Diesel Fuel Treatment:	**6.89%**	**8.09%**	**9.07%**	**9.05%**	**8.27%**
Combined Gain with BestLine DET & DFT:	**12.46%**	**10.29%**	**10.71%**	**10.43%**	**10.97%**

Notes:

1. Baseline Test Results include high and low values which indicates a skewed number when compared to the rest of the test results
2. To isolate a more even performance, evaluation was performed on the performance numbers within the 90% load range
3. Since no specific totalization numbers were identified, averaging was done between the beginning and ending gph numbers for each 5-minute interval to obtain the average total of fuel consumed during that 5-minute interval (worksheets 3 & 4)
4. Full averaging included averaging the baseline data shown on workseet #4

Note: When using a control engine, any changes in ambient conditions need to be reflected in the test engine. Example, during the DET Test, the control engine (Worksheet #3) burned 1.31% less fuel when compared to the baseline for the control engine test. That change has to be subtracted from the total change in the overall test result shown by the engine in order to reflect any changes in ambient conditions. This resulted in a corrected 1.64% of improvement.

Evaluation Process:

Given the fact that there were multiple "% of Engine Load" indicators to look at and the impact they had on the baseline results, it was decided to conduct the evaluations based on the readings from a single % of load factor; thus we evaluated those readings taken at 90% of engine load. The first page of test results shows the raw data with all loads being compared the engine baseline test results.

The second page shows the results using a 'Non-Averaged' comparison for all results in the 90% engine load range.

The third page show the results when we average the beginning interval number with the ending interval number to help us find the average fuel consumption for the individual interval. That process was run through the entire evaluation against non –averaged baseline results.

The fourth page is the same analysis run against a set of averaged baseline intervals. As indicated earlier, all results were compared to what happened with the control engine results during the same time period. The results were then corrected to account for any variance in the performance of the control engine based on any ambient and environmental changes the engine experienced.

Pacific Challenger BestLine Testing - Initial Results - Test Sequence# 1

Engines: Twin Cat 3508B Propulsion Engines Rated 1100 HP/ ea.
Flowmeters: Kral OME20 with BEG63 Sensor Group and BEM500/BEM810 Display Units

Test #1: Baseline Data - Non Adjusted - Includes Highs & Low Data Points
Vessel Speed: 10.25 knots
Vessel -Full Load Transit to Processing Plant
Engine Speed 1640rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard
1640 rpm	5 Min	89	42.025	4.10	1640 rpm	5 Min	90	35.158	3.43	
1640 rpm	5 Min	90	39.565	3.86	1640 rpm	5 Min	90	36.183	3.53	
1640 rpm	5 Min	88	41.718	4.07	1640 rpm	5 Min	90	36.490	3.56	
1640 rpm	5 Min	90	41.513	4.05	1640 rpm	5 Min	90	35.465	3.46	
1640 rpm	5 Min	90	40.898	3.99	1640 rpm	5 Min	90	35.158	3.43	
1640 rpm	5 Min	89	41.615	4.06	1640 rpm	5 Min	89	35.978	3.51	
1640 rpm	5 Min	91	42.230	4.12	1640 rpm	5 Min	91	35.363	3.45	
1640 rpm	5 Min	90	42.435	4.14	1640 rpm	5 Min	90	35.568	3.47	
1640 rpm	5 Min	90	39.258	3.83	1640 rpm	5 Min	90	35.773	3.49	
1640 rpm	5 Min	90	42.845	4.18	1640 rpm	5 Min	90	36.080	3.52	
1640 rpm	5 Min	90	43.255	4.22	1640 rpm	5 Min	90	36.798	3.59	
1640 rpm	5 Min	90	42.948	4.19	1640 rpm	5 Min	90	36.593	3.57	
			41.692	**4.07**				**35.884**	**3.501**	**13.93%**

Test # 2 Added 8 gallons of BestLine Engine Oil Treatment to Port Test Engine only
Vessel Speed: 10.25 knots
Vessel -Full Load Transit to Processing Plant
Engine Speed 1640rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET & DFT	Adjustment for Baseline Variance	Total Improvement w/ DET & DFT
1640 rpm	5 Min	90	37.618	3.67	1640 rpm	5 Min	90	35.158	3.34				
1640 rpm	5 Min	91	39.155	3.82	1640 rpm	5 Min	91	36.183	3.43				
1640 rpm	5 Min	90	41.513	4.05	1640 rpm	5 Min	90	36.490	3.40				
1640 rpm	5 Min	89	39.155	3.82	1640 rpm	5 Min	89	35.465	3.42				
1640 rpm	5 Min	90	40.180	3.92	1640 rpm	5 Min	90	36.080	3.47				
1640 rpm	5 Min	90	40.590	3.96	1640 rpm	5 Min	90	36.798	3.45				
1640 rpm	5 Min	89	39.873	3.89	1640 rpm	5 Min	89	36.593	3.46				
1640 rpm	5 Min	90	40.795	3.98	1640 rpm	5 Min	90	36.593	3.53				
1640 rpm	5 Min	92	41.205	4.02	1640 rpm	5 Min	92	41.337	3.56				
1640 rpm	5 Min	91	39.975	3.90	1640 rpm	5 Min	91	35.158	3.43				
1640 rpm	5 Min	90	40.488	3.88	1640 rpm	5 Min	90	35.363	3.45				
1640 rpm	5 Min	91	39.770	3.95	1640 rpm	5 Min	91	36.183	3.53				
			40.026	**3.91**				**36.450**	**3.46**	**8.94%**	**4.00%**	**-1.58%**	**5.57%**

Test # 3 Added 1.5 Gallons of BestLine Diesel Fuel Treatment to 800 gallons of Diesel fuel in Port Day Tank only
Allowed 3 hrs mix time prior to test. Represents just under 2 0z per 10 gallon recommended dosage
Vessel Speed: 10.25 knots
Vessel -Full Load Transit to Processing Plant
Engine Speed 1640rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET/DFT	Adjustment for Baseline Variance	Total Improvement with DET/DFT
1640 rpm	5 Min	90	36.798	3.59	1640 rpm	5 Min	90	35.875	3.50				
1640 rpm	5 Min	90	37.618	3.67	1640 rpm	5 Min	91	36.895	3.58				
1640 rpm	5 Min	91	36.593	3.57	1640 rpm	5 Min	90	35.978	3.51				
1640 rpm	5 Min	90	38.438	3.75	1640 rpm	5 Min	91	37.720	3.68				
1640 rpm	5 Min	92	41.000	4.00	1640 rpm	5 Min	92	39.155	3.82				
1640 rpm	5 Min	92	39.770	3.88	1640 rpm	5 Min	92	39.053	3.81				
1640 rpm	5 Min	91	39.873	3.89	1640 rpm	5 Min	91	39.053	3.81				
1640 rpm	5 Min	91	39.258	3.83	1640 rpm	5 Min	91	38.438	3.75				
1640 rpm	5 Min	90	38.335	3.74	1640 rpm	5 Min	90	37.105	3.62				
1640 rpm	5 Min	90	36.798	3.59	1640 rpm	5 Min	90	36.895	3.58				
1640 rpm	5 Min	90	36.080	3.52	1640 rpm	5 Min	90	35.568	3.47				
1640 rpm	5 Min	90	35.875	3.50	1640 rpm	5 Min	90	35.158	3.43				
			38.036	**3.71**				**37.208**	**3.63**	**2.18%**	**8.77%**	**-3.69%**	**12.46%**

Net Gain with BestLine Diesel Engine Treatment: 5.57%

Net Gain with BestLine Diesel Fuel Treatment: 6.89%

Combined Gain with BestLine DET & DFT: 12.46%

Pacific Challenger BestLine Testing - Initial Results - Test Sequence# 1

Engines: Twin Cat 3508B Propulsion Engines Rated at 1100 HP/ ea.
Flowmeters: Kral OME20 with BEG63 Sensor Group and BEM500/BEM810 Display Units

Test #1: Baseline Data using only 90% Load Data Points Non Averaged
Vessel Speed (SOG): 10.25 knots — Vessel - Full Load Transit to Processing Plant
Eng Speed 1640 rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard
1640 rpm	5 Min	90	39.565	3.86	1640 rpm	5 Min	90	35.158	3.43	
1640 rpm	5 Min	90	41.513	4.05	1640 rpm	5 Min	90	36.183	3.53	
1640 rpm	5 Min	90	42.230	4.12	1640 rpm	5 Min	90	35.363	3.45	
1640 rpm	5 Min	90	40.898	3.99	1640 rpm	5 Min	90	36.490	3.56	
1640 rpm	5 Min	90	42.435	4.14	1640 rpm	5 Min	90	35.465	3.46	
1640 rpm	5 Min	90	39.258	3.83	1640 rpm	5 Min	90	36.080	3.52	
1640 rpm	5 Min	90	42.845	4.18	1640 rpm	5 Min	90	36.798	3.59	
1640 rpm	5 Min	90	42.948	4.19	1640 rpm	5 Min	90	36.593	3.57	
			41.461	4.62				36.016	4.02	13.13%

Test # 2: Added 8 gallons of BestLine Diesel Engine Treatment to Port Test Engine only
Test Data using only 90% Load Data Points - Non Averaged
Vessel Speed: 10.25 knots — Vessel - Full Load Transit to Processing Plant
Eng Speed 1640 rpm (High Idle 1800)

Test Engine Port Engine					Control Eng Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET	Adjustment for Baseline Variance	Total Improvement w/ DET
1640 rpm	5 Min	90	37.618	3.67	1640 rpm	5 Min	90	36.080	3.47				
1640 rpm	5 Min	90	39.155	3.82	1640 rpm	5 Min	90	35.363	3.45				
1640 rpm	5 Min	90	41.513	4.05	1640 rpm	5 Min	90	35.465	3.46				
1640 rpm	5 Min	90	40.180	3.92	1640 rpm	5 Min	90	36.183	3.53				
1640 rpm	5 Min	90	40.590	3.96	1640 rpm	5 Min	90	35.158	3.43				
1640 rpm	5 Min	90	39.975	3.90	1640 rpm	5 Min	90	35.158	3.43				
1640 rpm	5 Min	90	41.205	4.02	1640 rpm	5 Min	90	35.363	3.45				
1640 rpm	5 Min	90	40.488	3.88	1640 rpm	5 Min	90	36.183	3.53				
			40.090	3.90				35.619	3.47	11.15%	3.31%	1.10%	2.20%
										Net Gain with BestLine Diesel Engine Treatment			2.20%

Test # 3 Added 1.5 Gallons of BestLine Diesel Fuel Treatment to 800 gallons of Diesel fuel in Port Day Tank only
Test Data using only 90% Load Data Points - Non Averaged
Note: Allowed 3 hrs mix time prior to test. Represents just under 2 oz. per 10 gallons, the recommended dosage
Vessel Speed: 10.25 knots — Vessel - Full Load Transit to Processing Plant
Eng Speed 1640 rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET & DFT	Adjustment for Baseline Variance	Total Improvement w/ DET & DFT
1640 rpm	5 Min	90	36.798	3.59	1640 rpm	5 Min	90	35.875	3.50				
1640 rpm	5 Min	90	37.618	3.67	1640 rpm	5 Min	90	35.875	3.50				
1640 rpm	5 Min	90	38.438	3.75	1640 rpm	5 Min	90	36.695	3.58				
1640 rpm	5 Min	90	36.593	3.57	1640 rpm	5 Min	90	35.978	3.51				
1640 rpm	5 Min	90	38.335	3.74	1640 rpm	5 Min	90	36.695	3.58				
1640 rpm	5 Min	90	36.798	3.59	1640 rpm	5 Min	90	36.695	3.58				
1640 rpm	5 Min	90	36.080	3.52	1640 rpm	5 Min	90	35.568	3.47				
1640 rpm	5 Min	90	35.875	3.50	1640 rpm	5 Min	90	35.158	3.43				
			37.105	3.62				36.095	3.52	2.72%	10.51%	-0.22%	10.29%

Net Gain with BestLine Diesel Engine Treatment: 2.20%

Net Gain with BestLine Diesel Fuel Treatment 8.09%

Combined Gain with BestLine DET & DFT: 10.29%

Pacific Challenger BestLine Testing - Initial Results - Test Sequence# 1

Engines: Twin Cat 3508B Propulsion Engines Rated 1100 HP/ ea.
Flowmeters: Kral OME20 with BEG63 Sensor Group and BEM500/BEM810 Display Units

Test #1: Baseline Data using only 90% Load Data Points Non Averaged
Vessel Speed (SOG): 10.25 knots Vessel -Full Load Transit to Processing Plant
Engine Speed 1640rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard
1640 rpm	5 Min	90	39.565	3.86	1640 rpm	5 Min	90	35.158	3.43	
1640 rpm	5 Min	90	41.513	4.05	1640 rpm	5 Min	90	36.183	3.53	
1640 rpm	5 Min	90	42.230	4.12	1640 rpm	5 Min	90	35.363	3.45	
1640 rpm	5 Min	90	40.898	3.99	1640 rpm	5 Min	90	36.490	3.56	
1640 rpm	5 Min	90	42.435	4.14	1640 rpm	5 Min	90	35.465	3.46	
1640 rpm	5 Min	90	39.258	3.83	1640 rpm	5 Min	90	36.080	3.52	
1640 rpm	5 Min	90	42.845	4.18	1640 rpm	5 Min	90	36.798	3.59	
1640 rpm	5 Min	90	42.948	4.19	1640 rpm	5 Min	90	36.593	3.57	
			41.461	4.62				36.016	4.02	13.13%

Test # 2: Added 8 gallons of BestLine Engine Oil Treatment to Port Test Engine only
Test Data using only 90% Load Data Points - Averaged for Totalization
Vessel Speed: 10.25 knots Vessel -Full Load Transit to Processing Plant
Engine Speed 1640rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET	Adjustment for Baseline Variance	Total Improvement w/ DET
1640 rpm	5 Min	90			1640 rpm	5 Min	90						
1640 rpm	5 Min	90	38.386	3.75	1640 rpm	5 Min	90	35.722	3.46				
1640 rpm	5 Min	90	40.334	3.94	1640 rpm	5 Min	90	35.414	3.46				
1640 rpm	5 Min	90	40.846	3.99	1640 rpm	5 Min	90	35.824	3.50				
1640 rpm	5 Min	90	40.385	3.94	1640 rpm	5 Min	90	35.670	3.48				
1640 rpm	5 Min	90	40.283	3.93	1640 rpm	5 Min	90	35.158	3.43				
1640 rpm	5 Min	90	40.590	3.96	1640 rpm	5 Min	90	35.260	3.44				
1640 rpm	5 Min	90	40.846	3.95	1640 rpm	5 Min	90	35.773	3.49				
			40.239	3.92				35.546	3.46	11.66%	2.95%	1.31%	1.64%
										Net Gain with BestLine Diesel Engine Treatment			1.64%

Test # 3 Added 1.5 Gallons of BestLine Diesel Fuel Treatment to 800 gallons of Diesel fuel in Port Day Tank only
Test Data using only 90% Load Data Points - Averaged for Totalization
Note: Allowed 3 hrs mix time prior to test. Represents just under 2 0z per 10 gallon recommended dosage
Vessel Speed: 10.25 knots Vessel -Full Load Transit to Processing Plant
Engine Speed 1640rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET & DFT	Adjustment for Baseline Variance	Total Improvement w/ DET & DFT
1640 rpm	5 Min	90			1640 rpm	5 Min	90						
1640 rpm	5 Min	90	37.208	3.63	1640 rpm	5 Min	90	35.875	3.50				
1640 rpm	5 Min	90	38.028	3.71	1640 rpm	5 Min	90	36.285	3.54				
1640 rpm	5 Min	90	37.515	3.66	1640 rpm	5 Min	90	36.336	3.55				
1640 rpm	5 Min	90	37.464	3.66	1640 rpm	5 Min	90	36.336	3.55				
1640 rpm	5 Min	90	37.566	3.67	1640 rpm	5 Min	90	36.695	3.58				
1640 rpm	5 Min	90	36.439	3.56	1640 rpm	5 Min	90	36.131	3.53				
1640 rpm	5 Min	90	35.978	3.51	1640 rpm	5 Min	90	35.363	3.45				
			37.171	3.63				36.146	3.53	2.76%	10.35%	-0.36%	10.71%

Net Gain with BestLine Diesel Engine Treatment: 1.64%

Net Gain with BestLine Diesel Fuel Treatment: 9.07%

Combined Gain with BestLine DET & DFT: 10.71%

Pacific Challenger BestLine Testing - Initial Results - Test Sequence# 1

Engines: Twin Cat 3508B Propulsion Engines Rated 1100 HP/ ea.
Flowmeters: Kral OME20 with BEG63 Sensor Group and BEM500/BEM810 Display Units

Test #1: Baseline Data using only 90% Load Data Points - Avergaed for Totalization
Vessel Speed (SOG): 10.25 knots Vessel -Full Load Transit to Processing Plant
Engine Speed 1640 rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard
1640 rpm	5 Min	90			1640 rpm	5 Min	90			
1640 rpm	5 Min	90	40.539	3.96	1640 rpm	5 Min	90	36.183	3.48	
1640 rpm	5 Min	90	41.871	4.09	1640 rpm	5 Min	90	35.363	3.49	
1640 rpm	5 Min	90	41.564	4.06	1640 rpm	5 Min	90	36.490	3.505	
1640 rpm	5 Min	90	41.666	4.07	1640 rpm	5 Min	90	35.465	3.51	
1640 rpm	5 Min	90	40.846	3.99	1640 rpm	5 Min	90	36.080	3.49	
1640 rpm	5 Min	90	41.051	4.01	1640 rpm	5 Min	90	36.798	3.555	
1640 rpm	5 Min	90	42.896	4.19	1640 rpm	5 Min	90	36.593	3.58	
			41.491	4.05				36.139	3.52	12.90%

Test # 2: Added 8 gallons of BestLine Engine Oil Treatment to Port Test Engine only
Test Data using only 90% Load Data Points - Averaged for Totalization
Vessel Speed: 10.25 knots Vessel -Full Load Transit to Processing Plant
Engine Speed 1640 rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET	Adjustment for Baseline Variance	Total Improvement w/ DET
1640 rpm	5 Min	90			1640 rpm	5 Min	90						
1640 rpm	5 Min	90	38.386	3.75	1640 rpm	5 Min	90	35.722	3.46				
1640 rpm	5 Min	90	40.334	3.94	1640 rpm	5 Min	90	35.414	3.46				
1640 rpm	5 Min	90	40.846	3.99	1640 rpm	5 Min	90	35.824	3.50				
1640 rpm	5 Min	90	40.385	3.94	1640 rpm	5 Min	90	35.670	3.48				
1640 rpm	5 Min	90	40.283	3.93	1640 rpm	5 Min	90	35.158	3.43				
1640 rpm	5 Min	90	40.590	3.96	1640 rpm	5 Min	90	35.260	3.44				
1640 rpm	5 Min	90	40.846	3.95	1640 rpm	5 Min	90	35.773	3.49				
			40.239	3.92				35.546	3.46	11.66%	3.02%	1.64%	1.38%
										Net Gain with BestLine Diesel Engine Treatment			1.38%

Test # 3 Added 1.5 Gallons of BestLine Diesel Fuel Treatment to 800 gallons of Diesel fuel in Port Day Tank only
Test Data using only 90% Load Data Points - Averaged for Totalization
Note: Allowed 3 hrs mix time prior to test. Represents just under 2 0z per 10 gallon recommended dosage
Vessel Speed: 10.25 knots Vessel -Full Load Transit to Processing Plant
Engine Speed 1640 rpm (High Idle 1800)

Test Engine Port Engine					Control Engine Starboard Engine					Gross Difference: % Change			
RPM	Time	% Eng Load	GPH	G/Nm	RPM	Time	% Eng Load	GPH	G/Nm	Port To Starboard	Improvement with DET & DFT	Adjustment for Baseline Variance	Total Improvement w/ DET & DFT
1640 rpm	5 Min	90			1640 rpm	5 Min	90						
1640 rpm	5 Min	90	37.208	3.63	1640 rpm	5 Min	90	35.875	3.50				
1640 rpm	5 Min	90	38.028	3.71	1640 rpm	5 Min	90	36.285	3.54				
1640 rpm	5 Min	90	37.515	3.66	1640 rpm	5 Min	90	36.336	3.55				
1640 rpm	5 Min	90	37.464	3.66	1640 rpm	5 Min	90	36.336	3.55				
1640 rpm	5 Min	90	37.566	3.67	1640 rpm	5 Min	90	36.695	3.58				
1640 rpm	5 Min	90	36.439	3.56	1640 rpm	5 Min	90	36.131	3.53				
1640 rpm	5 Min	90	35.978	3.51	1640 rpm	5 Min	90	35.363	3.45				
			37.171	3.63				36.146	3.53	2.76%	10.41%	-0.02%	10.43%

Net Gain with BestLine Diesel Engine Treatment: 1.38%

Net Gain with BestLine Diesel Fuel Treatment: 9.05%

Combined Gain with BestLine DET & DFT: 10.43%

4.109

BESTLINE INTERNATIONAL RESEARCH INC.

Economic Model for: F/ V Pacific Challenger

Economic Model Results on Twin Cat 3508 Propulsion Engines Utilizing BestLine Diesel Fuel Treatment

Note: Economic Model based on fuel consumption tests conducted on F/V Pacific Challenger

Note: Average price of #2 ULSD for Alaska @ $3.25 / Gal as of July 22, 2015

Vessel: F/V Pacific Challenger

ANALYSIS PER ENGINE:	Actual Test Data	Breakeven	6% REDUCTION	7% REDUCTION	8%REDUCTION
Fuel Medium: #2 ULSD Marine Diesel	$3.25 / Gal #2 USLD	$3.25 / Gal #2 USLD	$3.25 / Gal #2 USLD	$3.25 / Gal #2 USLD	$3.25 / Gal #2 USLD
Port Main Engine - Baseline Hourly Fuel Consumption:	41.46 gph@1640 rpm	41.46 gph@1640 rpm	41.46 gph@1640 rpm	41.46 gph@1640 rpm	41.46 gph@1640 rpm
BestLine Products: Diesel Fuel Treatment					
BestLine Fuel Treatment Mix Ratio:					
2 oz per 10 Gal / 1gal per 640 Gal — Shown in Gallons:	1.50	1.50	1.50	1.50	1.50
Day Tank Fuel Capacity — Shown per engine:	800.00	800.00	800.00	800.00	800.00
Hour of Annual Operations:	3500.00	3500.00	3500.00	3500.00	3500.00
Estimated Annual Fuel Consumption for both main engines:	240000.00	240000.00	240000.00	240000.00	240000.00
BestLine Diesel Fuel Treatment : Gallons Required to treat both engines	375.00	375.00	375.00	375.00	375.00
BestLine Diesel Fuel Treatment : Cost per Gallon:	$93.00	$93.00	$93.00	$93.00	$93.00
BestLine Diesel Fuel Treatment : Annual Cost:	$34,875.00	$34,875.00	$34,875.00	$34,875.00	$34,875.00
BestLine Diesel Fuel Treatment : Cost per engine:	$17,437.50	$17,437.50	$17,437.50	$17,437.50	$17,437.50
BestLine Diesel Fuel Treatment : Cost per hour per engine:	$4.98	$4.98	$4.98	$4.98	$4.98
BestLine Diesel Fuel Treatment Test Results Economic Model:					
Port Main Engine — Estimated Annual Fuel Consumption:	125000.00	125000.00	125000.00	125000.00	125000.00
% of Estimated Reduction in Fuel Consumption - From Test Data:	9.07%	4.62%	6.00%	7.00%	8.00%
Port Main Engine Baseline Test Average Fuel Consumption:	41.46	41.46	41.46	41.46	41.46
Port Main Engine Corrected Fuel Consumption with Control Engine:	37.17	39.54	38.97	38.56	38.14
Fuel Consumption - Reduced- gallons per hour - corrected for Control Engine	3.76	1.92	2.49	2.90	3.32
Corrected % of Reduction:	9.07%				
Gallons of Fuel Saved less 20% for Manuevering	10528.00	5365.59	6965.28	8126.16	9287.04
Cost of Marine Diesel Fuel in Dutch Harbor: July 1, 2015	$3.25	$3.25	$3.25	$3.25	$3.25
VALUE OF FUEL SAVED:	**$34,216.00**	**$17,438.16**	**$22,637.16**	**$26,410.02**	**$30,182.88**
Cost to Save Fuel per Engine:					
Estimated Value of Fuel Saved:	**$34,216.00**	$17,438.16	$22,637.16	$26,410.02	$30,182.88
BestLine Diesel Fuel Treatment Cost per Year:	**-$17,437.50**	-$17,437.50	-$17,437.50	-$17,437.50	-$17,437.50
Total Fuel Savings less Cost per Engine in the first year	**$16,778.50**	**$0.66**	**$5,199.66**	**$8,972.52**	**$12,745.38**
Estimated Total Annual Fuel Savings less Cost for both Engines:	**$33,557.00**	**$1.32**	**$10,399.32**	**$17,945.04**	**$25,490.76**
ESTIMATED TOTAL FUEL SAVINGS FOR THE VESSEL IN 5 YEARS:	**$167,785.00**	**$6.59**	**$51,996.60**	**$89,725.20**	**$127,453.80**

Process Notes & Acknowledgements:

I would like to especially thank Captain and Vessel Owner, Chris Peterson for allowing BestLine Lubricants the opportunity to conduct this test protocol on his vessel, F/V Pacific Challenger. I would also like to thank Chris for running the test protocols and completing the data collection with great precision during his transit to the Bering Sea in Alaska.

We had the four test phases in the initial Sequence 1. This sequence was defined as Sequence 1 since it only looked at the test data collected for both engines while operating at 90% engine load. We will be conducting identical test protocols at lower engine load ratings and they will be identified as Sequence #2 for testing at 80% Engine Load and Sequence #3 and #4 for test at 70% and 60 % engine loads respectively.

A complete report will be compiled covering all the data collected and evaluations performed for all four sequences. The identical test protocol format will be used to perform the next three sequence series. It will be available at the completion of the data collection, evaluation and review.

The evaluation of the data took place at the Northwest Regional office for BestLine Lubricants in Monroe, WA. It was conducted by Paul J. Masson and reviewed by Mr. Ron Sloan and Mr. John Polster of BestLine Lubricants to confirm analysis procedures and presentation.

If readers have any questions or comments regarding the procedure or test protocol used, please feel free to contact me via email or phone.

Thank you for consideration in this matter.

Paul J. Masson

Paul J. Masson - Test Coordinator
V.P. Marine and Industrial Products
BestLine Lubricants

Ph#: 360 794-9100
Email: pmasson@bestlinelubricants.com

KRAL

A - 6890 Lustenau

Worksheet BEM 500

Order number	BKD002793
Position number	10000
Project	KRAL-USA Inc.

1.00 Information

Serial number:	404011
Software:	3,003
Hardware:	3,002

Consumption A-B

1.01	Q:	0,0 galUS/h
1.02	T1:	0,0 galUS
	T2:	0,0 galUS

Volumeter A

1.03	QA:	0,0 galUS/h
	TempA:	0,0 °F
1.04	TA1:	0,0 galUS
	TA2:	0,0 galUS

Volumeter B

1.05	QB:	0,0 galUS/h
	TempB:	90,0 °F
1.06	TB1:	0,0 galUS
	TB2:	0,0 galUS

1.08	Direction change Volumeter A:	0
1.09	Direction change Volumeter B:	0
1.10	Reset bypass and coll. error message:	No
1.11	Brightness:	50 %
1.12	Contrast:	30 %
1.13	Language:	English

2.01	Enable Password: 1000	Yes
2.02	Change Password:	No
2.03	Mode:	Volume at X°
2.04	Temperature X:	59,0 °F

Select unit

2.05	Rate:	galUS/h
2.06	Total:	galUS
2.07	Temperature:	°F
2.08	Density:	lb/galUS

2.09	Select density determination:	Table 1
2.10	Decimal places:	1
2.11	Display Start message:	No
2.12	Function pick up:	PNP
2.13	Function Pulse inputs:	Encoder
2.14	Link Channel:	A-B
2.15	Threshold value	0,0 galUS/h
2.16	Average display Rate average Number values:	20
2.17	Deactivate Alarm messages:	No
2.18	Maximum flow rate Error message:	5 %
2.19	Minimum temperature Volumeter:	-4 °F
2.20	Maximum temperature Volumeter:	257 °F
2.21	Reset to factory settings:	No

Analog output

3.01	Function	4...20 mA
1 3.02	Allocation	Q
	3.03 Scale max.	158,4 galUS/h
2 3.04	Allocation	QA
	3.05 Scale max.	475,8 galUS/h
3.06	Average analog	20

Pulse output

3.07	Function	Independent
1 3.08	Allocation	T
	3.09 Scale	1,0 galUS/P
2 3.10	Allocation	TA
	3.11 Scale	1,0 galUS/P
3.12	Pulse width:	2 ms

3.13	Function Relay 1:	Bypass 1
3.14	Limit value Bypass	0,0 galUS/h
3.15	Delay Bypass:	30,0 s
3.16	Waiting period Repeat Bypass:	100,0 s
3.17	Relay 1 Switch:	On
3.18	Relay 2 Switch:	Off
3.19	Address Modbus:	1

Only changeable via Modbus
Only readable
Only resetable to 0
Non-programmable addition
No limits

Linearization A

A	Frequency [Hz]	K-Factor [P/l]
4.01	161,223	320,8
4.02	0,000	320,761
4.03	16,674	320,658
4.04	41,702	320,786
4.05	72,079	320,590
4.06	112,949	320,879
4.07	161,223	320,841

Linearization B

B	Frequency [Hz]	K-Factor [P/l]
5.01	161,351	320,9
5.02	0,000	320,505
5.03	16,668	320,530
5.04	41,702	320,786
5.05	72,137	320,846
5.06	112,995	321,008
5.07	161,351	321,097

Density table 1

for medium LDO

	Temperature [°F]	Density [lb/galUS]
6.01	14	6,891
6.02	32	6,832
6.03	50	6,772
6.04	60	6,739
6.05	68	6,712
6.06	86	6,652
6.07	104	6,592
6.08	122	6,531
6.09	140	6,470
6.10	158	6,409

Density table 2

for medium LDO

	Temperature [°F]	Density [lb/galUS]
7.01	14	6,891
7.02	32	6,832
7.03	50	6,772
7.04	60	6,739
7.05	68	6,712
7.06	86	6,652
7.07	104	6,592
7.08	122	6,531
7.09	140	6,470
7.10	158	6,409

Remarks

Volumeter A

Item number	OME 20.5315361
Serial number	404007
K-Factor	320,8 P/l
Calibration number	14W03348
Pick up	BEG 61

Volumeter B

Item number	OME 20.5315361
Serial number	404008
K-Factor	320,9 P/l
Calibration number	14W03349
Pick up	BEG 61

Date	02.10.2014
Time	12:46
Tester	Daniel Steiner
Signature	i. A.

KRAL
A - 6890 Lustenau

Worksheet BEM 500

Order number	BKD002793
Position number	10000
Project	KRAL-USA Inc.

1.00 Information

Serial number:	404012
Software:	3,003
Hardware:	3,002

Consumption A-B

1.01	Q:	0,0 galUS/h
1.02	T1:	0,0 galUS
	T2:	0,0 galUS

Volumeter A

1.03	QA:	0,0 galUS/h
	TempA:	0,0 °F
1.04	TA1:	0,0 galUS
	TA2:	0,0 galUS

Volumeter B

1.05	QB:	0,0 galUS/h
	TempB:	90,0 °F
1.06	TB1:	0,0 galUS
	TB2:	0,0 galUS

1.08	Direction change Volumeter A:	0
1.09	Direction change Volumeter B:	0
1.10	Reset bypass and coll. error message:	No
1.11	Brightness:	50 %
1.12	Contrast:	30 %
1.13	Language:	English

2.01	Enable Password:	1000	Yes
2.02	Change Password:		No
2.03	Mode:		Volume at X°
2.04	Temperature X:		59,0 °F

Select unit

2.05	Rate:	galUS/h
2.06	Total:	galUS
2.07	Temperature:	°F
2.08	Density:	lb/galUS

2.09	Select density determination:	Table 1
2.10	Decimal places:	1
2.11	Display Start message:	No
2.12	Function pick up:	PNP
2.13	Function Pulse inputs:	Encoder
2.14	Link Channel:	A-B
2.15	Threshold value	0,0 galUS/h
2.16	Average display Rate average Number values:	20
2.17	Deactivate Alarm messages:	No
2.18	Maximum flow rate Error message:	5 %
2.19	Minimum temperature Volumeter:	-4 °F
2.20	Maximum temperature Volumeter:	257 °F
2.21	Reset to factory settings:	No

Analog output

3.01	Function		4...20 mA
1 3.02	Allocation		Q
1 3.03	Scale max.		158,4 galUS/h
2 3.04	Allocation		QA
2 3.05	Scale max.		475,8 galUS/h
3.06	Average analog		20

Pulse output

3.07	Function		Independent
1 3.08	Allocation		T
1 3.09	Scale		1,0 galUS/P
2 3.10	Allocation		TA
2 3.11	Scale		1,0 galUS/P
3.12	Pulse width:		2 ms
3.13	Function Relay 1:		Bypass 1
3.14	Limit value Bypass		0,0 galUS/h
3.15	Delay Bypass:		30,0 s
3.16	Waiting period Repeat Bypass:		100,0 s
3.17	Relay 1 Switch:		On
3.18	Relay 2 Switch:		Off
3.19	Address Modbus:		1

Only changeable via Modbus
Only readable
Only resetable to 0
Non-programmable addition
No limits

Linearization A

A	Frequency [Hz]	K-Factor [P/l]
4.01	161,287	320,7
4.02	0,000	320,505
4.03	16,661	320,402
4.04	41,669	320,530
4.05	72,079	320,590
4.06	112,949	320,879
4.07	161,287	320,969

Linearization B

B	Frequency [Hz]	K-Factor [P/l]
5.01	164,130	320,9
5.02	0,000	321,017
5.03	16,679	320,754
5.04	40,859	320,883
5.05	73,299	320,782
5.06	113,338	321,072
5.07	164,130	321,194

Density table 1

for medium LDO

	Temperature [°F]	Density [lb/galUS]
6.01	14	6,891
6.02	32	6,832
6.03	50	6,772
6.04	60	6,739
6.05	68	6,712
6.06	86	6,652
6.07	104	6,592
6.08	122	6,531
6.09	140	6,470
6.10	158	6,409

Density table 2

for medium LDO

	Temperature [°F]	Density [lb/galUS]
7.01	14	6,891
7.02	32	6,832
7.03	50	6,772
7.04	60	6,739
7.05	68	6,712
7.06	86	6,652
7.07	104	6,592
7.08	122	6,531
7.09	140	6,470
7.10	158	6,409

Remarks

Volumeter A

Item number	OME 20.5315361
Serial number	404009
K-Factor	320,7 P/l
Calibration number	14W03350
Pick up	BEG 61

Volumeter B

Item number	OME 20.5315361
Serial number	404010
K-Factor	320,9 P/l
Calibration number	14W03351
Pick up	BEG 61

Date	02.10.2014
Time	13:23
Tester	Daniel Steiner
Signature	i. A.