# DESIGN OF MOBILE PETROL PUMP

*BY*

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*UNDER THE GUIDENCE OF*

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**MANOJ DUBEY ( MIDCO )**

*SPONSERED BY*

Midco

# About the sponserer




# WHY MOBILE PETROL PUMP ??

No easy access to petroleum in rural areas..

there are lot of farm equipment which needs fuel but fuel is away in cities.

Instead bringing vehicle to fuel, let gas station bring the fuel to vehicles and equipments lying around.

This is not yet tried in India

# Possible applications of mobile petrol pump

1. Supply of fuel at the farm - pumps and remote areas where power is fuel based .
2. Industries who has their own diesel power gen-sets.
3. Vehicles on the road who needs immediate fuel can make a phone call to mobile unit.
4. As a mobile petrol pump for villages covering two-three villages and having a certain duration in week or so at particular place for petrol dispensing service.
5. As a kerosene dispenser for villages.

# Issues that needs to be consider

## FUNCTION STRUCTURE

**MOBILE PETROL PUMP**

### dispensing to customer

- Parking the vehicle.
- Dispensing the petrol/diesel.
- For remote pipe pulling pipe or filling a can for delivery.
- Checking the level in the fuel tank.
- Carrying money transactions and giving bills.
- Arrangement for filling of the cans or packing for small quantity.
- Safety check, no smoking and vehicles are turn off.

### Refilling The tanks

- If empty check.
- Park the vehicle at refilling station.
- Refilling from either pump ( inbuilt in vehicle or at station.) or gravity feed.
- For small tankers, automatic fuel shut.
- Refilling for petrol diesel both.
- Safety precautions if it is to be filled at normal petrol pump.

### Traveling

- Get the schedule before starting journey.
- Plan the route..
- Can be pre-packed in polythene and delivered by two wheeler.
- Go to the individual places.
- Careful traveling on village roads.

### Maintenance

- Scheduling of the servicing time.
- Service the transport vehicle.
- Service the tank.
- Service the pump and dispenser unit.
- Arrangement for emergency tool kit

### Manufacturing

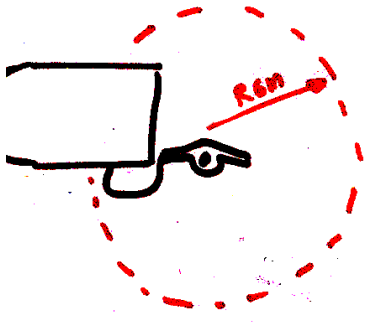
- Manufacturing decision about making petrol and diesel tanker separate.
- Small chassis for petrol tankers.
- Big chassis for diesel tankers.
- Combined tanker with petrol and diesel.
- Anticorrosion and proper materials for tanker.
- Integration of units from existing pumps.
- Minimum tooling cost for manufacturing the unit.

### Economy

- The final delivery cost as we are spending fuel to deliver fuel.
- The combined cost of the mobile unit and other accessories needed.
- Convincing the customer for good business from this unit.

# Discussion with BPCL officers

1. Rules for handling flammable fuels :-

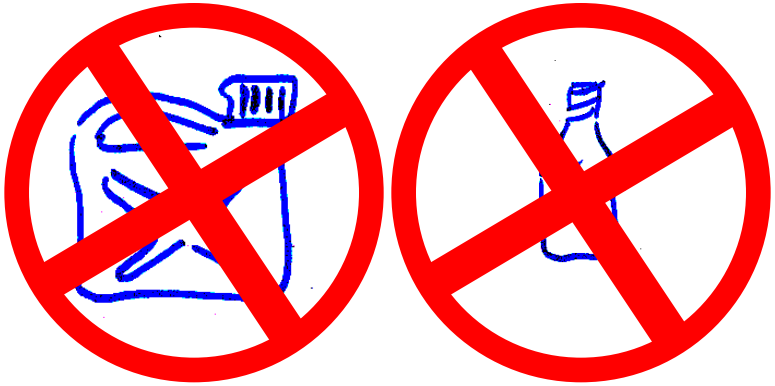



•Minimum six meter radius place are is secured or fenced from the dispensing nozzle.
•Vehicle should not park around electricity pole.

2. Ideal capacity for the tank should be 10kl. 2-3 kl for petrol and 7-8kl for diesel.

3. Fuel Meter needs to be made shock proof.

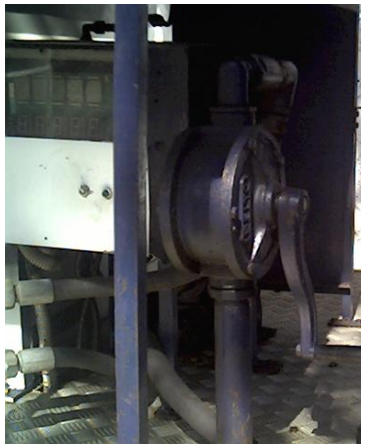
4 Carrying petrol in bottles and cans are highly unsafe and unlawful too.



# Visit to jet airways

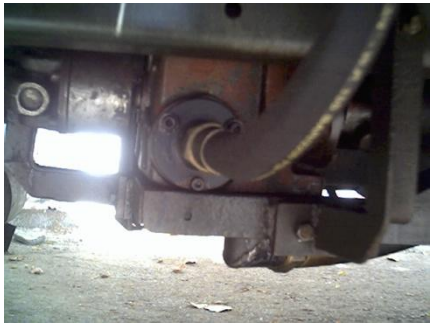
Specially fabricated for dispensing of diesel to various equipment on the airport.

The chassis is TATA 407. the monthly schedule is followed for pump and also there is separate schedule for vehicle maintenance.

The capacity of this bowser is 2600 liters. The daily consumption is about 1200 liters of fuel.

The tank is skid mounted. The pump is located at the middle, near engine. A power for pump is given from the engine gear box.



# Study of other similar products

Water bowsers


Aero plane and fuel bowsers


Oil and petroleum tankers

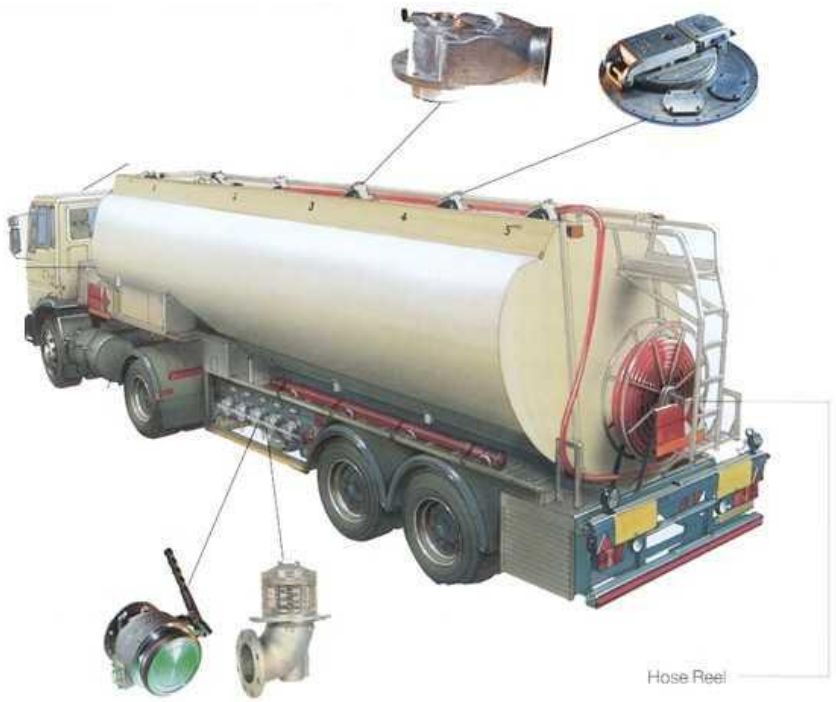

# About similar products…

- All are made for dispensing of large quantity and generally they empty after one trip.

- Most of them are built on a separate chassis and then toed to a vehicle for carrying.

- Fabrication details can be borrowed from these products.

- Lot of them use standardized prefabricated tanks available in the market



# Visit to fabricators

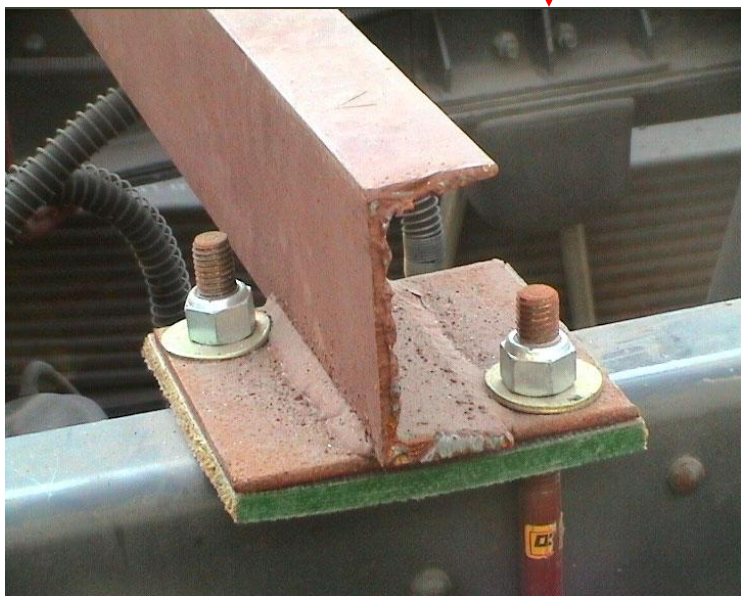
In order to study the constructional details of the separately built vehicles, visit were made to two fabricators.

1. Tex-fab fabricators.

   - The details about tanker fabrication were learnt here. He gave the drawing for a standard tank.

2. Sigma autocrafts pvt. Ltd.

   - details about separately built vehicles fabrication were learned.



# Visit to villages

Places visited :

Manakapur,

Hupari,

Rendal

New learning

•@ 25 tractor and 200-300 two wheelers in a village of population 10000-12000.

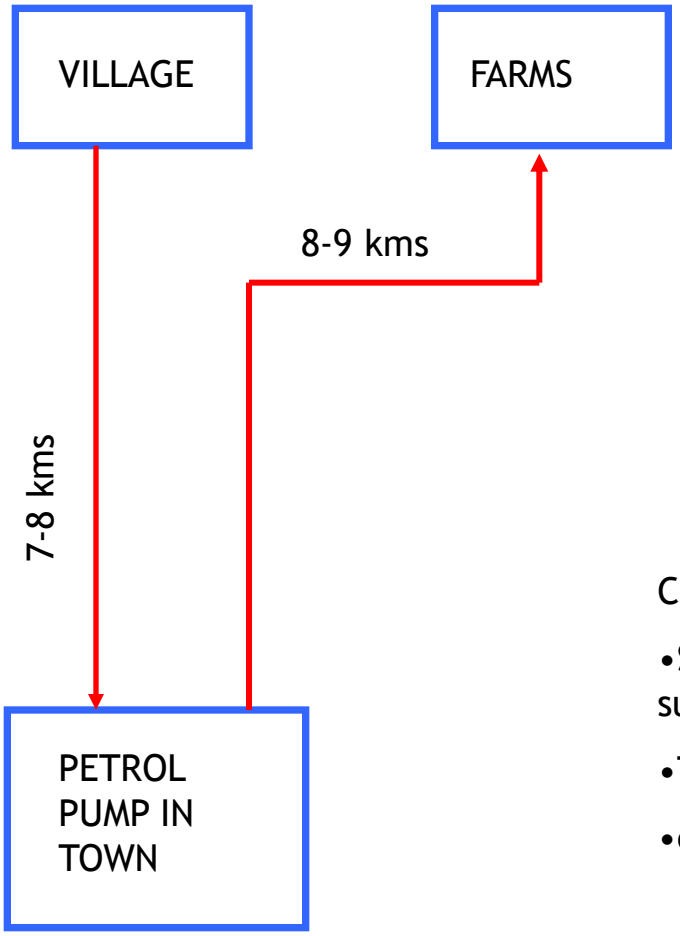
•Each tractor consumes @ 20-25 litres of diesel per day and vehicles consumes 1-2 litres of petrol.

•Everyday buys the fuel in order to keep low investments.

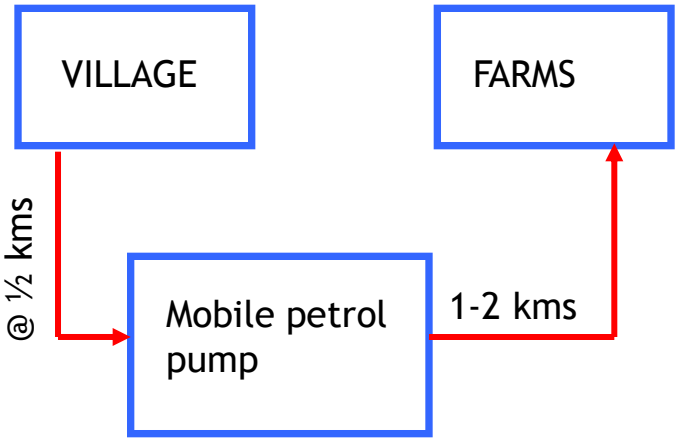
•Also the petrol is sold as a red oxide thinner in ordinary PET bottles.

# Fuel purchase models

**EXISTING SCENARIO**




**SCENARIO WITH MOBILE PUMP**




Cutting down distance will help in

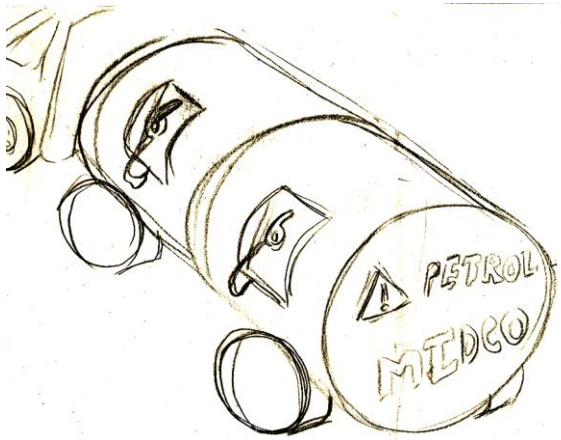
- Saving of the fuel to travel to city for diesel vehicles such as tractors.
- Time saving to bring the fuel as its everyday activity.
- convenience

# Design brief

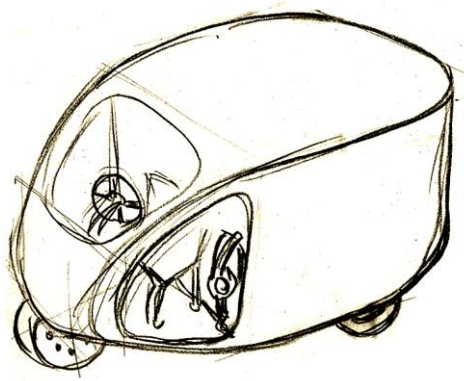
Design a mobile gasoline dispenser satisfying following requirements.

- The operators ease and safety should be ensured.
- Design should follow all the safety rules and regulations.
- Both fuel dispensing arrangement must be provided
- 9 KL capacity. ( 3 kl petrol and 6kl diesel.)
- The dispenser vehicle must be integrated with fuel meter and pump assembly.
- The organization of the product should be such that it has an integral look.

# Few initial rough concept before the brief

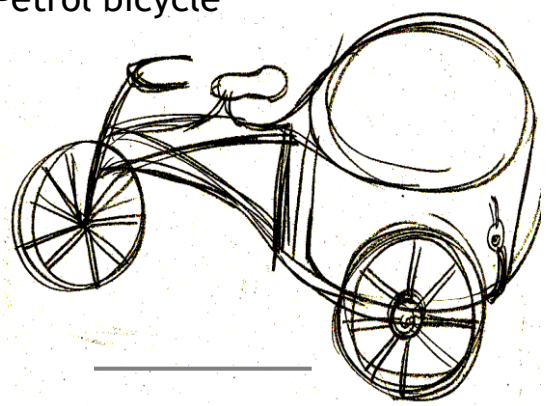


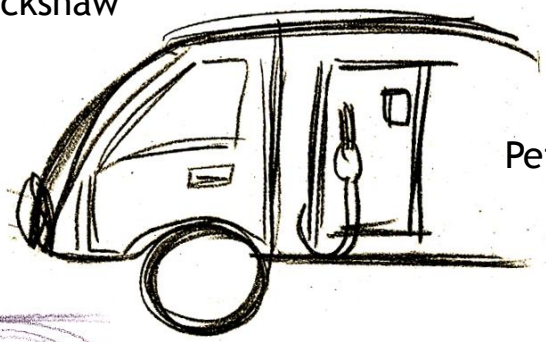

Two modular cylinders



Petrol auto rickshaw

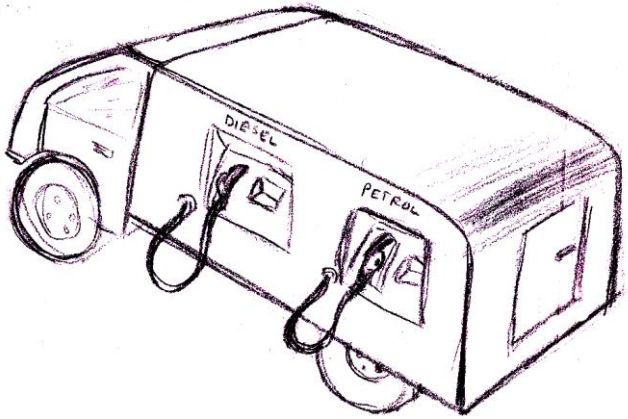
Petrol bicycle

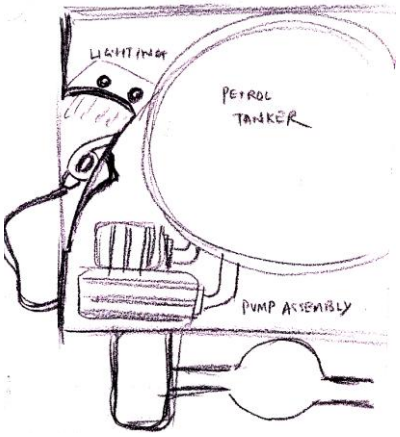




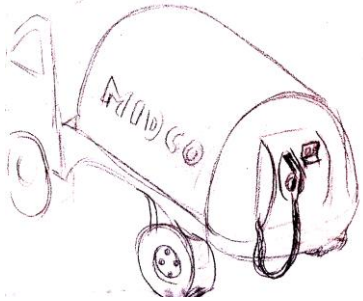
Petrol van

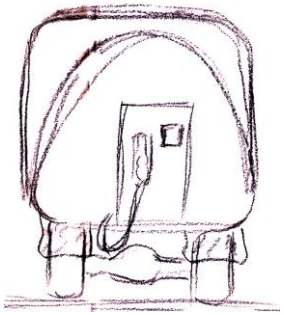
Petrol/diesel truck



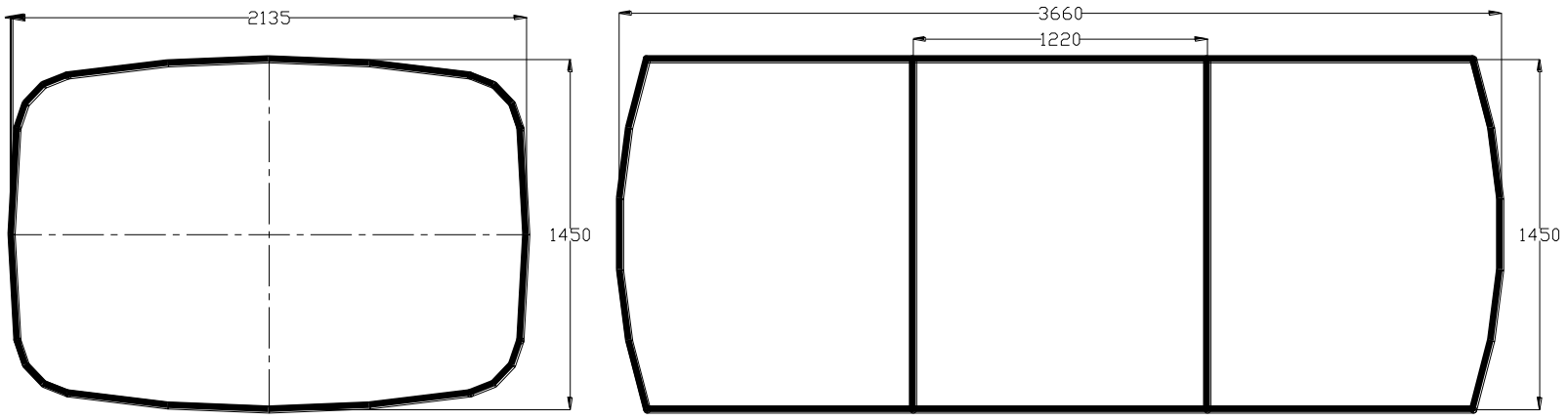




Petrol truck



# Finalizing the tank dimension and selection of chassis




**SPECIFICATIONS**

- overall capacity of the tank = 9000 litres
- length of the tank = 3660 mm
- height of the tank = 1450 mm
- width of the tank = 2135 mm
- compartments = 3

- Diesel capacity = 6000 litres. ( two compartments)
- petrol capacity = 3000 litres (one compartment)
- weight of the fuel = @ 8500 kg

# Finalizing the tank dimension and selection of chassis

**Main specifications for chassis**

Max. Permissible RAW = 10200 KG
Overall length = varies as per model
Front track = 1933 mm
Rare track = 1809 mm
Wheel base = 4225 mm
Overall width = 2434 mm.

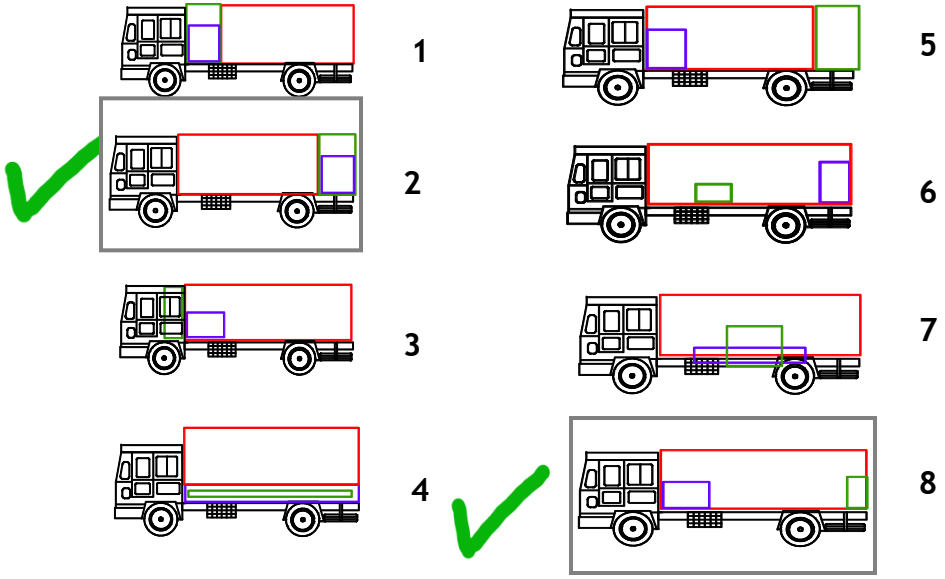
**Selection criteria for chassis:**

- weight of the tank with fuel.
- dimensions of the tank.




# The selection of configuration

| the criteria | Config. 1 | Config. 2 | Config. 3 | Config. 4 | Config. 5 | Config. 6 | Config. 7 | Config. 8 |
|---|---|---|---|---|---|---|---|---|
| 1) ease of dispensing | 2 | 4 | -2 | 2 | 4 | 3 | 2 | 4 |
| 2) maintenance ease | -2 | 4 | -2 | -2 | 2 | 2 | 2 | 2 |
| 3) the manufacturing suitability | 0 | 4 | 0 | -2 | 2 | 0 | 0 | 3 |
| 4) Standardization and integration of pump and metering assembly with tank. | 4 | 4 | 2 | 0 | 4 | 4 | 0 | 3 |
| 5) Strength and structural considerations | 0 | 4 | 4 | -2 | 2 | 0 | 1 | 3 |
| 6) aesthetics | 4 | 0 | 2 | 0 | 4 | 2 | 4 | 2 |
| 7) ease of attaching accessories | 2 | 2 | 0 | -2 | 2 | -1 | -1 | 4 |
| 8) safety | 4 | 1 | 2 | 4 | -2 | -2 | 4 | 4 |
| **points given** | 14 | 23 | 6 | -2 | 18 | 8 | 12 | 25 |



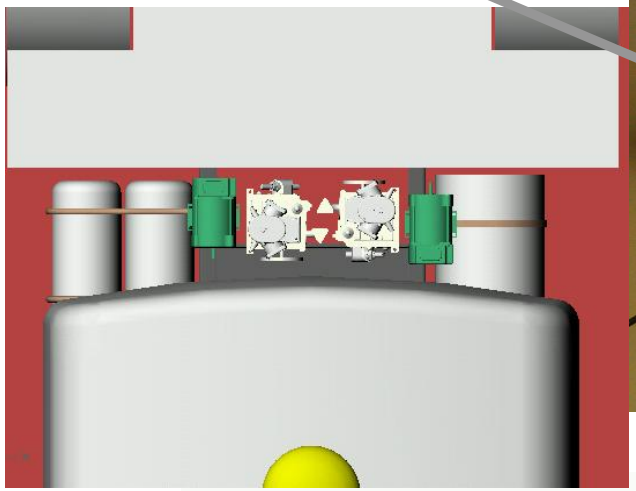

The tank
The pump and metering unit
Nozzle and display with safety equipment

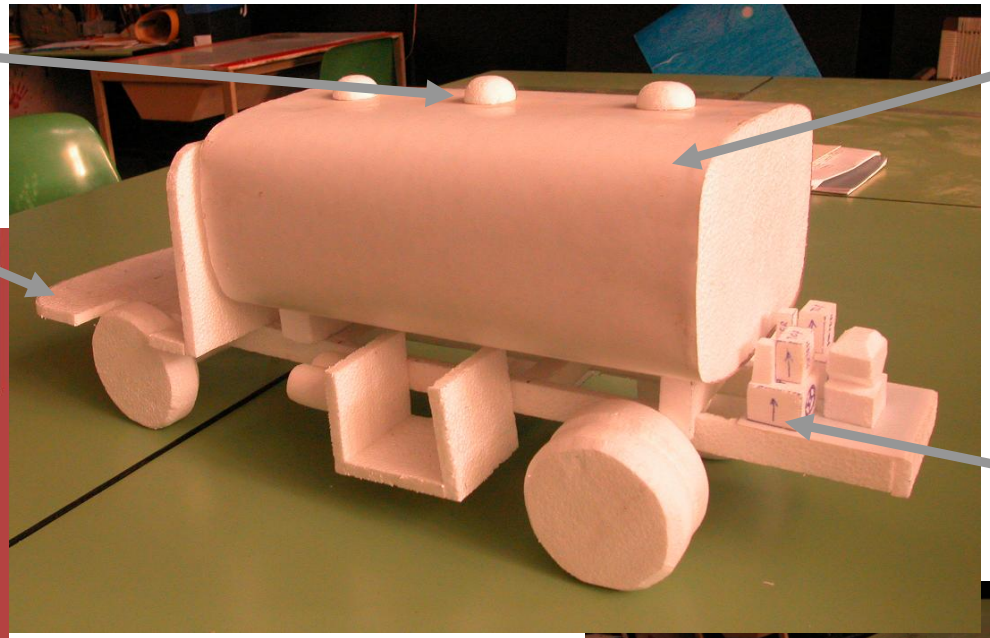
| scale of marking is -10 to +10 | |
|---|---|
| 0 - neutral/don't matters | |
| 2 - fair | minus 2 - disturbing |
| 4 - good | minus 4 - bad |
| 6 - very good | minus 6 - very bad |
| 8 - excellent | minus 8 - destructive |
| 10 - extraordinary | minus 10 - not acceptable |

# Internal product organization

Opening for refilling of tank

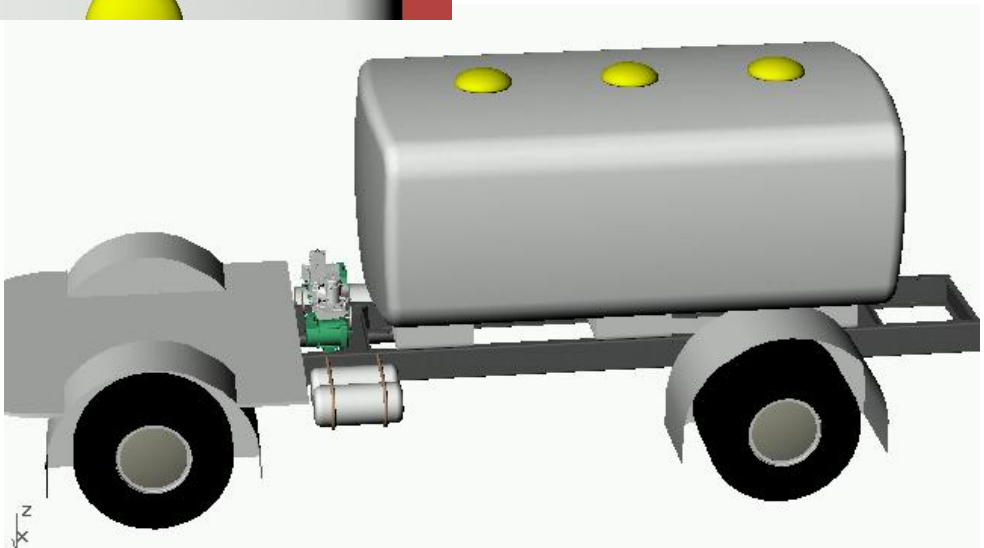
Driver cab with chassis

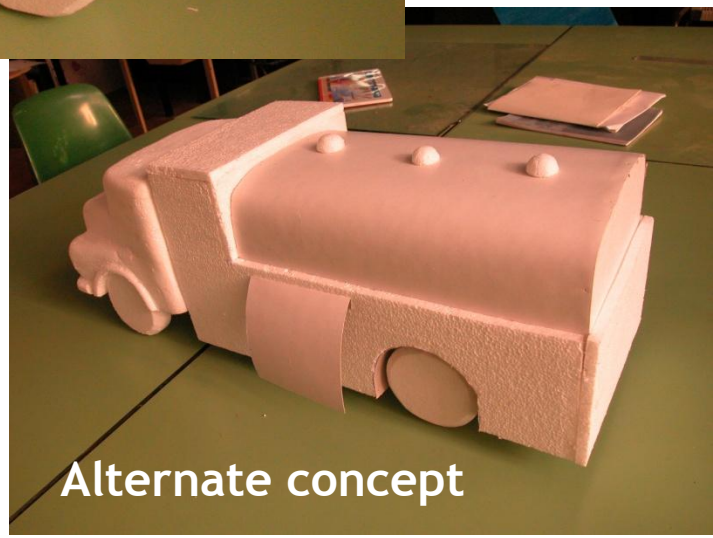




tank

Pump, meter and filter unit





Alternate concept

# The final configuration options

Fig. 1

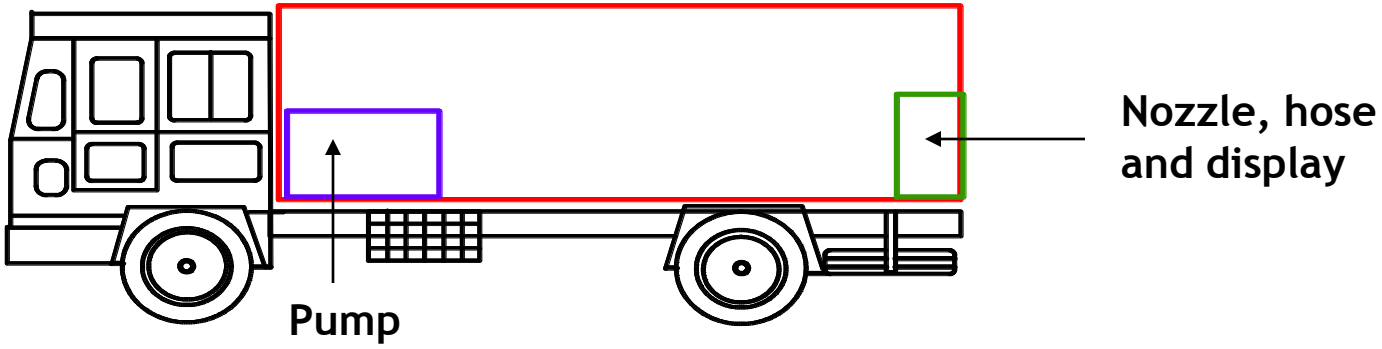
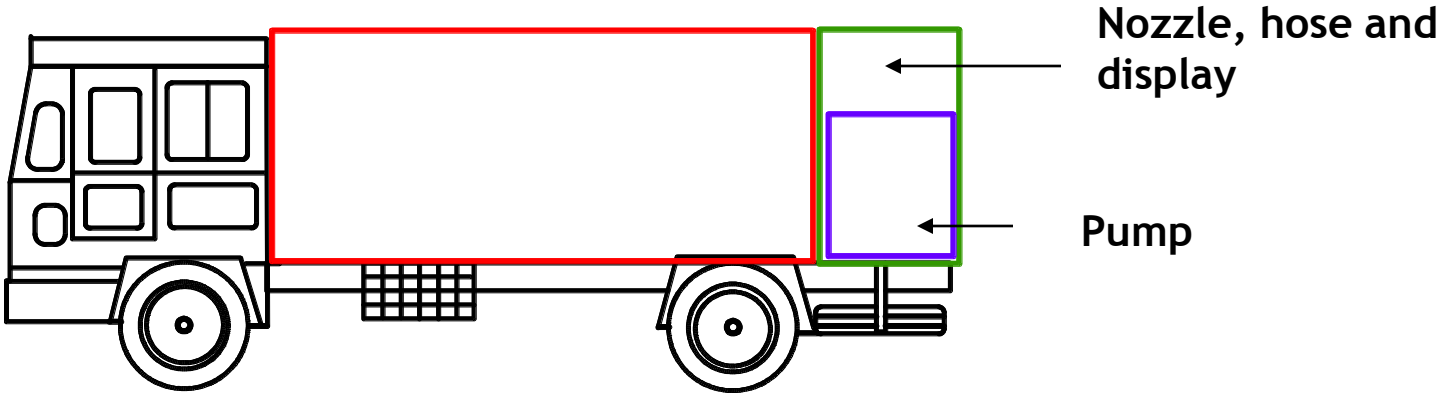



Fig. 2



# The optimum configuration

| | safety | ease- operator and end user | maintenance ease | aesthetics | total |
|---|---|---|---|---|---|
| **safety** | 0 | 5 | 5 | 5 | 15 |
| **ease- operator and end user** | 1 | 0 | 5 | 5 | 11 |
| **maintenance ease** | 1 | 1 | 0 | 5 | 7 |
| **aesthetics** | 1 | 1 | 1 | 0 | 3 |
| **total** | | | | | 36 |

## The Weightage factors for evaluation :-

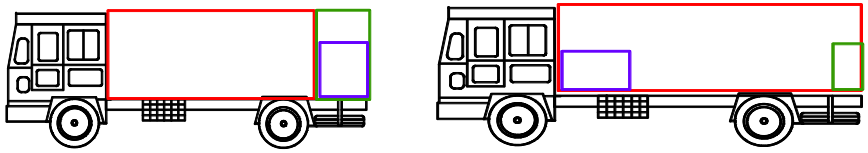
1) Weightage for safety = 15/36 = 0.42

2) Weightage for ease of operator end user = 11/36 = 0.31

3) Weightage for ease of maintenance = 7/36 = 0.19

4) Weightage for aesthetics = 3/36 = 0.08

# The optimum configuration

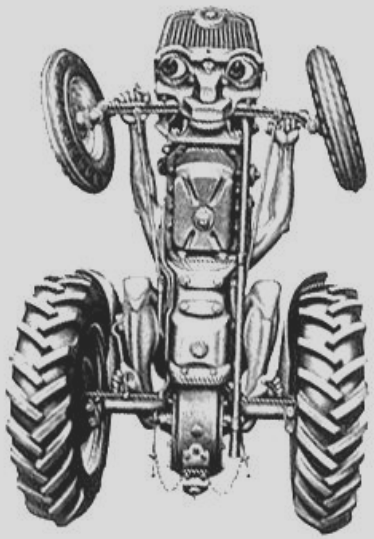


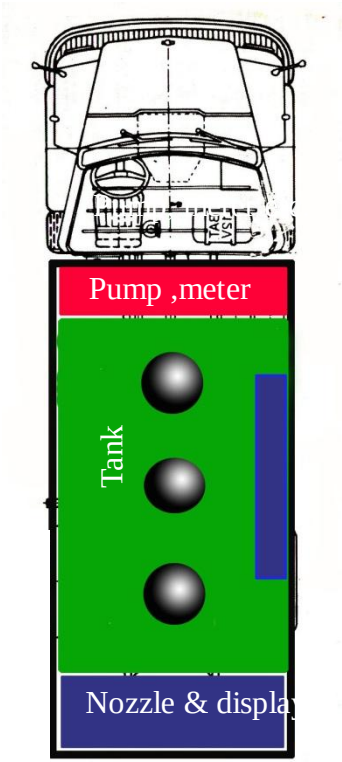
| | pump, meter at the back along with display and nozzle | Pump, meter between tank and driver cabin and display , nozzle at the back | comments |
|---|---|---|---|
| **safety** | 2.1 | 4.2 | Safety is more when display are away from pump |
| **ease- operator and end user** | 1.55 | 3.1 | If the pump comes at back then display height increases. less space for operator interface |
| **maintenance ease** | 0.95 | 0.95 | Pump at the middle can have a separate cabin having access through driver cabin |
| **aesthics** | 0.4 | 0.56 | There in no constraints on the aesthetics treatment of operator interface when pump is at middle |
| **total** | **5** | **8.81** | So the second configuration is accepted |

# The advantages of display and nozzle at back

Layout 1

Road

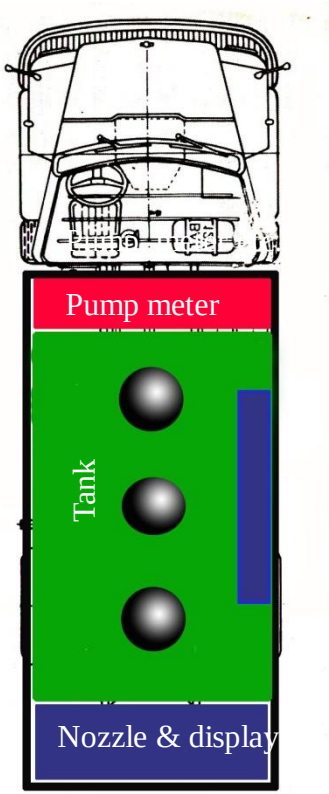





Dispensing to customer vehicle

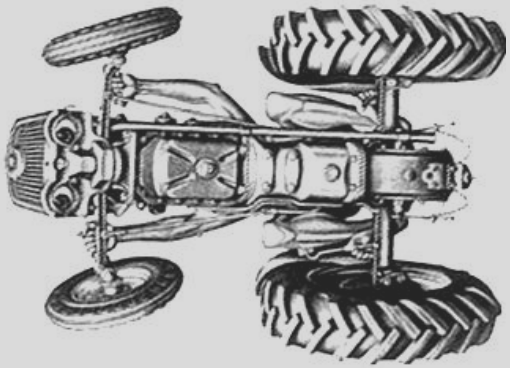
Top view

Layout 2



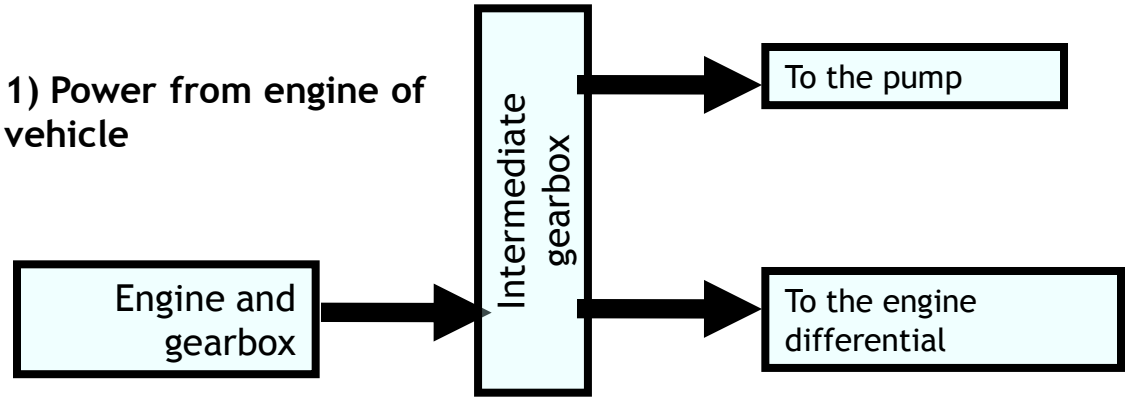

Dispensing to customer vehicle

Road



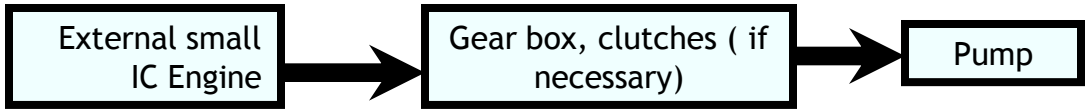
# Power arrangement for pump

**1) Power from engine of vehicle**



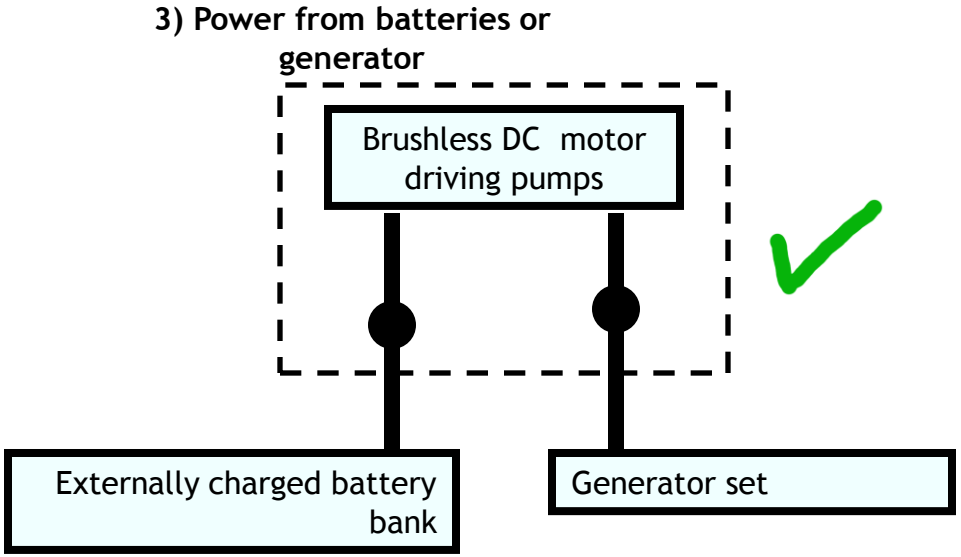

Much more power than the necessary

**2) Power from external engine**




Hot engine exhaust and engine heating can be detrimental.

# Power arrangement for pump

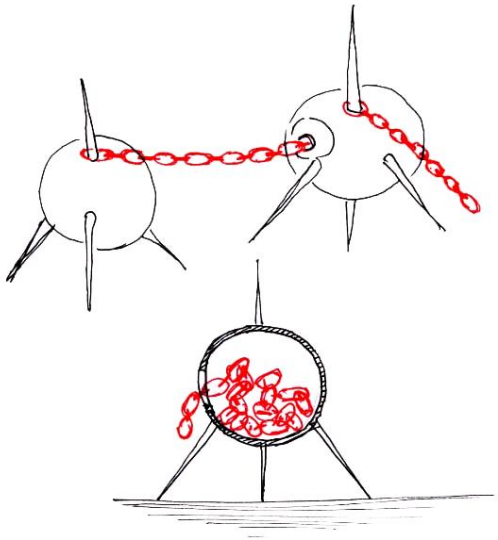



Noiseless, flexibility in location, flexibility in power input brings flexibility in operations

# arrangement for securing the area

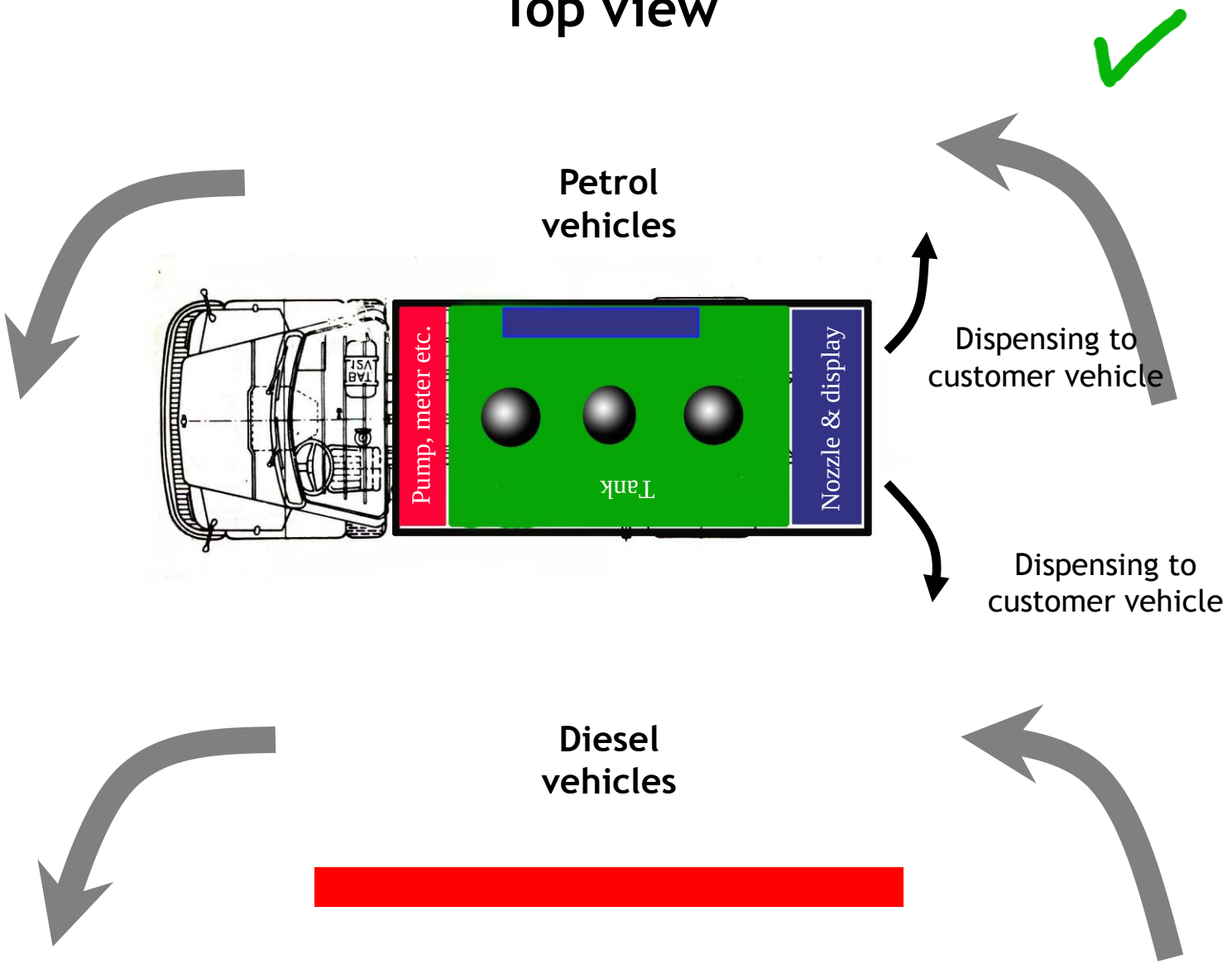
1. The flexible, stackable plastic cones

1. The ball with pointed end rods with arrangement to keep chain in ball.



# arrangement for securing the area

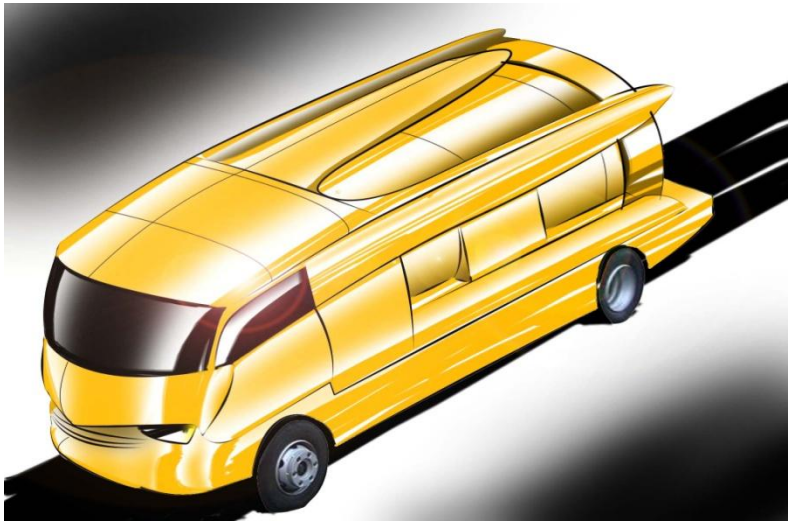
## Top view



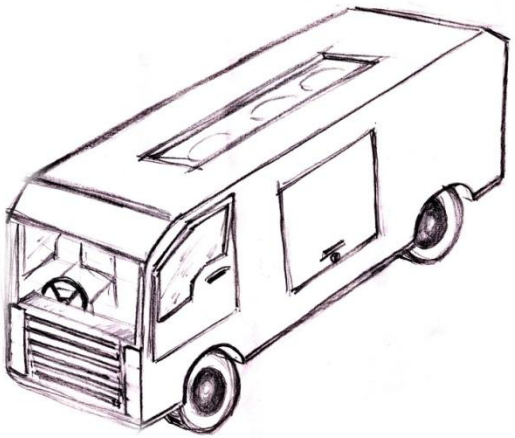
# Product form

1) Open tank vehicles

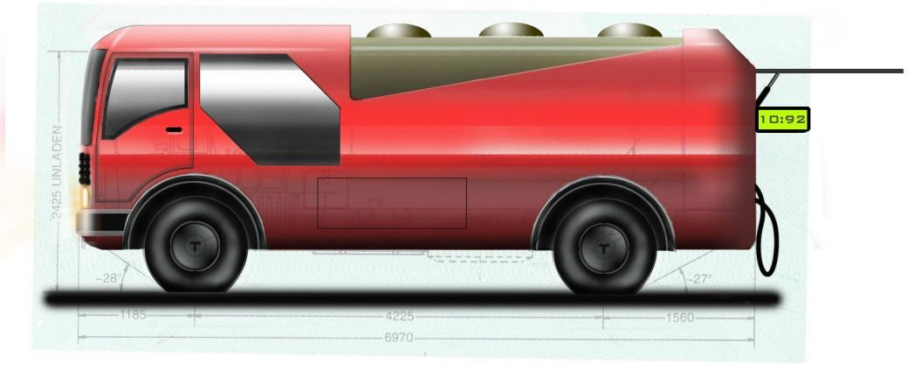

2) semi-enclosed tank vehicles ✓

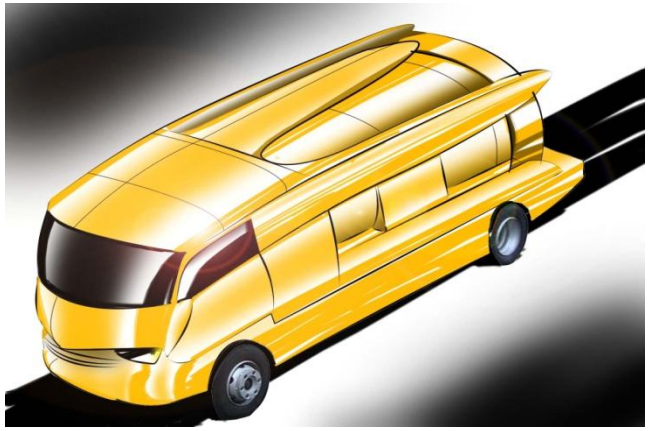


2) enclosed tank vehicles

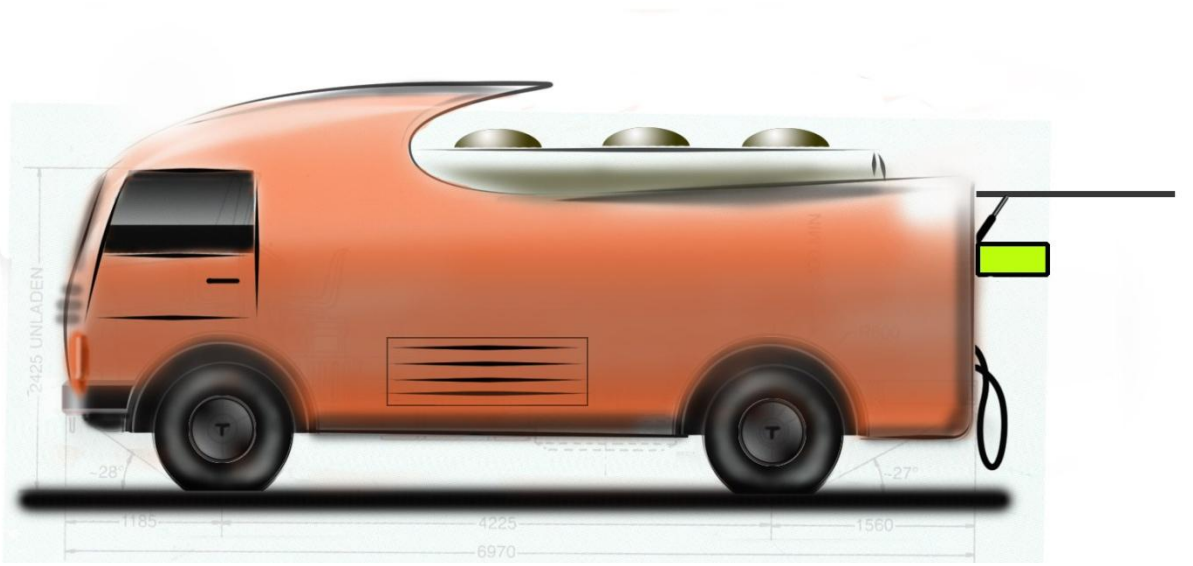


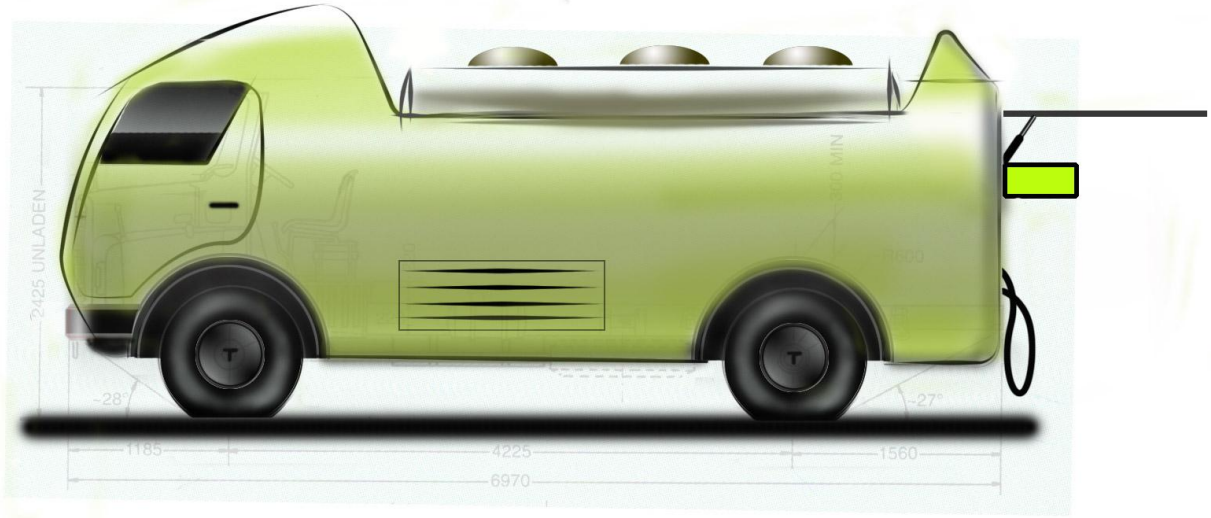
# Product form – options



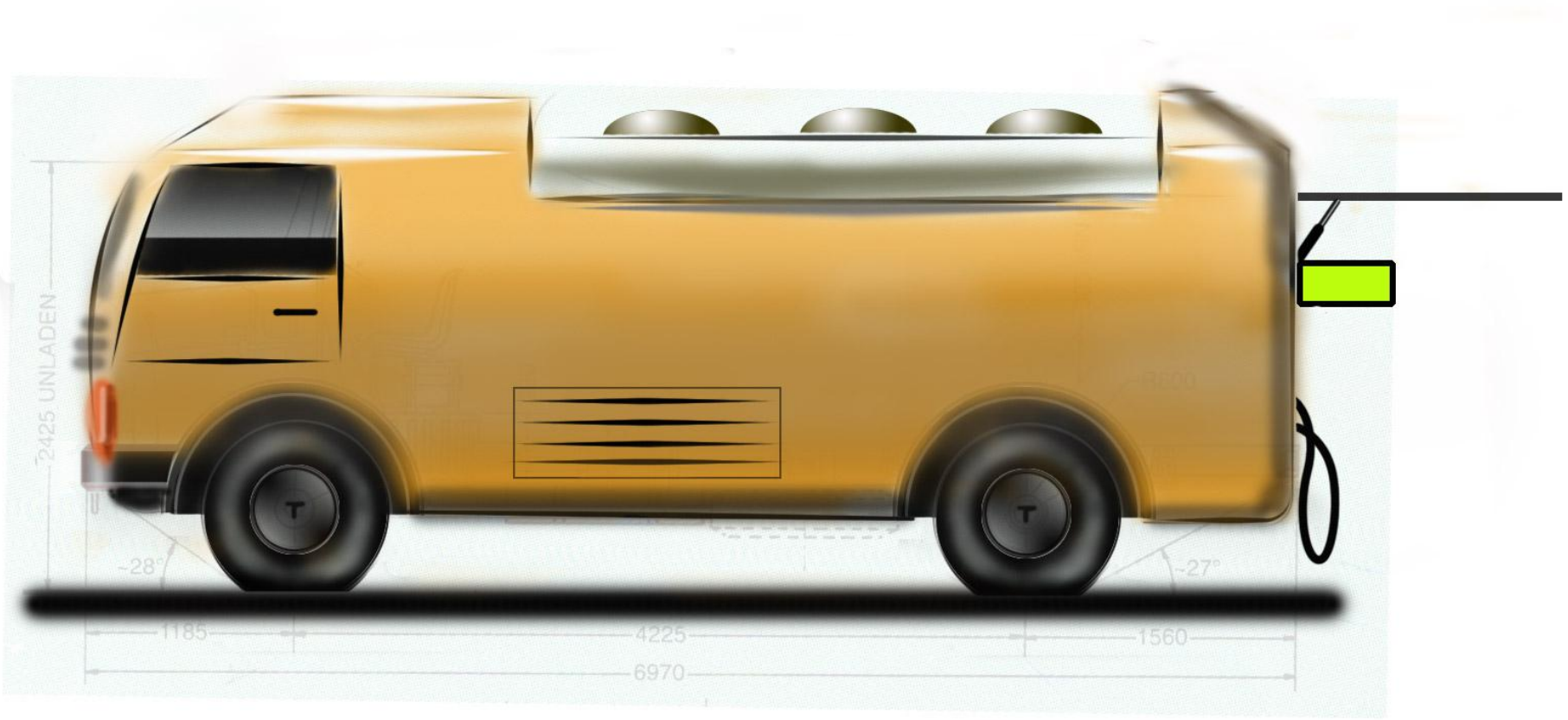



# Product form – Finalization



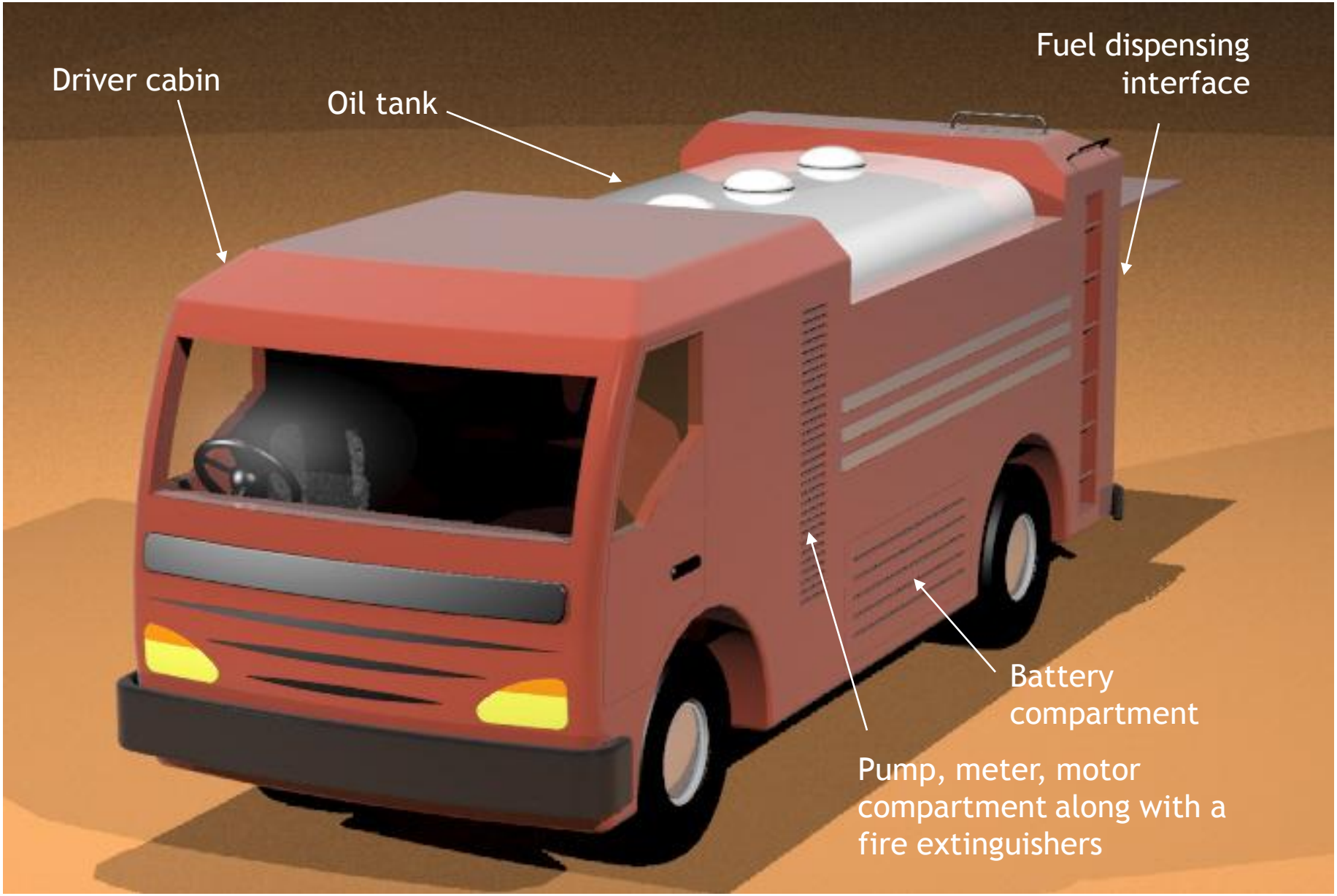



# Final Concept

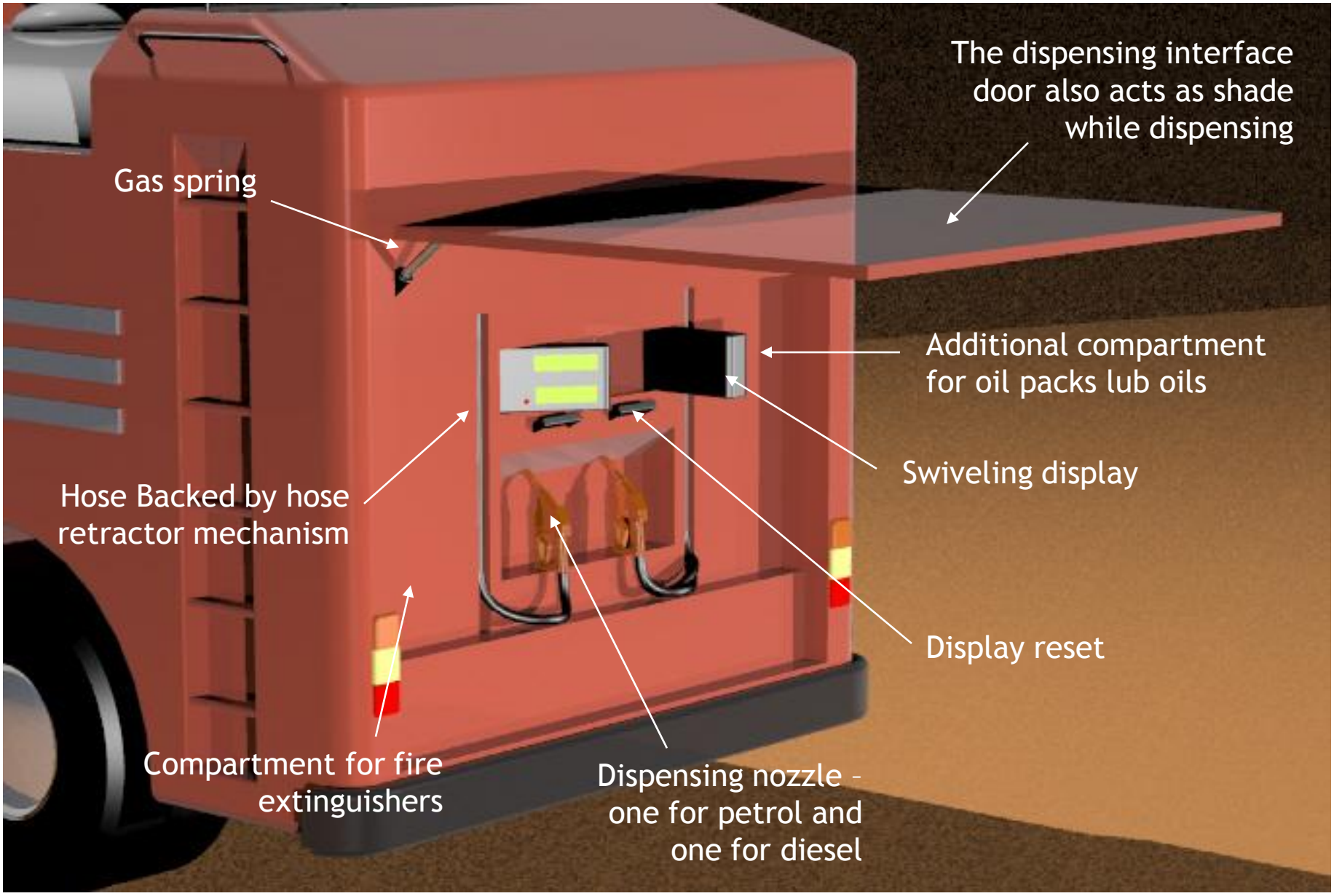



- Customization for IBP
- Serious /safe vehicle
- Meeting all product brief requirements

# Final Concept



# Final Concept – the dispensing interface



# Model photographs