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EXPERIMENTATION & DEVELOPMENT OF DUAL FUEL (DIESEL+CNG) TRACTOR

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ABSTRACT: To Upgrade Tracror with dual Fuel technology which enables Its engine to run with combination of CNG and Diesel fuel.This experiment will provide following benefits to Tractor Customers -

1.Savings on fuel expenditures

2.Reduce pollution mainly CO, NOx and PM emission

INTRODUCTION: Towards the effort of reducing the operating cost of tractor with diesel engines for farmer, We have proposed solutions of using CNG(gaseous fuel) as a fractional supplement for Diesel (liquid fuel).

A dual-fuel (Diesel-CNG) engine is a basic diesel engine equipped with a dual-fuel conversion kit that allows the use of a clean-burning alternative fuel such as compressed natural gas. Diesel and natural gas are burned simultaneously in this engine. Natural gas is supplied in the cylinder in conjunction with intake air; the quantity of diesel injection is decreased accordingly.

There are number of potential benefits of Dual fuel engines such as higher compression ratio, fuel flexibility, and improved efficiency and less adjustment in current diesel engines. Due to less smock and PM emissions and high efficiency of diesel combustion it as an environmentally friendly technology .

Normally diesel is costlier then natural gas. The total Cost savings for dual fuel will depend upon the proportion of fuel added. For energy consumption and environmental pollution point of view, and availability of CNG dual fuel technology is a efficient technology to use.

EXPERIMENTAL DESIGN AND PROCEDURE: For experiment a tractor of 50HP being used, a separate CNG kit installed on tractor for which various parts detail given below

1.CNG cylinders

2.CNG Integrated dual filling kit

3.CNG high pressure coalescing filter

4.CNG high pressure regulator

5.CNG cylinder valve

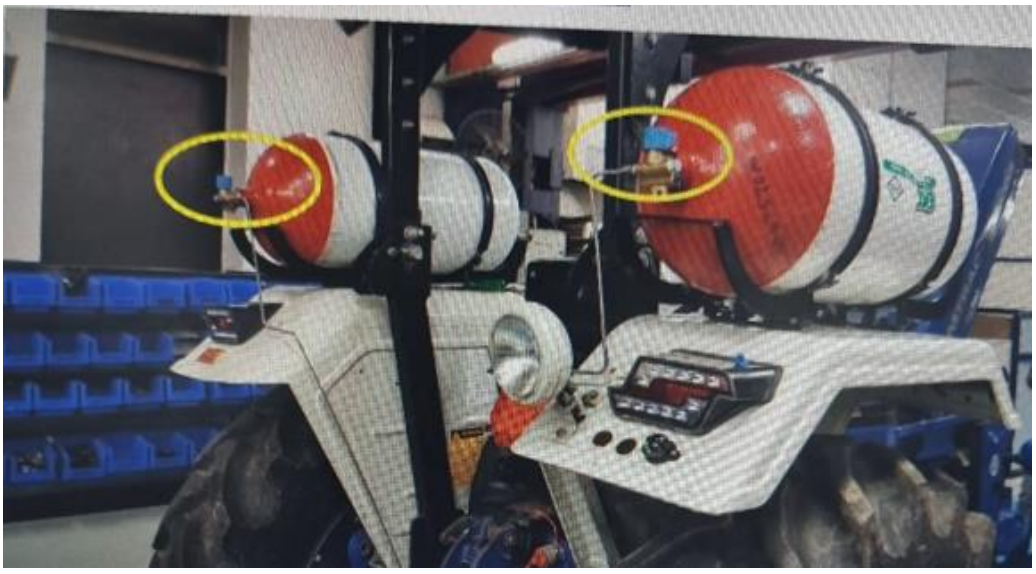
6.CNG fuel indicator

7.Electronic control module

8.CNG single point injector assembly

9.Hose assembly LP HPR to SPI

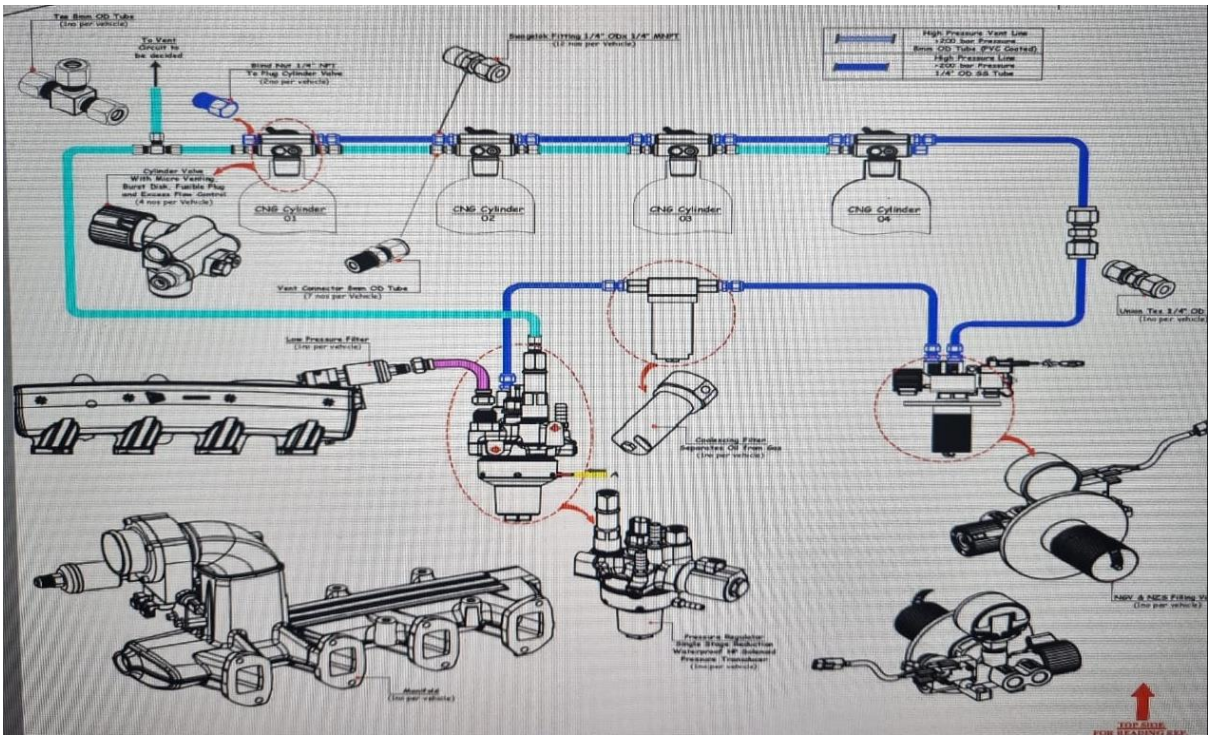
10.Tubes and connectors



CNG kit on diesel engine setup.

The configuration of tractor for the experiment is given below

MODEL	49.5 HP
RATED RPM	1850
ENGINE CC	3680
ENGINE CYLINDER	4
BORE/STROKE	98/122
TRACTOR COFIG.	PS/DC/OIB/169X28



Circuit diagram for CNG Kit

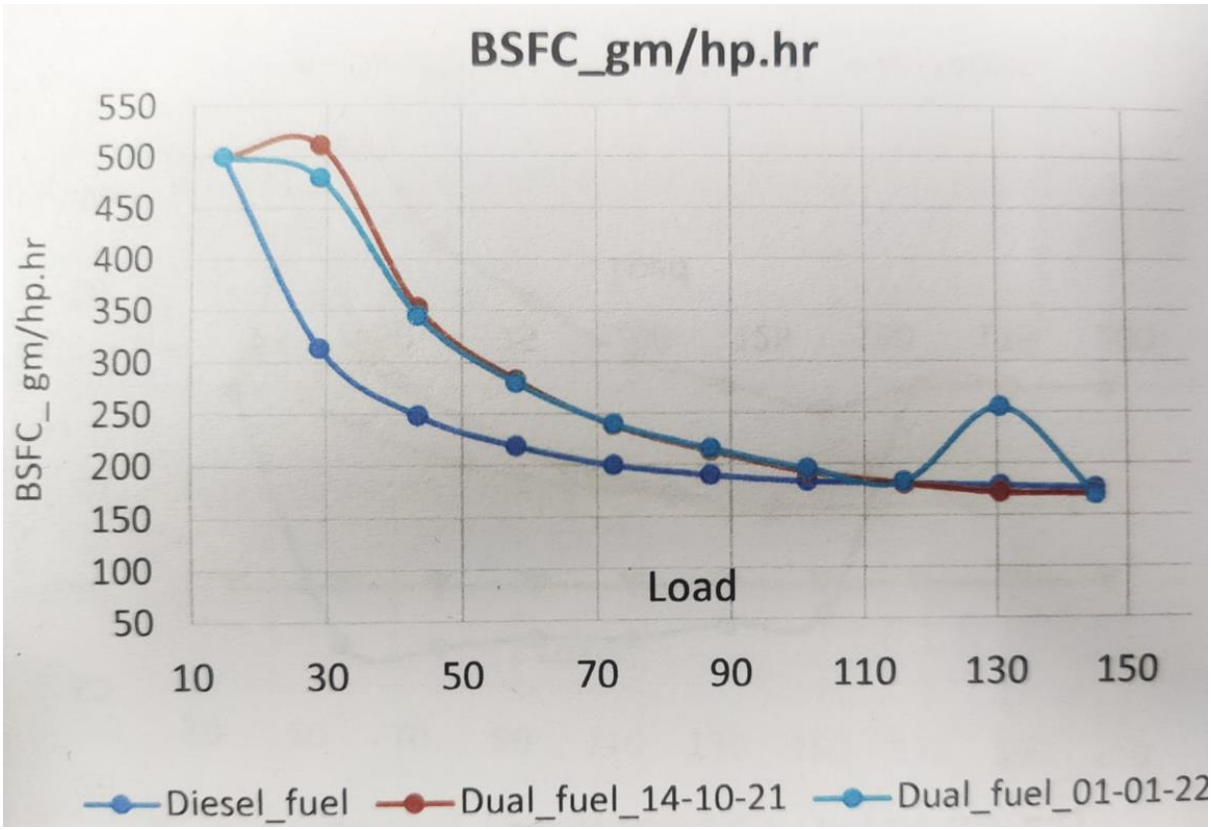
RESULT AND DISCUSSIONS:-

Below are the observation with dual fuel (Diesel + CNG) test result.

- **ERPM drop is better by 30-40 with different application**
- **Ltr/Acr is better by 35-36%**
- **Ltr/hrs is better by 30-32%**
- **Acr/hrs is better by 2-3%**

COMPARISION @1800 Erpm DIESEL VS DIESEL+CNG					
D+CNG					
ENGINE	TORQUE	PTO SPEED	POWER	FUEL CONSUPTION	
RPM	NM	RPM	Ps	Kg/hr	L tr/hr
1800	0	537	0	198	2.37
1783	50	532	4	2.4	2.87
1798	100	537	8	1.94	2.32
1787	150	533	11	2.28	2.72
1775	200	530	15	2.62	3.14
1764	250	527	19	2.97	3.55
1756	300	524	22	3.36	4.02
1748	350	522	26	4.16	4.98
1731	400	517	29	4.8	5.74
1717	450	513	33	5.16	6.17
1703	500	508	36	6.05	7.24
1682	550	502	39	7.17	8.58
1667	600	498	43	7.74	9.26
1590	650	475	44	7.95	9.51

COMPARISION @1800 Erpm DIESEL VS DIESEL+CNG						%DELTA Kg/hr	%DELTA Ltr/hr
DIESEL							
ENGINE	TORQUE	PTO SPEED	POWER	FUEL CONSUPTION			
RPM	NM	RPM	Ps	Kg/hr	L tr/hr		
1800	0	537	0	1.95	2.3	-1.9	
1786	50	533	4	2.35	2.8	-2.22	
1773	100	529	8	2.77	3.3	30	
1761	150	526	11	3.22	3.9	29.28	
1754	200	523	15	3.69	4.4	28.91	
1746	250	521	19	4.15	5	28.56	
1737	300	518	22	4.63	5.5	27.45	
1727	350	516	26	5.15	6.2	19.1	
1717	400	513	29	5.65	6.8	15.07	
1706	450	509	33	6.15	7.4	16.15	
1694	500	506	36	6.69	8	9.58	28.34
1679	550	501	39	7.3	8.7	1.79	
1667	600	498	42	7.8	9.3	0.69	
1565	650	467	43	787	9.4	-1.11	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BSFC_ gm/hp.hr
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Diesel_fuel
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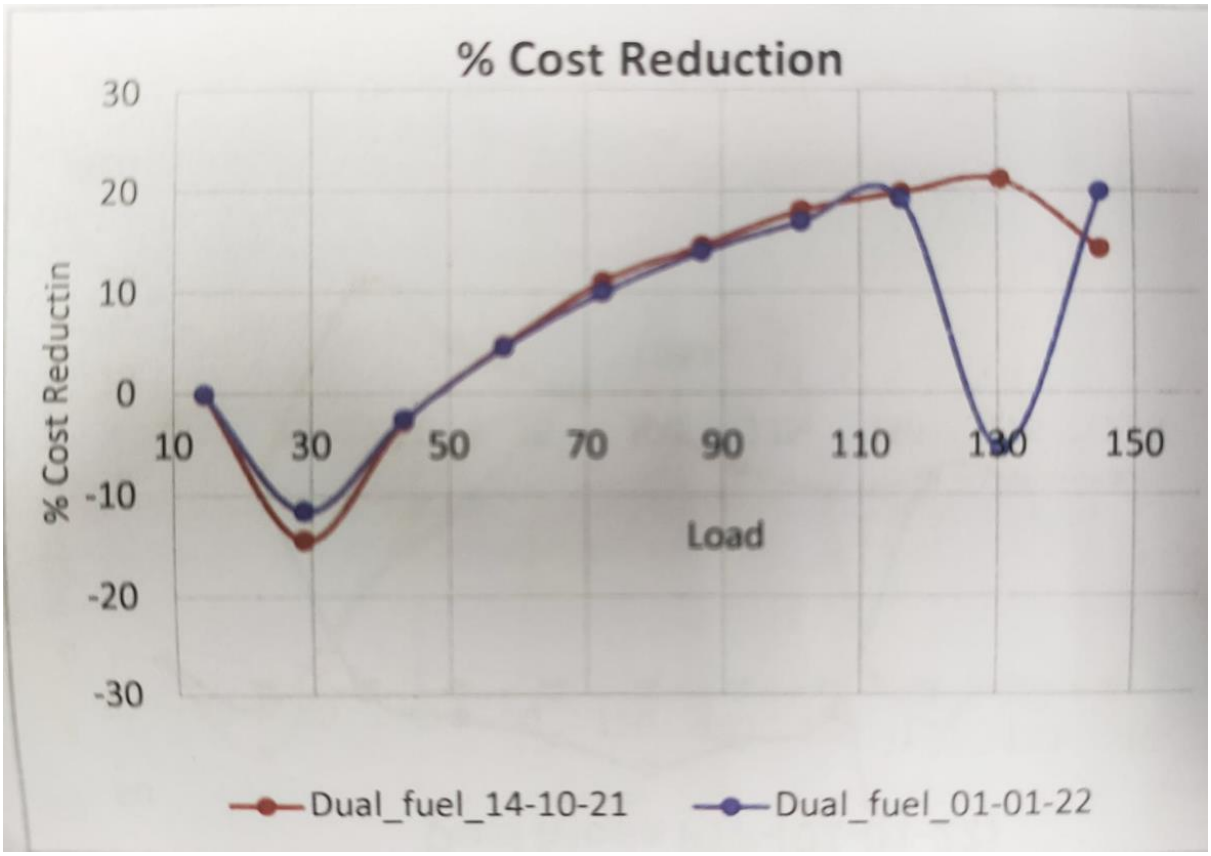
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CONCLUSION

The operating cost of tractor reduced significantly, As shown in below table the cost reduction per hr is Rs 83.25 along with the significant reduction in PM exhaust gases.

PARAMETER	FIELD TEST RESULTS		
IMPLEMENT	9X9 DISC HARROW	13 TYNE CULTIVATOR	8 FT ROTAVATOR
OPERATING RPM	1800		
BASE RESULTS OF TRACTOR 50HP WITH DIESEL+CNG			
AREA COVERAGE,ACR/Hrs	2.5-2.6	4.9-5.0	1.7-1.75
FUEL CONSUPTION,Ltr/ACR	1.6-1.7	0.9-1.0	3.6-3.8
FUEL CONSUPTION,Ltr/HrS	4.2-4.3	4.5-4.6	6.0-6.1
TRACTOR 50HP DIESEL+ CNG W.R.T TRACTOR 50HP DIESEL			
AREA COVERAGE,ACR/Hrs	3%	3%	2%
FUEL CONSUPTION,Ltr/ACR	38%	32%	34%
FUEL CONSUPTION,Ltr/HrS	36%	30%	32%
CAPABILITY	↑	↑	↑

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