

# An Alternative DSFB Fuel for Pure Diesel Four Stroke Engine

Prof. Dr. V.S. Oddvar Petter  
Department of Industrial Engineering,  
Norwegian University of Science and Technology, Norway.

## Abstract

Refined sunflower oil used for an alternative oil of four stroke diesel engine. To overcome the increasing demand of diesel oil a mixture of 30% of refined sunflower oil and diesel used as good lubricant oil for diesel engine. A relative experimental study was accompanied to estimate the presentation of solo cylinder four stroke VCR (variable compression ratio) diesel engines when fuelled with sunflower blends with diesel fuel in consonant speed of 1500 rpm. Experiments were also accepted out with diesel oil to be used as a sample point. For the test we calculate the following Power of the engine, Torque, BSFC, Thermal efficiency, brake thermal efficiency and Specific Fuel Consumption (SFC). These Surveys will support to discover the alternate of Diesel and also make best use of the refined sunflower oil mixtures with Pure Diesel in solo cylinder, four stroke VCR diesel engine. This examination was made numerous loading situations at constant speed are documented and calculated to relate it with pure diesel fuel.

**Indexed Items:** Four Stroke VCR Diesel Engine, Alternative Mixture, Refined Sunflower Oil and Diesel oil.

## I. INTRODUCTION

A four-stroke engine is an internal combustion (IC) engine in which the piston completes four distinct strokes while rotating a crankshaft. A stroke mentions to the full travel of the piston along the cylinder, in either one direction. Intake: This stroke of the piston instigates at top dead centre (T.D.C.) and finishes at bottom dead center (B.D.C.). In this stroke the ingestion valve must be in the open place while the piston wrenches an air-fuel blend into the cylinder by creating vacuum pressure into the chamber through its descending motion. Compression: This stroke instigates at B.D.C, or just at the finish of the force stroke, and ends at T.D.C. In this stroke the piston wrappings the air-fuel blend in preparation for ignition during the power stroke (below). Both the consumption and expend valves are closed during this stage. Combustion: This is the start of another revolution of the four stroke cycle. At this opinion the crankshaft has accomplished a full 360 degree revolution. While the piston is at T.D.C. (the end of the compression stroke) the crushed air-fuel combination is ignited by a spark plug (in a gas engine) or by heat produced by high density (diesel engines), convincingly returning the piston to B.D.C. This stroke products mechanical work from the engine to turn the crankshaft. Exhaust: Throughout the *exhaust* stroke, the piston once for a second time returns from B.D.C. to T.D.C. while the consume valve is open. This accomplishment expels the expended air-fuel mixture through the exhaust valve.

engine pointer is formfitting in control panel which intellect pressure and eccentric angle data interface with processor. The engine and electric generator meter were interfaced to a regulator panel. Performance Investigation Software "IC Machine Soft Ver. 8.5, Complete by test rig supplier" was used for demo the test limitation such as oil flow rate, air flow rate, temperature, loads etc. and for appraising the concert distinguishing such as Brake Thermal Efficiency, Precise Fuel Consumption, Specified Thermal Efficiency, Motorized efficiency (\_mech), Volumetric Efficiency (\_vol) etc. The high energy value and compactness of the specific fuel was fed to the software for computing the above said limitations. Sunflower sophisticated oil is mixed with fuel diesel in quantity like 15%, and 30%. These mixtures are termed as DSFB15, DSFB30. Engine presentation using these mixtures and pure diesel have been note down and calculated in IC engine laboratory.

## II. DESIGN SIGNIFICANT

High-tech solitary cylinder, 4 strokes, direct injection, water cooled VCR (Variable Compression Ratio) diesel engine Examination Rigout is used. An



Fig. 1 Experimental Setup

**Table 1. Listed out the Design Specifications**

Make and Model	KirloskarOil Engine Limited
Engine Type	4 stroke, water cooled (TU I)
Number of Cylinder	Single
Bore	97.5 mm
Stroke	125 mm
Cubic Capacity	676 Cc ( 0.676liter)
Net Power	4.50 kw @ 1500 rpm
Compression ratio	14 to 20 :1
Max Speed	1500 rpm
Valves per Cylinder	Two
Number of nozzles	One
Fuel injection type	Direct Injection
Max power	6.2 kw
Connecting rod length	264 mm
Orifice Diameter	24mm
Fuel injection type	Direct Injection

**DYNAMO METER CONDITION**

1. Type - Eddy current
2. Max power - 8.5kw@1500-3000 rpm

**III. INVESTIGATIONAL METHOD**

1. First Power on the supply.
2. Provide water source connections to engine and turbine meter over rota meter.
3. On fuel stream, if discrete arrangement is complete for stowage & supply of biodiesel.
4. The engine is in progress and warm up for 20 minutes.
5. Start the processor and select the mode (arrange) to pass in the data.
6. Choose the run option.
7. Every test is showed and data is put away at five diverse loads, as on No load, 25%, 50%, 75% and full load.
8. Machine is run for 10-30 minute for one test and data obtainable is put in storage by log key at the termination of time interval.
9. Following tests are showed in sequence like pure diesel, DSFB15, and DSFB30.

*Study of Engine Performance*

Measurement and outcomes got by accompanying trials using diesel and mixtures of refinedsunflower oil with the support of engine software are signified in the succeeding table 1 to 4. These outcomes are used to study numerousfunctioningappearances of engine such as SFC, Torque and Power etc.

**Table. 2 Observation Table: On Pure Diesel**

No.	Speed (Kg)	Load (kg)	T1 (°C)	T2 (°C)	T3(°C)	Fuel cc/min	Air (mm)	F1	F2	F3
1.	1455	0.38	26.05	31	85	5.00	51	22.5	75	100
2.	1478	3.57	26.25	34.50	96	7.00	53.70	24.76	75	110
3.	1485	6.87	26.50	37.67	105	9.00	54.20	24.98	75.50	115
4.	1438	9.77	26.75	39.20	125	12.00	54.50	26.55	75.50	120
5.	1481	12.25	27	41.50	150	15.00	55	27.20	76	125

**Table. 3 Observation Table: On Pure Diesel**

No .	Torqu e (Nm)	B.P. (Kw )	F.P. (Kw)	I.P. (Kw)	BMEP (bar)	IMEP (bar)	Bth _ (%)	Ith _ (%)	Mech _ (%)	SFC Kg/kw h	VoIE (%)	A/F Ratio
1.	0.9	0.15	1.45	1.30	0.5	0.60	5.40	45.87	5.88	2.90	65.7	69
2.	6.89	0.90	1.35	2.66	1.7	2.05	14.1	46.04	28.44	0.30	67.9	54
3.	15.67	2.9	1.77	3.78	2.90	3.40	25.67	45.25	35.98	0.26	68.3	33
4.	20.89	4.5	1.20	4.45	3.77	4.80	35.34	46.89	49.7	0.45	69.6	26

**Table. 4 Observation Table: On Diesel Sun Flower Blend 30%**

No.	Speed (Kg)	Load (kg)	T1 (°C)	T2 (°C)	T3(°C)	Fuel cc/min	Air (mm)	F1	F2	F3
1.	1565	0.28	28.05	38	88	6.00	51	23.56	75	150
2.	1423	3.67	28.25	44.50	100	8.00	54.70	25.76	75	150
3.	1465	7.7	27.50	47.67	115	10.00	54.89	25.98	75	150
4.	1478	10.50	27.75	39.20	165	13.00	53.50	23.55	75	150
5.	1421	12.35	27	41.50	140	16.00	51.78	23.20	75	150

The result of refined sunflower oil and its blends and diesel fuel on engine rotation are measured. The values of torque for oil are specified in test Observation tables from 2 to 5. The engine torque almost same with accumulative loads

for bio fuel and diesel. It is perceived that the rotation values of sunflower oil mixtures are somewhat same to the diesel at all load situations.

**Table. 5 Observation Table: On Diesel Sun Flower Blend 30%**

No	Torque (Nm)	B.P. (Kw)	F.P. (Kw)	I.P. (Kw)	BMEP (bar)	IMEP (bar)	Bth (%)	Ith (%)	Mech (%)	SFC Kg/kwh	VoIE (%)	A/F Ratio
1.	0.76	0.18	1.65	1.78	0.9	0.70	5.20	40.57	5.08	2.30	75.7	67
2.	9.89	0.50	1.79	2.23	1.3	2.58	15.1	42.84	30.44	0.60	63.9	44
3.	25.67	3.9	1.23	3.58	2.50	3.87	29.67	46.05	39.98	0.06	60.3	53
4.	22.89	5.51	0.9	4.95	4.77	4.34	33.34	41.49	50.7	0.35	61.6	16

**IV. CONCLUSIONS**

The sunflower refined oil with 30% blend with petrol diesel is used in the electronic VCR diesel appliance without any alteration in engine or oil system, presentation evaluation. It was perceived that the Performance functioning features that are Torque, Brake pedal power, resistance power, indicated power, brake thermal efficiency, specified thermal effectiveness, obvious fuel consumption, volumetric efficiency, and mechanical efficiency are all most equivalent to petroleum diesel at several loading conditions at constant speed for sunflower refined oil blend with diesel at 30% (DSFB30) oil blends. Consequently, sunflower is an inexpensive fresh material and its low working cost in purifying creation make this training a proficient one for conceivable technological applications. Sunflower refined oil mixed with diesel fuel can be used as a substitute fuel in diesel engines short of any major alteration.

**REFERENCES**

[1] Hofman, V., D. Kaufman, & W.E. Dinusson. Sunflower for power. NDSU Cooperative Extension Service Circular AE-735. Fargo, ND. 1981.  
 [2] Jagadale S.S., Jugulkar L.M. (Aug. 2012), Performance characteristics of single cylinder diesel engine using blend of chicken fat based biodiesel, Vol. 3.  
 [3] Kailas M. Talkit and D.T. Mahajan, "Studies on Physicochemical Properties of

[4] Soybean Oil and its Blends with Petroleum Oils", International Journal of Mechanical Engineering & Technology (IJMET), Volume 3, Issue 2, 2012, pp. 511 - 517,  
 [5] ISSN Print: 0976 – 6340, ISSN Online: 0976 – 6359.  
 [6] A. Swarna Kumari, Ch. Penchalayya, A.V. Sita Rama Raju and D. Vinay Kumar, "Performance Characteristics for the use of Blended Safflower Oil in Diesel Engine", International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 4, Issue 3, 2013, pp. 26 - 32, ISSN Print: 0976-6480, ISSN Online: 0976-6499.  
 [7] Wikipedia of sunflower oil and working of blending of alternative fuel with pure diesel in diesel engine.  
 [8] Baranescu, R.A. & J.J. Lusco. Performance, durability, & low temperature operation of sunflower oil as a diesel fuel extender vegetable Oil Fuels: MI: ASAE 1982  
 [9] Kuldeep Singh<sup>1</sup>, Mohd. Yunus Sheikh<sup>2</sup>, Dr. Y.B. Mathur<sup>3</sup> (April 2014) Performance Study of a VCR Diesel Engine Fueled With Diesel & Low Concentration Blend of Linseed Oil Biodiesel, (ISSN 2250-2459, Vol. 4, Issue 4)  
 [10] U. Santhan Kumar, K. Ravi Kumar, (Sep 2013) Performance, Combustion and Emission Characteristics of Corn oil blended with Diesel, vol. 4 Issue 9.  
 [11] A. P. Patil and H.M. Dange, "Experimental Investigations of Performance Evaluation of Single Cylinder, Four Stroke, Diesel Engine, using Diesel, Blended with Maize Oil", International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 3, Issue 2, 2012, pp. 653 - 664, ISSN Print: 0976-6480, ISSN Online: 0976-6499.