RESEARCHERID
THOMSON REUTERS

[Jadhav * *et al.*, 7(6): June, 2018]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

CASE STUDY OF FUEL TANK DESIGN & FIELD FAILURE ANALYSIS FOR INDIAN COMMERCIAL VEHICLE

Kiran Jadhav[*1], Rahul Joshi[2] & Dr Pradip Kumar Patil[3]

[*1]PG Scholar, Department of Mechanical Engineering, S.V.C.E., Indore (M.P), India

[2&3]Assistant Professor, Department of Mechanical Engineering, S.V.C.E., Indore (M.P), India

DOI: 10.5281/zenodo.1282859

ABSTRACT

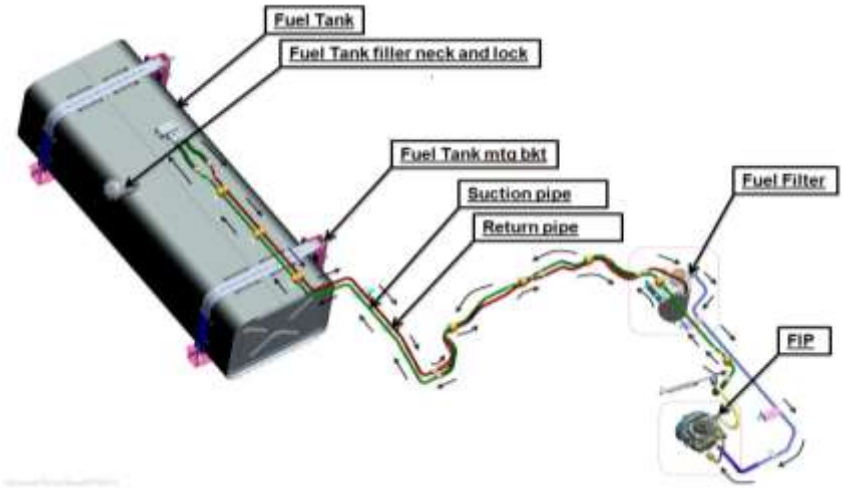
This Case study has developed a comprehensive method to minimize Rust formation on Diesel fuel Tank coating surface & its effects by using ALSi sheet and field failure analysis by using testing, validation to find out Root Causes.also concept design & packaging Double fuel tank after E-commerce segment study.

The aims of this project are mainly cover the General, Technical & Dimensional specification, safety concern of fuel tank assembly, Concept 3d cad modeling, calculation, 3D CAD simulation, fuel tank manufacturing Process sequence chart, tentative process costing and its practical field failure analysis. The Research is mainly concerned to compare metallic fuel tank with diffrant coating Surfaces like GA & Alusil for rust formation study.This project applies to commercial vehicles segment of automotive industry consisting mainly of bus & truck segment. And also covers the various study To get insight on underlying segment behaviour, Product usage, Product Performance in E-Com segment and exploring the product opportunities with additional fuel capacity that is win-win E-Com Segment customer.

Keywords: Fuel Tank, Double fuel tank , E-commerce,Alusil,rust.

I. INTRODUCTION

A fuel tank acts as a reservoir for fuel & has a secondary function of Cooling of the fuel. The design of a fuel tank is very important for vehicle performance Prospective & safety concern. fuel tank is a safe container for flammable fluids. Though any storage tank for fuel may be so called, the term is typically applied to part of an engine system in which the fuel is stored and propelled (fuel pump) or released into an engine. Fuel tanks range in size and complexity from the small plastic tank of lighter to the multi-chambered cryogenic Space Shuttle external tank.



Fuel Circuit from Fuel Tank To Fuel Filter

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

II. MATERIALS AND METHODS

Case study-I

Avoid Rust formation on Diesel fuel Tank coating surface & its effects by using ALSi sheet –

ALSHEET is cold-rolled steel that has been hot-dipped in an aluminum/silicon alloy. It offers the attractive surface of processed steel sheet that simultaneously affords some of the features of aluminum, such as resistance to corrosion, attractive appearance, coupled With superior heat resistance and heat reflection, cold-rolled steel's mechanical attributes and other physical characteristics. We have use hot-dip aluminum-coated steel sheets for fuel tank test.

Test Objective: To compare metallic GA & Alusil coated fuel tank for rust formation on coating surface.

Specification of The Fuel Tank

Two tank made one with GA and 2nd with Alusil Coted tank.

Parameter	Value
GA	415 liters Gatiman
Alusil	415 liters Gatiman

The following steps are used in the test procedure

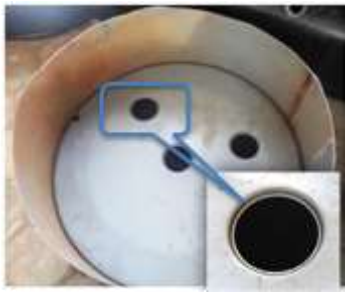
1. Both Tank filled full of capacity with water & kept for two Months in open atmosphere.
2. Fuel level sensor and fuel cap not used in tank.

Evaluation Criteria:

There should not be rust formation on fuel tank inner surface after the predefine test criteria.

III. RESULTS AND DISCUSSION

After two Months removed water from both tanks & cut tank from centre by using Cutter.Rust observed on Baffle plate pocket & Heavy rust observed on inner surface of GA coated fuel tank but very miner rust observed on Alusil coated tank. hence ALSHEET affords better corrosion resistance than galvanized steel sheet under various conditions.

Alusil Fuel Tank Cut section	GA Fuel tank Cut Section
	
No rust on Alusil coated.	Rust observed on Baffle plate pocket of GA coating.
	
No rust on inner surface	Heavy rust observed on inner surface of GA coated fuel tank as compare to Alusil.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Rust formation on fuel tank inner surface

Case study II

E-commerce segment Study to introduce Double fuel tank.

The E-Commerce sector has seen unprecedented growth in 2015-17 with an expected growth of 35% CAGR over the next 5years and this trend is likely to boom in the coming years with the advent of mobile commerce. Consumers today are purchasing nearly everything online, from antiques to furnishings and grocery to electronics. E-Commerce is increasingly attracting customers from Tier 2 and 3 cities, where people have limited access to brands but have high aspirations. According to E-Commerce companies, these cities have seen a 30% to 50% rise in transactions.Logistics in e-commerce are customized to specific product ordering, inventory management, warehousing, distribution and billing, packaging, labelling, shipping, cash on delivery, payment, product return & exchange, and much more. Their huge network of distribution warehouses is strategically placed across. Some established e-retailers create their own logistics while some depend on third party. 3-4 years back, for the transportation of these goods there was high dependency on air movement. Now this has gradually shifted towards surface cargo (road movement~60%),due to limited volume & low operating economics. Customer preferences are shifting towards Completely Customized Transport Solutions exclusive for E-Commerce perspective which comprises of enhanced product value proposition in terms of Higher TAT, Cargo Safety, TCO, and Reliability backed with better service packages and support by OEM's. Mostly,20ft, 24ft & 32ft vehicles are used for "Delivery hub "to "Delivery hub" (Line Haul Movement), Market place to delivery hub mostly 14ft, 17ft vehicles are used, Last Mile Delivery and Reverse Logistics(To customer) SCVs, 2 wheelers, 3 wheelers, SCV or Maruti Omni & Eeco's are used.

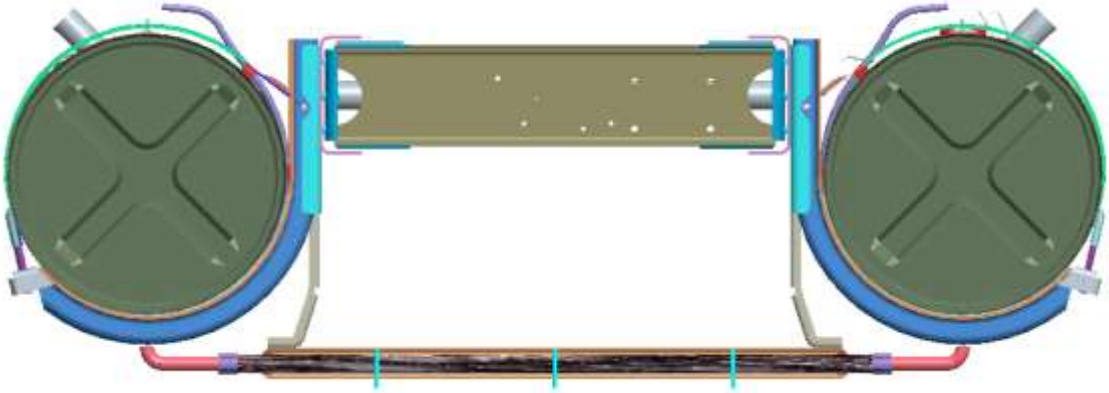
Objective: To get insight on underlying segment behaviour, Product usage, Product Performance in E-Com segment and exploring the product opportunities with additional fuel capacity that is win-win E-Com Segment customer. To equip sales team to pitch and offer right products & services in the segment and to provide feedback to product development for current and new product developments.

Feedback from Customer : Fuel tank capacity has evolved as one of the biggest challenges for E-commerce players because.
Longer Route from OEM to Deliver hub & Deliver hub to Customer.
State to state Different fuel rate due to tax.
Increased incidences of theft.
Difficult to FE (Mileage) calculation due to Number of time fuel filling.

Deaign to full fill cutomer requermnt:

One 395 Lilts fuel tank design & its packaging already available in vehicle. I have take challenge to package one more 395 Lilts fuel tank in same frame which is very difficult due to less space, heavy load. Below are the parts to package double fuel tank.

1) 395 Litres Fuel Tank LH/RH :- It is the container on the automotive for storing liquid fuel to be used by the power unit of the automotive. It includes all fitting units which are integral with the storage unit.

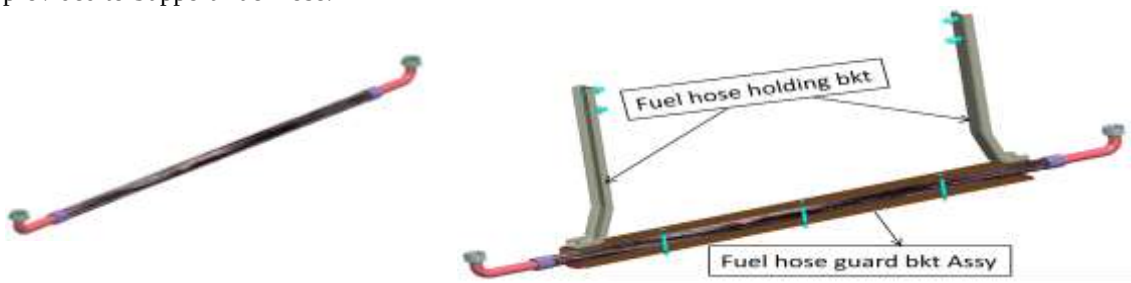


Fuel tank Assy 395 ltrs

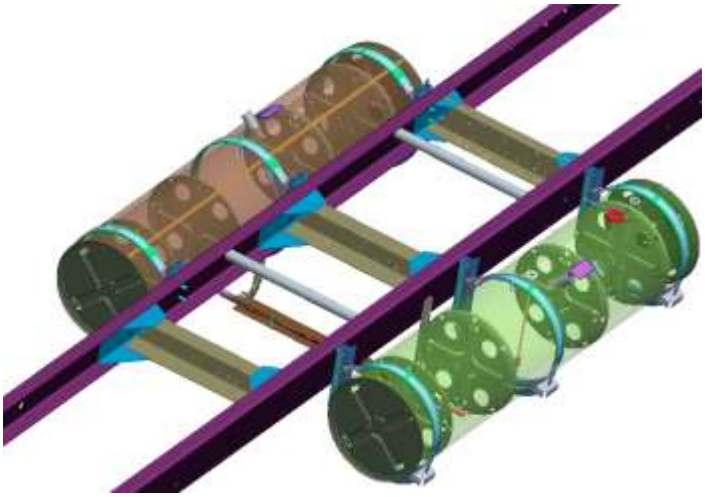
2) Pipe connection Assy double fuel tank: The rubber hose pipe with crimp bend routings which connects in between two fuel tank.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

3) Fuel connection Assembly:I. Fuel hose guard to protect fuel pipe from stone & sludge.II. Tow bracket provided to Support Fuel hose.



4) Double fuel tank installation: - Fuel tank mounted on Both LH &RH side long member. One cross member & Stiffener added to factor of Safety & frequency.



Double fuel tank installation on frame

Case study III

Avoid Corrosion inside the empty fuel tank at Storage location.

Corrosion occurs in side the fuel tank due to direct contact with atmospheric air when fuel tank is empty at storage location befor use.

Corrective Action Plan:-VCI (Vapors corrosion inhibitors) –Treatment of fuel tank to avoid corrosion of fuel Tank.VCI-512 pouch (powder) of Suprabha make to be hang inside fuel tank

S.r.	Type of VCI oil	To be used for	Landed rate of VCI oil / litrs.
1	VCI – 401	Flushing	838.79
2	VCI – 415	Spray By Gun	170.84
3	VCI – 512	(Pouch) Powder	1304.80

IV. CONCLUSION

1. ALSHEET affords better corrosion resistance than galvanized steel sheet under various conditions. Rust observed on Baffle plate pocket & Heavy rust observed on inner surface of GA coated fuel tank but very miner rust observed on Alusil coated tank.
2. Increased Fuel capacity has evolved as one of the biggest game changer for E-commerce players because

- No multiple fuel filling required for Longer Route from OEM to Deliver hub & Deliver hub to Customer.
- No worry about State to state Different fuel rate due to taxation.
- Reduced incidences of theft.
- Easy to FE (Mileage) & GI calculations

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

3. After resolving rusting issue fuel filter and Fuel injaction pump life has been improve drastically.

V. ACKNOWLEDGEMENTS

We express profound sense of gratitude to **Dr.R.S.Tare, Principal**, Swami Vivekanand Group of Institute, Indore (M.P.) who was involved right from the inception of ideas to the finalization of the work. We are especially thankful to **Dr. Sanjay Purkar,** and **Dr. A. I. Khandwawala** for their kind support and coordination to complete this dissertation work.

VI. REFERENCES

[1] IS: 12056 -1994-Indian Standard Recommendations For Safety Requirements for Fuel Tank Assembly Of Automotive Vehicle.
[2] IS: 14681-1999-Automotive Vehicles-Fuel Tanks For Two or Three Wheelers.
[3] IS: 513-1994 - Indian Standard Cold Rolled Low Carbon Steel Sheets & Strips –Specification.
[4] IS: 12313-2002-04-Specification For Hot-Deep Terne Coated Carbon Steel sheets.
[5] IS:6745-1972-Indian Standards method For Determination Of Mass Zinc Coating on Zinc Coated iron & Steel articles.
[6] IS: 15547- Automotive Vehicles-Plastic Fuel Tanks For Four Wheelers.
[7] ASTM B117-Salt Spray Testing.
[8] CMVR- Central Motors Vehicles Regulations.
[9] ARAI-Automotive Research Association of India.
[10] IS/BIS/ISO/ASTM/ ASTM A90 or JIS HO41.
[11] Industrial Visit.
[12] http://www.medianama.com/2015/01/223-outlook15-niche-e-commerce/ The Papers, Netherlands-based leading independent source of news and Intelligence for professionals in the global payment community
[13] http://www.business-standard.com/article/companies/breakthrough-year-for-e-commerce-115011800744_1.html
[14] http://www.forbes.com/sites/morganhartley/2013/01/24/the-growing-pains-of-indian-e-commerce-what-you-need-to-know/
[15] IBEF: The rise & rise of e-commerce in India (Jan 2013)
[16] Pwc: E- Commerce in India Accelerating growth ASSOCHAM: Evolution of e-commerce in India
[17] E&Y: Rebirth of e-Commerce in IndiaDeloitte, ASSOCHAM: Future of e-Commerce Uncovering
[18] http://www.nssmc.com (Nippon steel & sumitomo metal).

CITE AN ARTICLE

Jadhav, K., Joshi, R., & Patil, P. K., Dr. (2018). CASE STUDY OF FUEL TANK DESIGN & FIELD FAILURE ANALYSIS FOR INDIAN COMMERCIAL VEHICLE. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY, 7*(6), 174-178.