Dual Fuel Tractors: A Cleaner Path to Affordable Farming

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Escorts Kubota Limited (EKL) Overview

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Escorts Kubota Businesses

- Agri Machinery

- Construction Equipment

- Engine Business

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Agri Machinery

Powering The Dreams Of Farmer

Escorts Kubota Limited (EKL) Overview

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Construction Equipment

1) Material Handling

2) Earth Moving

3) Road Construction

Escorts Kubota Limited (EKL) Overview

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Engine Business

Variable Speed Engines

25-110 hp segment

Fix Speed (Genset) Engines

7.5-82.5 KVA range

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Presentation Contents:

- What is dual fuel Tractor
- Architecture and Integration
- Experiment and Results
- Challenges
- Conclusion

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What is dual fuel Tractor

The tractor has separate storage for diesel and a gaseous fuel.

The system can switch to operating entirely on diesel if the gaseous fuel runs out or is temporarily unavailable.

Farmers can utilize various fuels available on-site, such as biogas from agricultural waste, offering cost savings.

By replacing a significant portion of diesel with a cheaper or on-farm gaseous fuel, overall fuel consumption will reduce.

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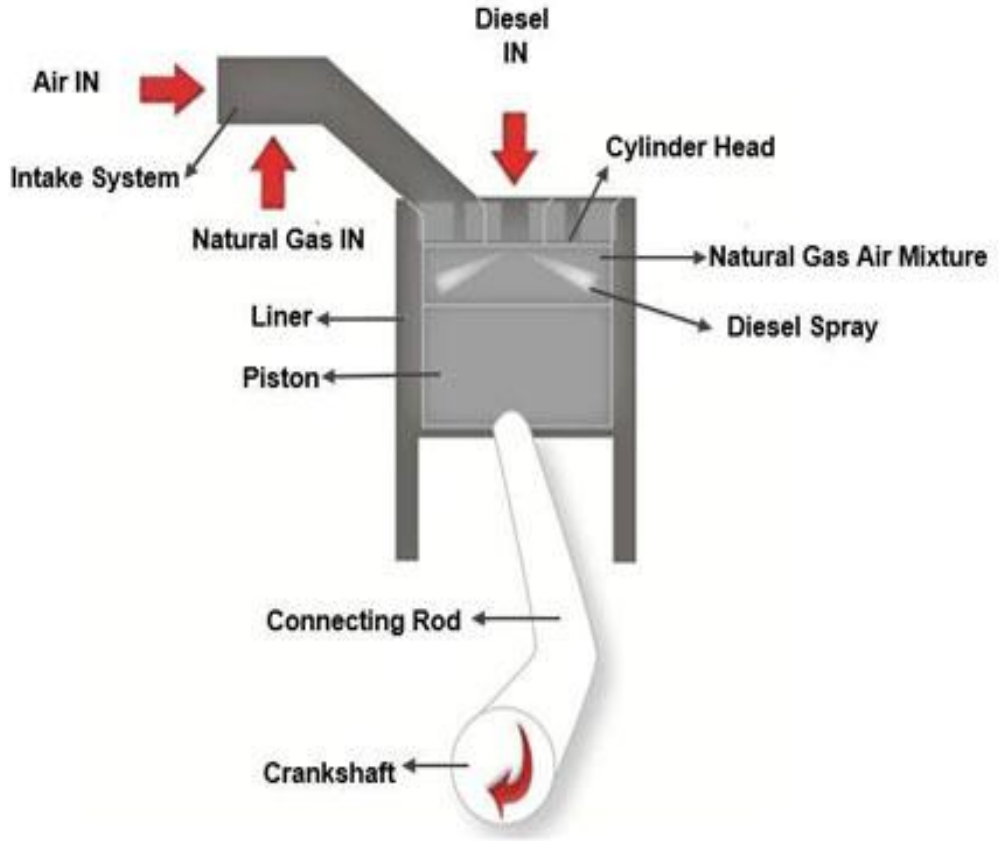
Architecture and Integration

Main Fuel : Diesel

2nd fuel : CNG

When mixing Gas (CNG) with air in a diesel engine during part-load conditions, the objective was to replace a significant portion of diesel fuel



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Experiment and Results

CNG flow RPM Vs Load

Red Zone : CNG **NO**

Green Zone : CNG **YES**

RPM: HI ↓ / LI ↓	0 %		---------- Load ----------					100 %
	8.00	8.00	8.00	0.30	8.00	8.00	8.00	8.00
	8.00	8.00	0.50	0.30	0.30	8.00	8.00	8.00
	8.00	8.00	0.80	0.30	0.30	8.00	8.00	8.00
	8.00	8.00	0.40	0.40	0.40	8.00	10.00	10.00
	8.00	8.00	0.60	0.10	0.30	0.45	8.00	8.00
	8.00	8.00	1.90	0.10	0.10	0.45	8.00	8.00
	8.00	8.00	1.30	0.40	0.45	0.50	8.00	8.00
	8.00	8.00	0.80	0.15	0.45	0.45	8.00	8.00
	8.00	8.00	0.60	0.40	0.50	0.50	0.70	8.00
	8.00	8.00	8.00	0.40	0.40	0.40	0.60	8.00

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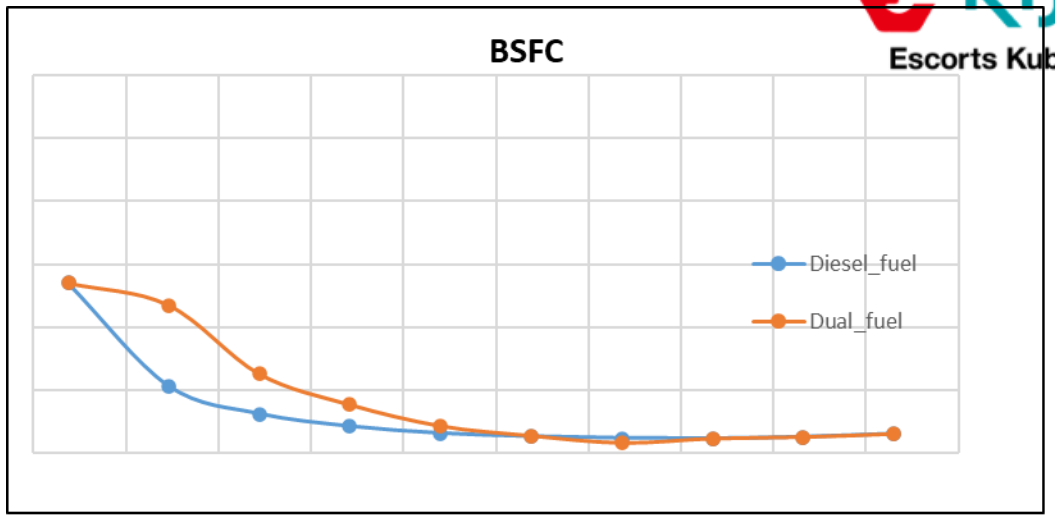
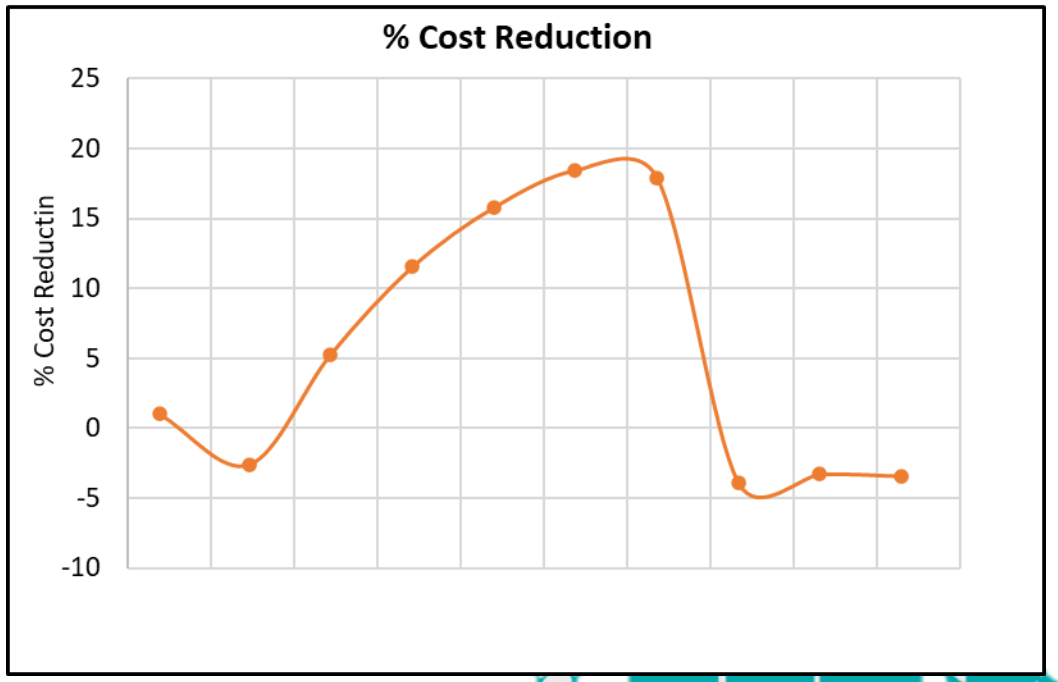
Experiment and Results

Experiment was performed on Mechanical Trem 3A engine.

Objective was to ensure no change in Max power out put.

There was no challenge of emission in dual fuel mode.





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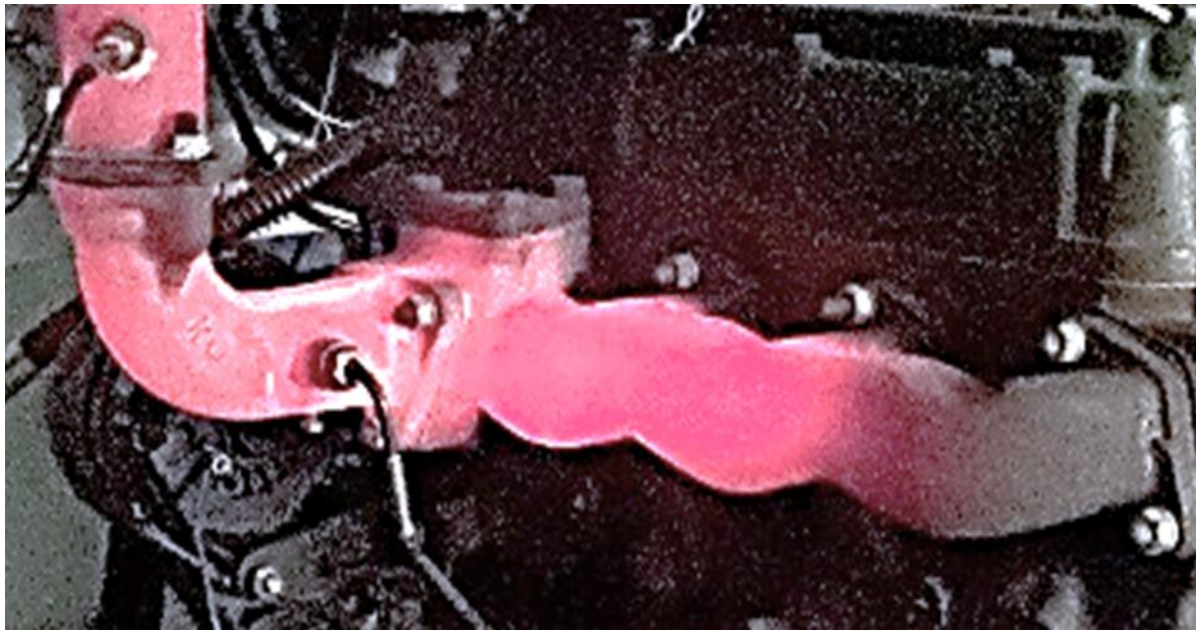
Challenges

Control the gas qty to maintain Exhaust temp within acceptable band.

No CNG mixing @ full Load

Packaging of gas cylinder & KIT Parts



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MAP	Operating Map							
	°C							
	130	170	200	350	450	480	500	630
2200	No flow	No flow	No flow	0.40	0.40	0.40	0.60	No zone
2000	Hunting	Hunting	0.60	0.40	0.50	0.50	0.70	No zone
1900	Cost loss	Cost loss	0.80	0.15	0.45	0.45	3.50	temp rise
1700	temp drop	Cost loss	1.30	0.40	0.45	0.50	3.00	temp rise
1500	temp drop	Cost loss	1.90	0.10	0.10	0.45	temp rise	temp rise
1400	temp drop	Cost loss	0.60	0.10	0.30	0.45	temp rise	temp rise
1300	temp drop	Cost loss	0.40	0.40	0.40	Cost loss	temp rise	temp rise
1200	temp drop	Cost loss	0.80	0.30	0.30	Cost loss	temp rise	temp rise
1100	temp drop	Cost loss	0.50	0.30	0.30	Cost loss	No flow	temp rise
675	temp drop	temp drop	No flow	0.30	No flow	No flow	No flow	temp rise

Conclusion

Map shows potential example of cost reduction zone highlighted in green color (differ engine to engine & case to case).

Hence, Dual fuel is having potential to reduce operating cost for farmers.

THANK YOU

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