Feasibility Study on Car Carrier (Trailer) Design Optimization

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Abstract

An idea to modify car carrier trailer design to improve the load optimization, operating safety, improved turnaround time (TAT) & to reduce Ordering to delivery lead time for customers. Car Carriers current length is 22.5 Meter which is operated by articulated mechanism connected with prime horse. Government also planning to modify the Central Motor vehicle Act to reduce the length of Car carrier. Currently all cars are loaded from rear end of Trailer & all trailers has double deck so both deck accommodate cars, all the deck movements are controlled by hydraulics mechanism. Here Instead of rear loading it is proposed to use side loading for both loading & unloading the cars. Also for Tier 1 logistics instead of 22.5 meter 20 feet trailer with hydraulic mechanism suggested overcoming the traffic & quick turnaround of vehicle. The proposed model feasibility studied & next step all the design related parameters pertains to Trailer shall be analysed and results will be compared.

KEY WORDS: Car Carrier, TAT (Turnaround Time), Loading & Unloading, Articulated Trailer, Tier 1 Logistics

1. INTRODUCTION

In India Mumbai, Delhi and other metropolitan centres, roads are often severely congested during the rush hours. The dramatic growth in vehicle ownership during the past decade - has reduced rush hour speeds especially in the central areas of major cities. A car carrier trailer, known variously as a car-carrying trailer, car hauler, auto transport trailer, etc., is a type of trailer or semi-trailer designed to efficiently transport passenger vehicles via truck. Modern car carrier trailers can be open or enclosed. A box on wheels that is pulled by a car and is used for taking things from one place to another.

Definition of Problem: In this project current scenario Issues are classified as below
- Challenges/Problem for Tier 1 Distribution:
- Challenges for Easy Loading/Unloading TAT
- Load Utilization per vehicle
- Un safe Operating environment

Challenges/Problem for Tier 1 Distribution: In Today market share all Tier 1 Cities contributes more than 70% of car sales, today using car carrier trailer distribution in Tier 1 Cities is major concerns
Major Concern Factors
- Day By Day Increasing Traffic condition
- Entry Restriction during peak hours
- Space availability for vehicle parking
- Delayed Turn Around Time
- On Time Delivery Delay
- Revenue loss due to TAT delay
- More Urbanization & more population density
- Safety Issue due to lengthy vehicle

Loading /Unloading (TAT Loss): TAT is Turnaround time for Vehicle to complete the Gate in with loading of cars & Gate out from Car plant. Industry Benchmark is 2 Hours TAT. In addition to loading 2 Hours Unloading TAT will be another 2 Hours. So major concern is loading/unloading contributes One day & which enables loss of business & Utilization

Load Utilization per Vehicle: Today Logistics cost all OEM to improve to achieve the TDC (Total Delivery Cost), Hence Improving the loading efficiency per vehicle is key important. Also Presently Union government working is CMV Rule amendment which will further reduce the length of the vehicle & which will reduce the number of cars per vehicle. So it is inevitable to have solution for Load Utilization per Vehicle.

Safety Concern: Human Resource has precious value. In Car Carrier loading, unloading the drivers has to drive car in narrow width of Truck space & Lashing to be done at same time he should not take care the quality of cars. Safety has two aspects
- Safety while loading /Unloading
- Safety while driving (Due to Length)

Feasible Solution Study
Feasible solution shall classified as two
- Tier 1 Logistics vehicle design
- Long Haul Logistics Vehicle design

For feasibility study Car size of Alto considered as reference, as it is fast moving car

For Tier 1 Logistics: Currently 22.5 Meter Trucks are used for all dealer destination with many constraints like space, Traffic, TAT time etc. To ease these operations we shall use normal Truck with hydraulics lift which shall accommodate two cars in truck. Since this is hydraulics based it shall be lifted when it is required, so this Truck shall be utilized for other cargo handling also. In case of dedicated service to OEM it shall take both spare parts to dealers & Car delivery in same truck by dedicated delivery system.
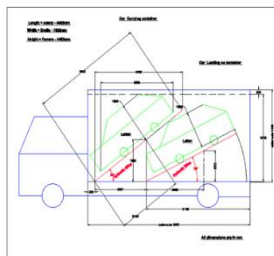

Figure.1. Loading of Two Cars in 20 Feet

For Long Haul Vehicle: Currently Big challenge is for Long Haul Vehicle which has to travel a long up to 4000 KS to deliver the cars.
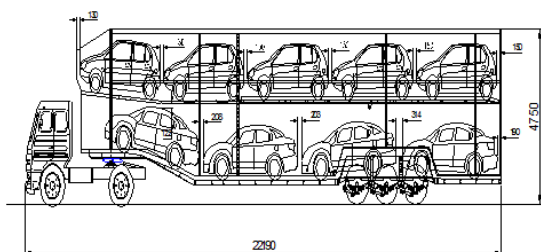

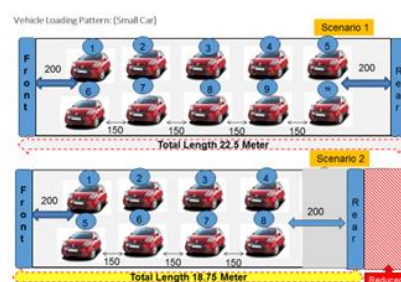**Figure.2. Current Scenario Car Carrier**:

Figure.3. Loading of Cars view in Car Carrier: (Rear Loading)

Proposed Feasible Solution for optimization:
- Trucks side body will be opened by Hydraulics
- Opened side body will be rested in the Ground
- Side body have necessary slots for lashing of cars
- Cars to be loaded shall be drive in & positioned in slots for lashing
- Since it is open condition it is easy for loading
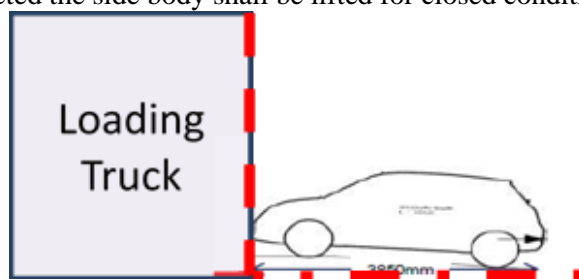- Once Loading is completed the side body shall be lifted for closed conditions.

Figure.4. Step 1 loading

Merits of Modified Design: With available models we shall discuss the merits & advantages over the conventional system.

City Logistics Merits:
- Easy Access to Tier 1 & metro City for Distribution
- Faster Loading & Unloading due to lesser vehicle
- To cater the any traffic area with faster Turnaround time
- Faster customer service (Order to delivery)

Long Haul Logistics Merits:
- Due to Side Loading it is easy for operator to load & UN load the vehicle
- TAT is improved more than 50%
- Operator Safety is Improved 100% with accident free operations
- Vehicle Utilization 10% Improved without Double Deck loading Operation

- Driver Fatigue is reduced
- Damages to Vehicles shall be improved
- Sequential distribution is not required as required cars shall be unloaded
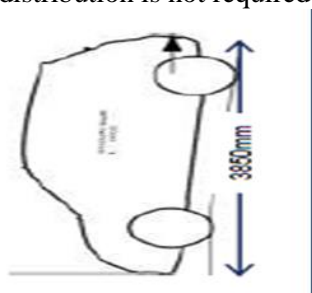

Figure.5. Step2 Loading
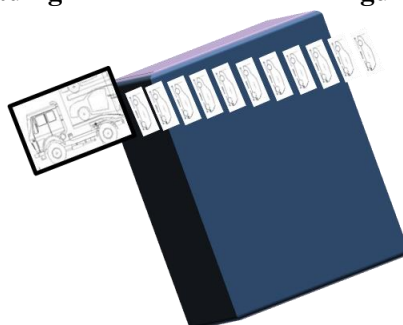

Figure.6. Expected View of Side Loading

Figure.7. Side View of Cars Loading re 4Position

Following are next step towards the design optimization
- Development of Loading Simulation with actual dimensions of cars Bumper to Bumper
- Vehicle Related Load capacity for
- o Hydraulic system for Lifting operations
- o Carrier Chassis Load Calculations due to side loading
- o Vehicle Weight Addition & Reduction calculations
- Simulation for loading pattern in Reverse direction with hanging factor as assumption
- Simulation of Inclined loading option feasibility study
- Multiple Application simulation in case of Bigger Car to be loaded
- Guided mechanism study for Loading movement in defined specific path
- Any other Vehicle modifications required will be analysed
- Automated Loading Option feasibility study
- Cost Saving due to Modified model

2. CONCLUSION

The Basic Feasibility of modified design expects many merits in comparison with the current Car carrier operating model. More analysis pertains to vehicle design shall make this solution viable. This will be huge cost savings for all the OEM in India & all Car Carrier Transporters due to swift TAT, Safer operating conditions. Result than conventional piston. The feasibility concept compared to conventional system is compared and expected results are satisfactory.

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