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Taming the beast:
Vehicle dynamics simulations on
a 32 axle Schnabel car

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Background

ABB in Ludvika
A world center of high voltage

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Transport Task

Get the transformers from the production plant in Ludvika to the shipping ports. ~60-80 transports/year

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Power Transformers

Shipping ports

The beast: Uaai-xxy, also known as Q73

Main data Uaai-xxy (Q73)

Main data for Uaai-xxy (Q73):

- Design: Norca Machine Corporation, U.S.A
- Year of manufacture: 1973
- Length: 73 meters
- Tare load: 230 tonnes
- Maximum payload: 500 tonnes
- Number of axles: 32
- Maximum speed: 30 km/h loaded, 60 km/h tare
- Owner: ABB

The Challenge: BIGGER transformers

Wider:

- Extra bracket for sideframe
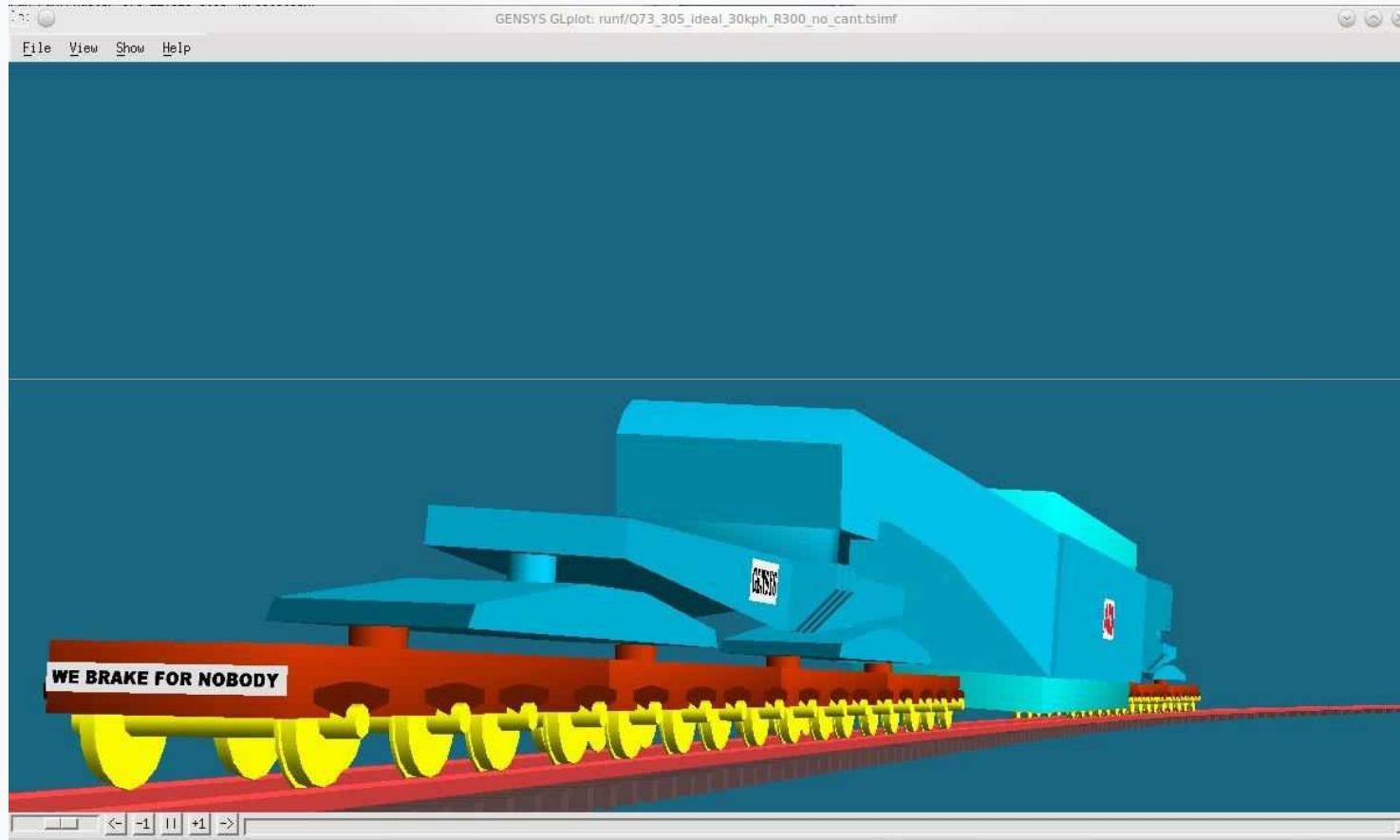
Higher:

- Rubber cover for insulation of overhead line

Longer:

- Increase length of sideframe

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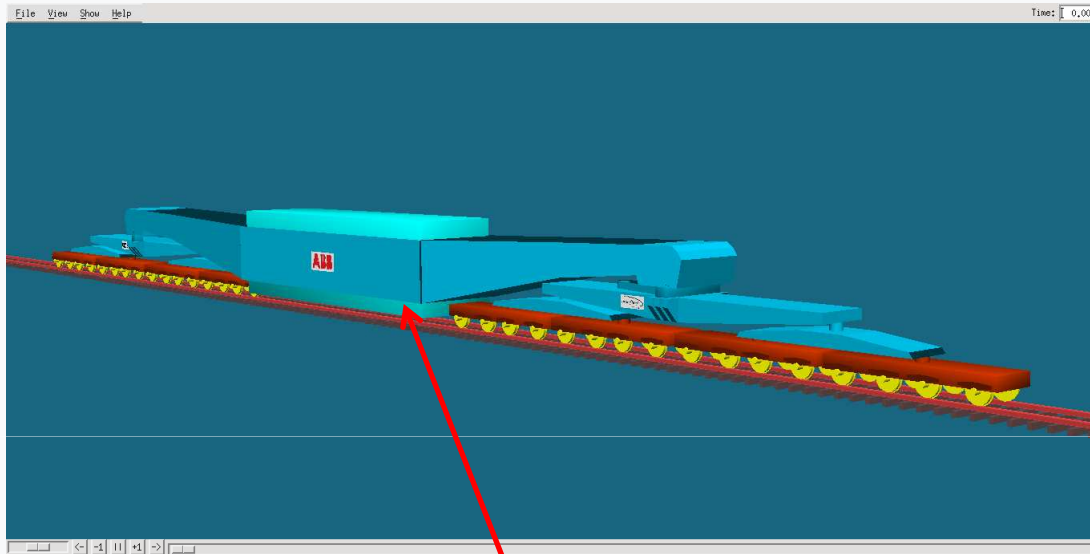Technology

Simulation model

(Note: Videoclip was shown in presentation)

Simulation model, main data

Task: calculate dynamic loads on sideframe

Main data:

- 50 masses
- 313 couplings
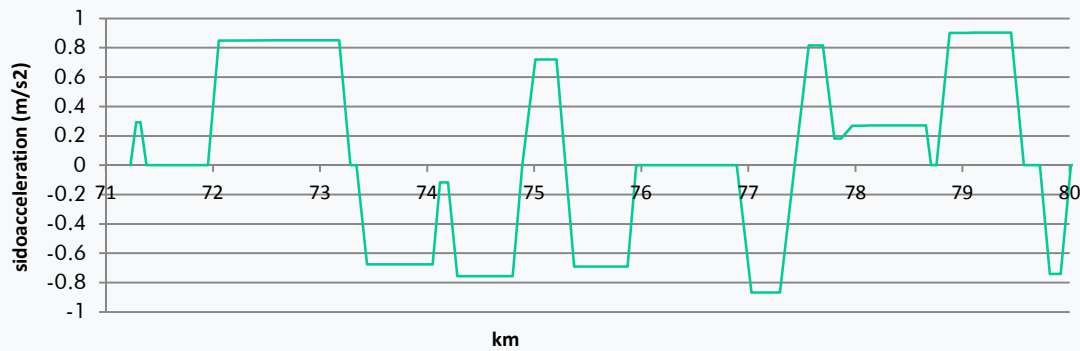- 288 degrees of freedom
- MBS tool: Gensys

Simplified wheel-rail contact model:

- Wheelset follows track centre line
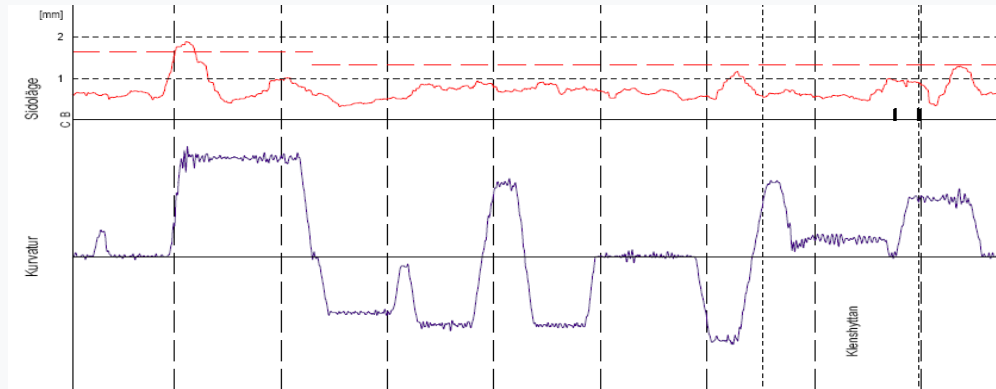- Vertical forces correct, wheel lift is possible

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Simulation model, track data

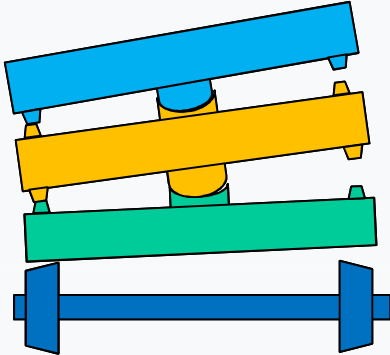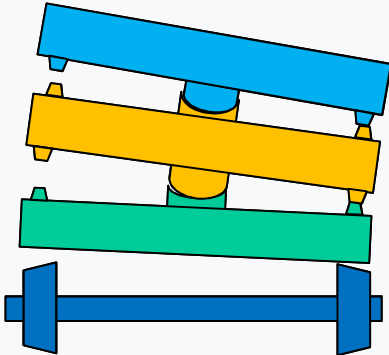- Measured track data, track geometry as well as track irregularities
  example:

Geometric trackplane acceleration on the line La-Stl km 71-80, v= 30 km/h

Measured track (STRIX), lateral and curvature, La-Stl km 71-80

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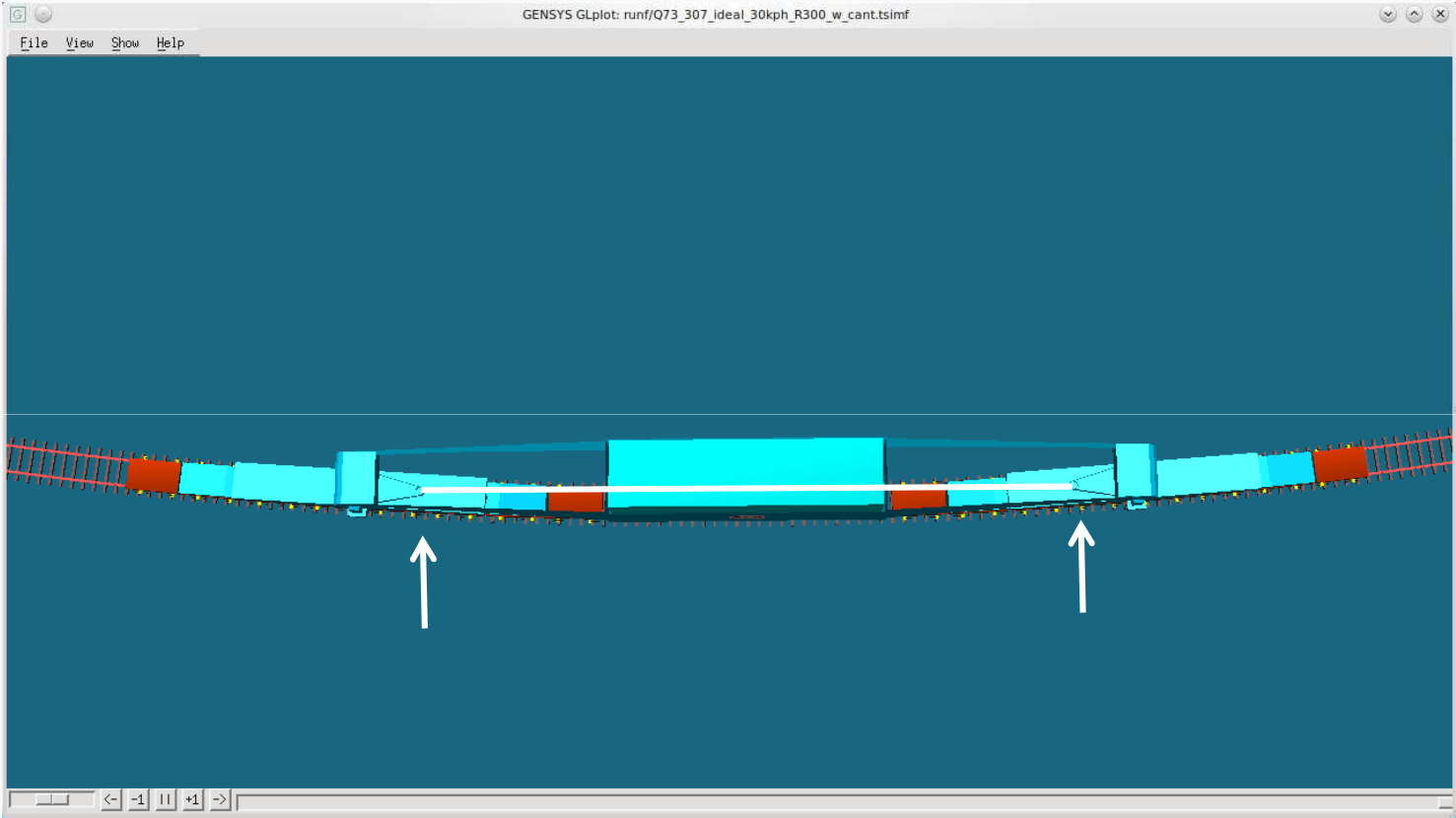# Design feature: side supports

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Design feature: reduced pivot

Vertical supports

Pivot point, i.e. centre of rotation

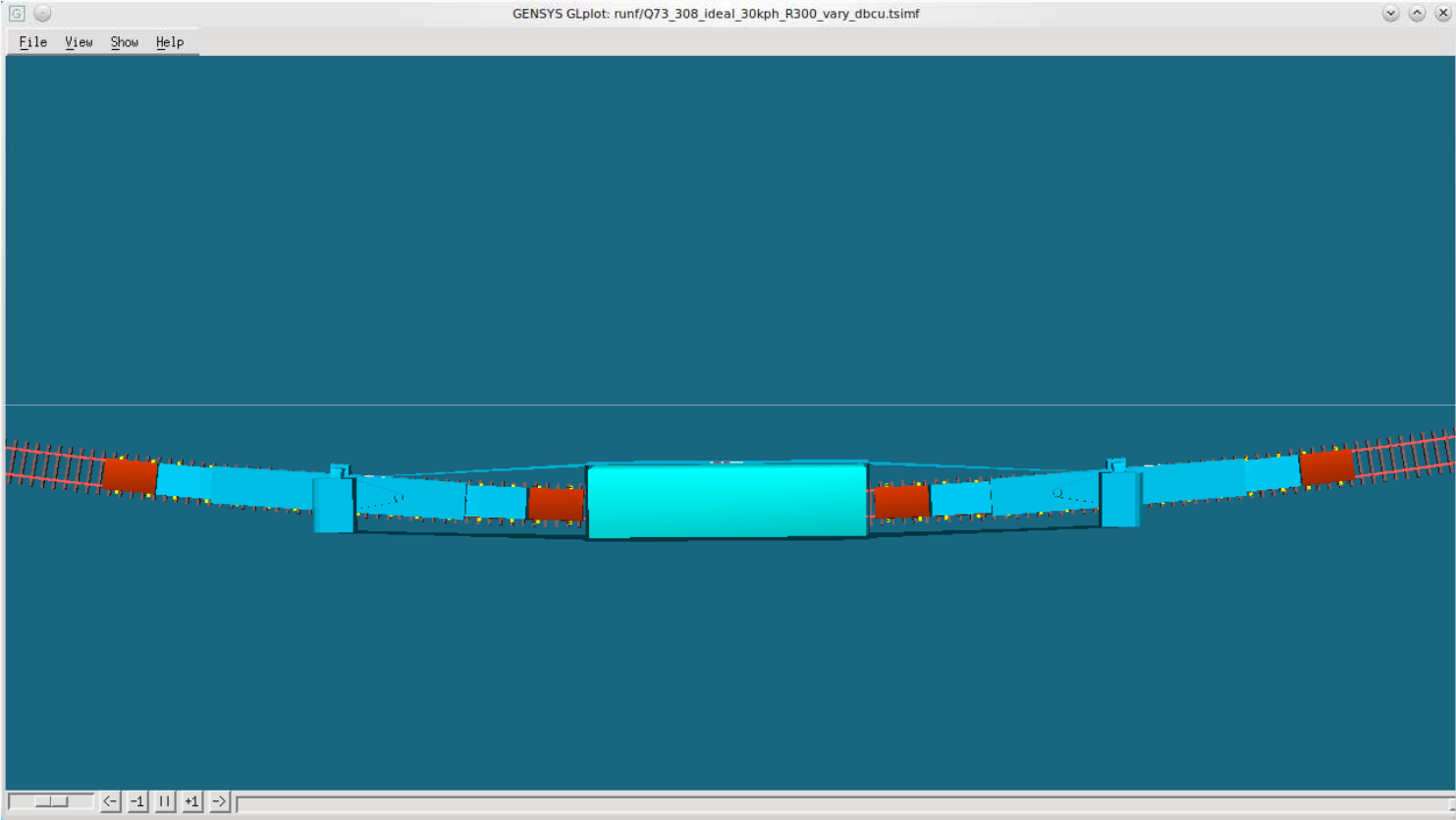# Pivot mechanism in curves

Pivot reduces overshoot in curves

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Design feature: lateral load displacement

Hydraulic cylinders for lateral load displacement

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Lateral load displacement

Clear obstacles by lateral load displacement

Lateral load displacement

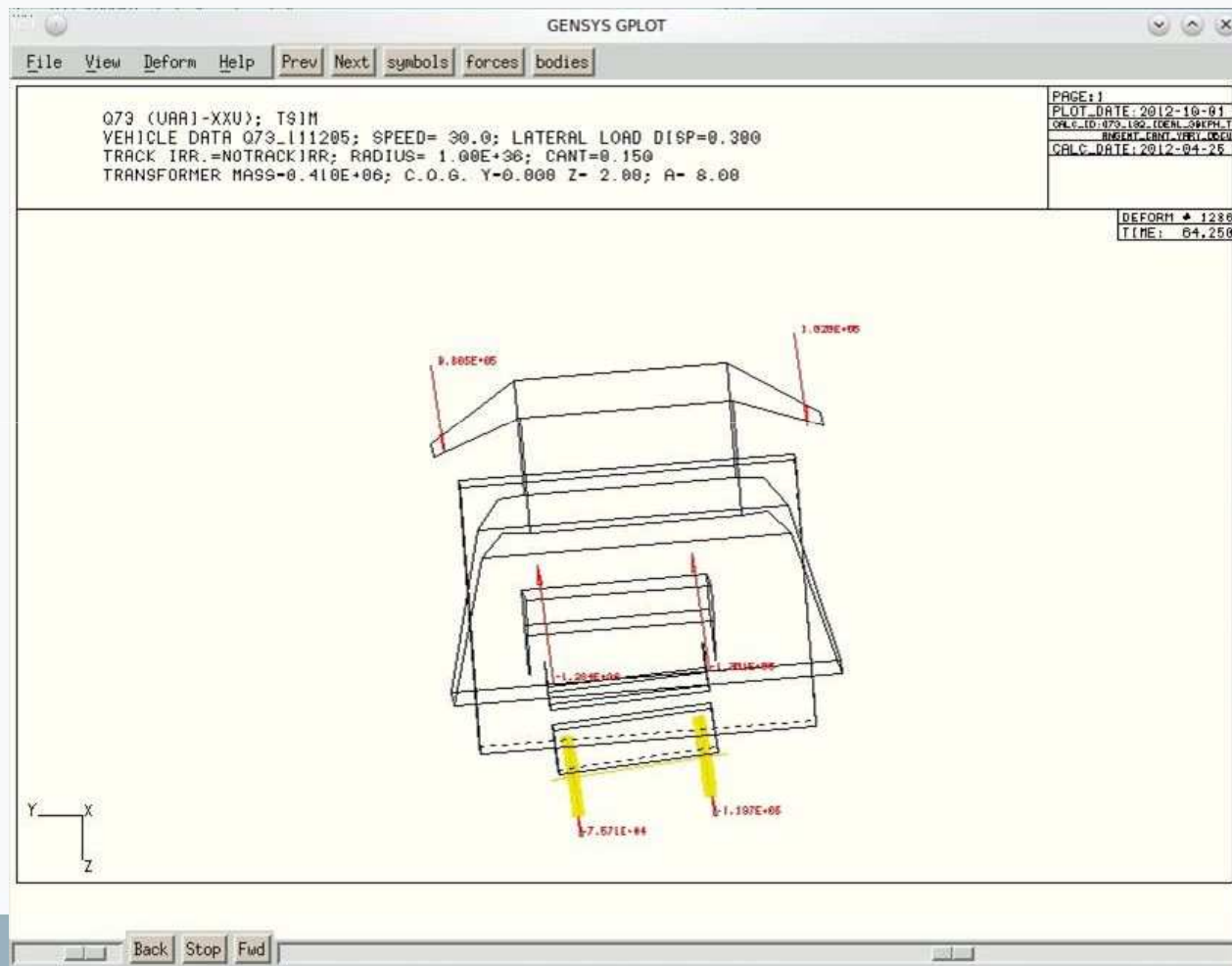## Comparison: without lateral displacement
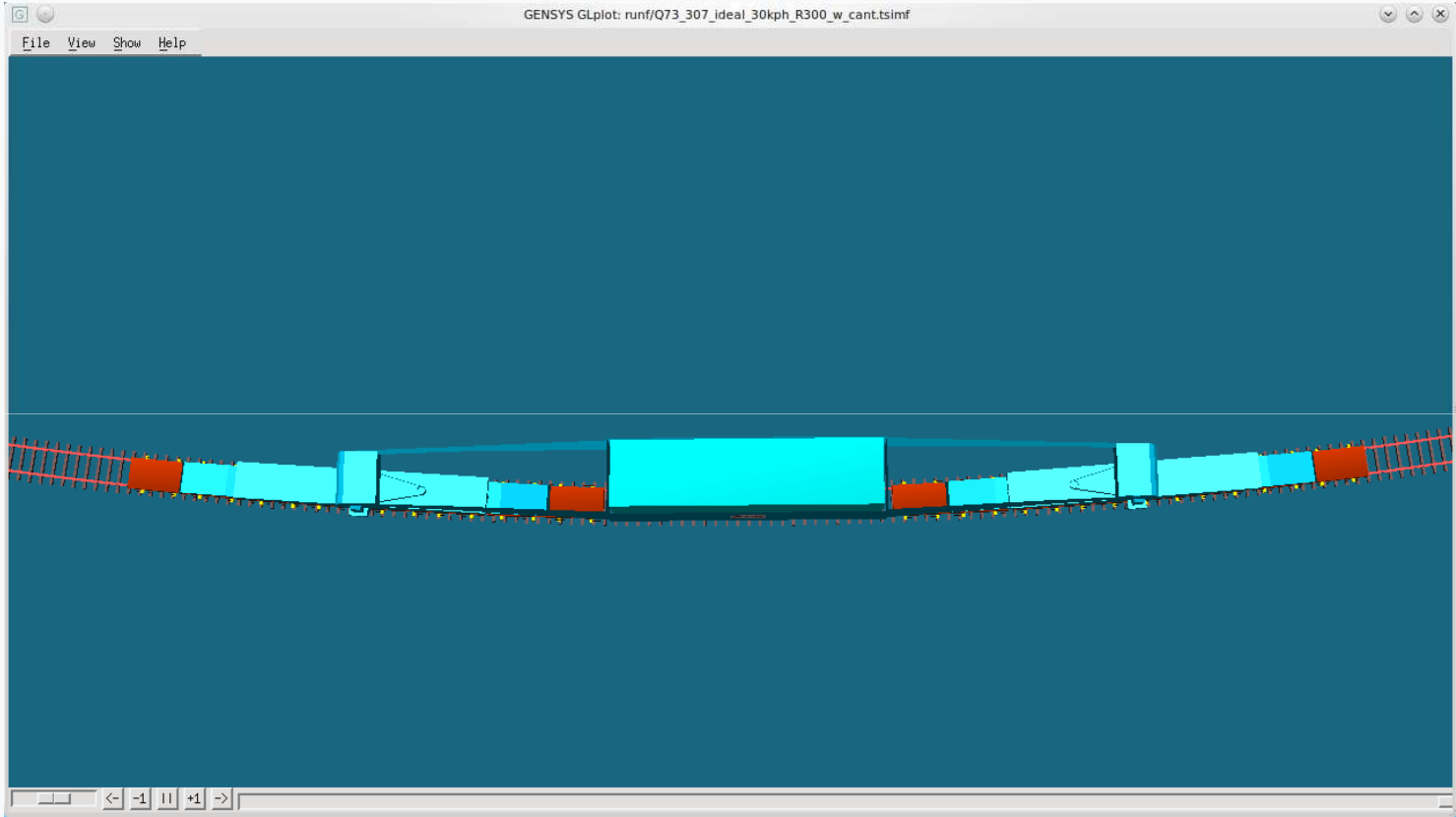
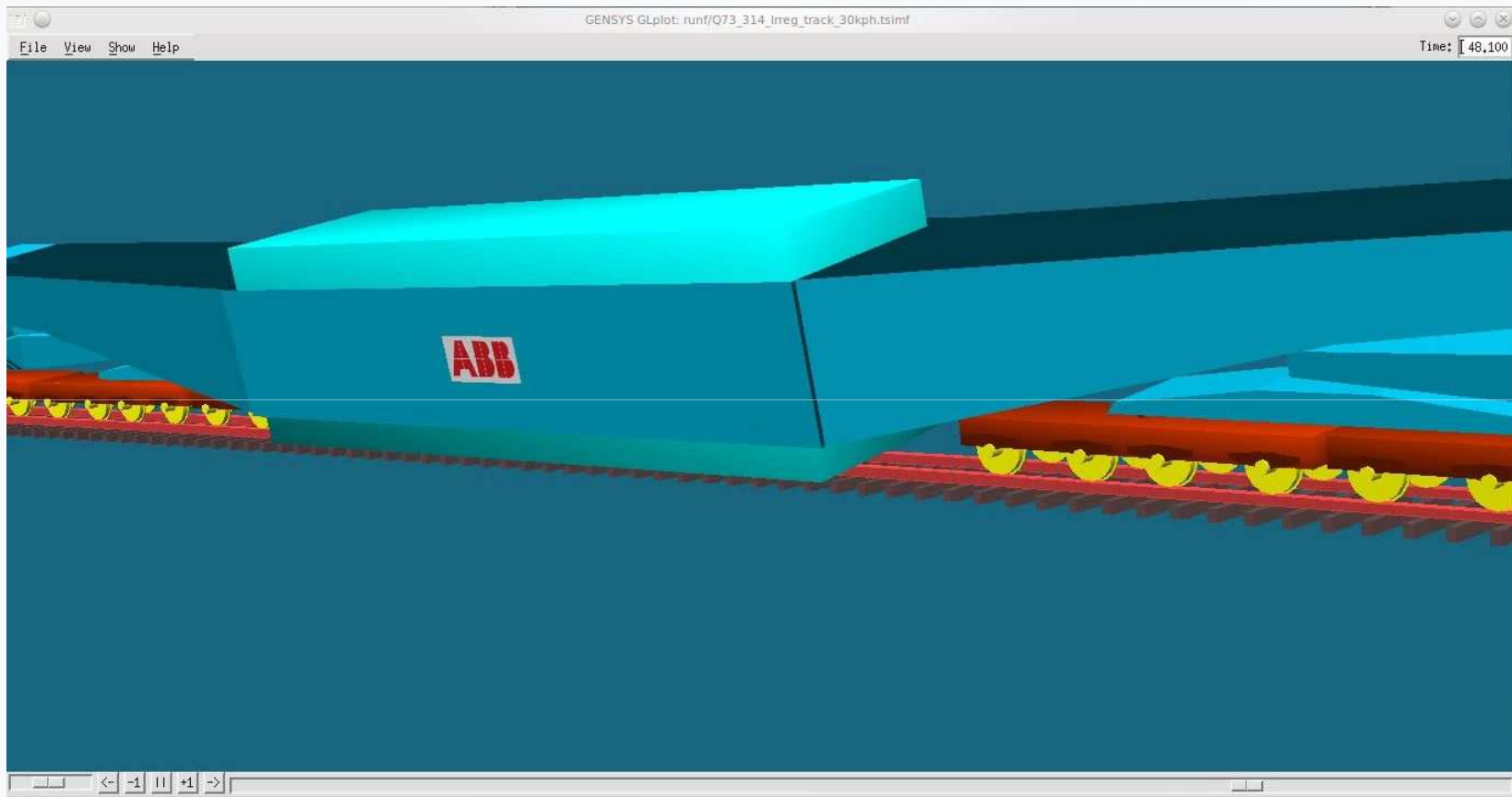# Example: simulations of forces in load displacement

(Note: Videoclip was shown in presentation)

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Example: simulation on measured track

(Note: Videoclip was shown in presentation)

Summary

Present task:

- Calculated load collective of internal forces for dimensioning of sideframes, based on real track input data
- Taking into account most unfavourable transformer load, offset centre of gravity
- Simulated Schnabel beam assembly with torsional flexibility

With this model it is also possible to make detailed analysis of:

- Track stresses
- Vehicle dynamic safety, track forces
- Gauging

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Acknowledgements

Interfleet wish to thank ABB Power Transformers
for kind permission to share this information
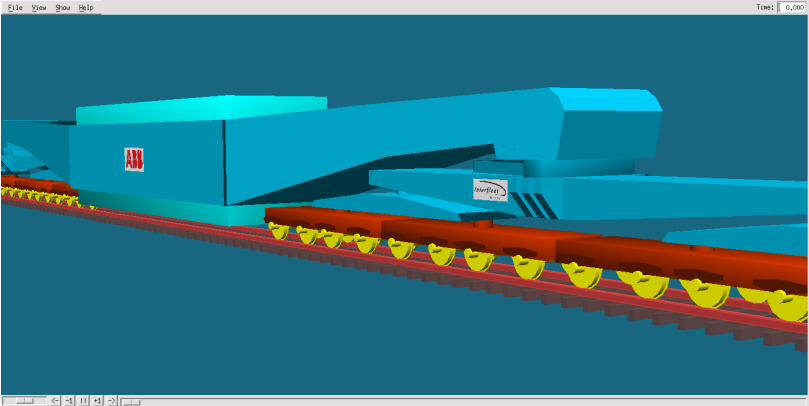
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Bottom line

Do you have this: ? (or another vehicle)

Then we can make this: !

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