

Case Study – Mechanical Design

Automotive – Development of Multi-Axle Vehicle (Modular Trailers)

Multi-Axle Vehicle (Modular Trailer)	<p>Modular trailers are vehicles that can be configured as per the size of cargo. Typically, modular trailers are built as modules of 4 and 6 axles. They can be combined to form a long rigid vehicle up to 24 axles. (practical limit). The suspension is hydraulics that ensures equal reaction on all the axles, and also ensures that the trailer is not subjected to bending stresses due to road profile. Maximum load capacity of these trailers is 20 tons per axle</p>
Scope	<ul style="list-style-type: none"> • Concept design of hydraulic suspension. • Simulation of suspension. • Detailed design of suspension, and hydraulics. • Guidance during manufacturing. • Continuation of development. • Concept design of Modular steering mechanism, suitable for 4 axles to 24 axles. All the axles are steered simultaneously. Kinematic analysis, optimization. • Detailed design, guidance for manufacturing, and continuous development. • Structural analysis of load bearing elements.



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Description	Tractor implement control is by a mechanical servo valve. The main feature is servo control to adjust the depth so that force on the implement (e. g. Plough) is maintained constant. This is force servo. Other mode of control is Position control of implement. Both the control functions are achieved by mechanical feed back linkages. Important aspect of design is load sensing hydraulics, (for power conservation) and pressure compensated servo valve operation. Cost of valve is also very important criteria.
Scope	<ul style="list-style-type: none"> • Concept • Dynamics Simulation on Computer • Data generation for simulation by experiments in Lab and Field. • Prototype testing.
Important Feature	The complete design is perfected by computer simulation of the dynamics of hydraulic and mechanical system. Simulation was used for evaluating concept, perfecting the design parameters for optimum performance, understanding limitations, and evaluate the effect of manufacturing tolerances.
Technologies Needed	Hydraulics, Dynamics, Simulation, Precision manufacturing