

Reducing Fatigue Forces on the Bergen Line



CHALLENGE

A demanding route creates demanding forces. The Oslo–Bergen railway is a 450km steep, curvy, and constantly changing in geometry. For Norske tog's aging Type 7 coaches, this meant:

- High longitudinal forces
- Heavy buffer loads in curves
- High loads causing issues

Norske tog wanted to consider an alternative to the existing Combigard friction-spring side buffers, but physical testing alone couldn't evaluate alternative solutions efficiently, this is where DigitalTrains™ stepped in.

APPROACH

Two studies were carried out, the first was to simulate the force interaction between vehicles as the train negotiated curves of the route with the associated driving and braking forces over the mountainous terrain.

The second study was to simulate the effects of replacing the Combigard buffers with low force side buffers at 4 interfaces on a test train that would travel the Bergen Line in both directions.

Norske tog supplied survey data for the route, in 8 sections between Honefoss and Bergen, and then Oslo and Honefoss. The survey data contained all the engineering data about the track but when imported didn't map accurately. The DigitalTrains™ team were able to create software which allowed the survey data to be manipulated to conform to the known route on the map.

Once all of the survey data had been converted into 'route profiles' speed limits and their positions were added. Differing driving and braking characteristics were applied to be activated at these positions, which would control the speed of the train accordingly.

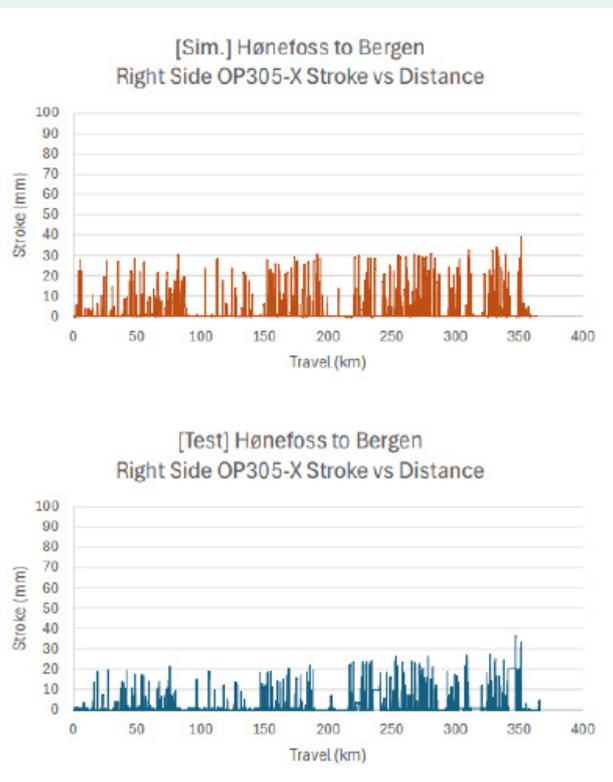
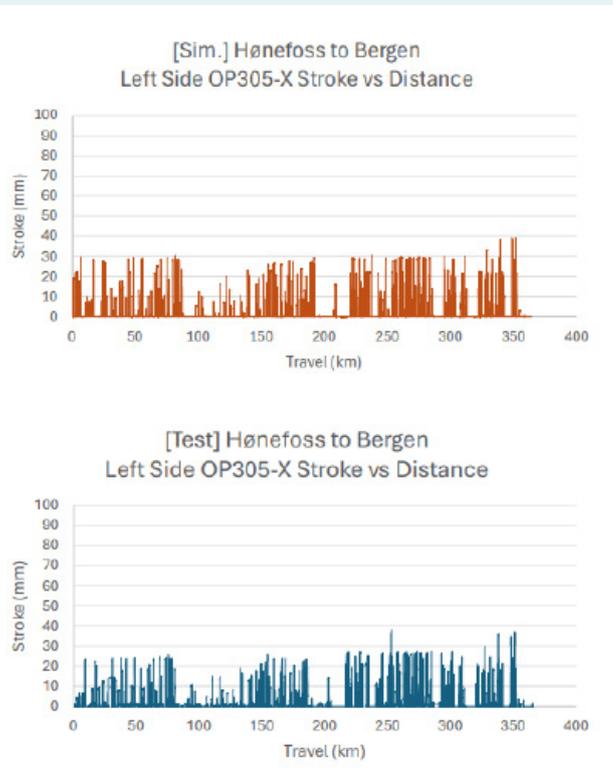
Speed Profiles were used in the second study, where the route profiles were reversed so that trains could be simulated traveling the survey sections in either direction.

The route sections were between 20km and 100km long and took between 15 and 100 minutes to simulate.

CLIENT: Oleo International for Norske tog

LOCATION: Oslo-Bergen Train Line - Norway

PROJECT: Simulations Fatigue Forces Reduction



CONCLUSION

DigitalTrains™ gave a powerful, evidence-based understanding of effect of the Bergen Line on trains.

By combining accurate survey-driven simulation with real-world validation, Norske tog could confidently evaluate lower-force side buffers and reduce the fatigue loads affecting their fleet.

The same DigitalTrains™ workflow can now be applied to other fleets, components, and routes where operators need clear, evidence-based understanding of in-service forces.

Impact for Norske Tog

With DigitalTrains, Norske tog could:

- Understand the cause of recurring issues
- Explore and compare buffer technologies without modifying a full train
- Reduce reliance on expensive physical trials
- Validate the benefits of low-force buffers with confidence
- Support decisions about extending the life of the Type 7 fleet

Key Insights

- ✓ Low-force buffers reduce fatigue-driving loads typically around 50% lower buffer forces in curves
- ✓ Coupler behaviour becomes smoother peak loads similar, but far less overall force cycling
- ✓ Critical track sections identified
- ✓ Precise survey-based geometry showed which curves and transitions contribute most to fatigue
- ✓ Simulations accurately predicted real test results A close match between simulated and measured forces confirmed the validity of the approach

