SOFTWARE SIMULATION AND TESTING

OLEO 1D RAIL

Oleo 1D Rail is a software program that analyses the combined effects of couplers, buffers and anti climbers with approximate crush behaviours of vehicle ends. This is useful for investigating the sensitivity of the whole train Crash Energy Management (CEM) system for collision response. The software is specifically designed for evaluating the options for various energy absorption methods used in bolt on devices including couplers, buffers, anti-climbers and other crush elements.

The software inputs are flexible so that a specific train can be modelled and various collision scenarios simulated.

Longitudinal force, stroke, velocity and acceleration data is output for each vehicle interface.

Each vehicle in the train is modelled as a single mass with a stiffness value.

Each vehicle can be allocated a drive force and a separate coefficient of friction to model brakes or rolling friction.

The hydraulic units are selected from a library of designs that can be customised and their specific dynamic behaviour verified by full size physical testing.

The characteristics of linear devices such as rubber, elastomer, deformation tubes, crush boxes and shear out mechanisms can be selected. Specific alternative characteristics can be entered.

The specific geometry at each interface can be input along the train to model the couplers, buffers and anti-climbers along with their force stroke characteristics.

The approximate crush behaviour of the ends can be entered as force vs. displacement data from separate detailed finite element analysis.

Once the basic train of up to 100 vehicles and their energy management set up has been modelled, it is possible to run various collision scenarios such as:
Train into train – either same configuration or a different train configuration altogether and;
    a. Moving train into stationary train – with and without brakes.
    b. Moving trains at different speeds and directions.
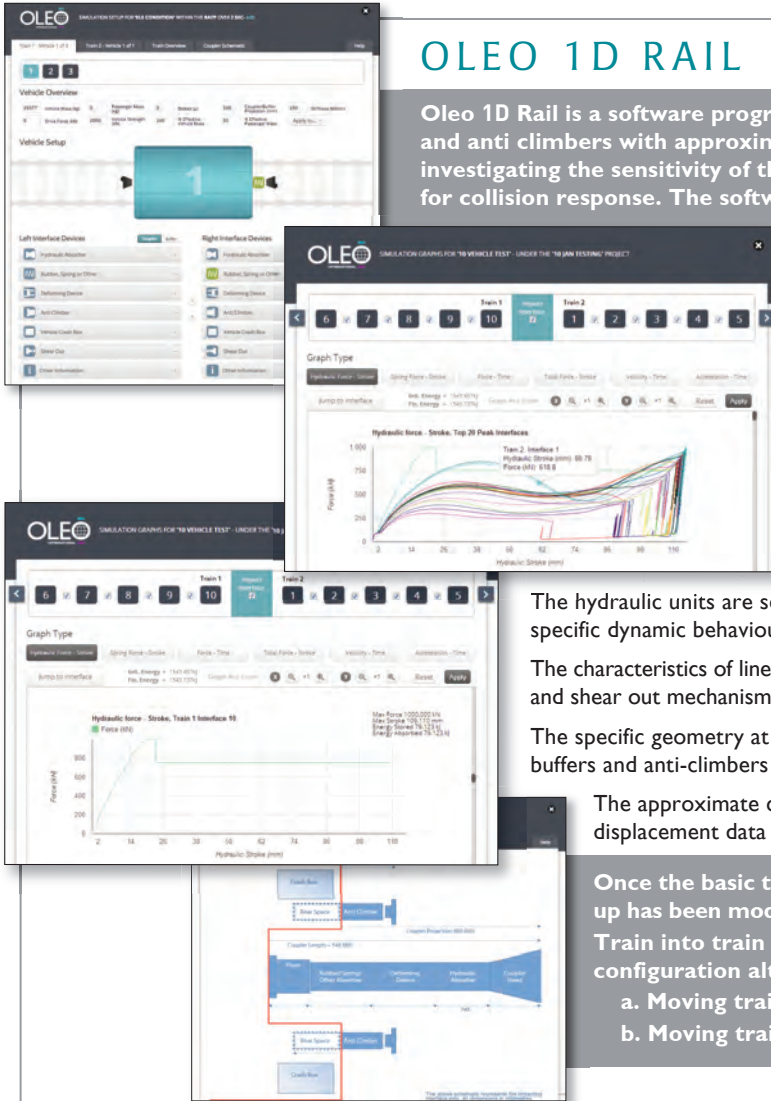
OLEO 2D AND MULTI BODY DYNAMICS SIMULATION

Oleo Multi Body Dynamics (**MBD**) Simulations include a three dimensional model of the rail vehicle including bogie and suspension features as well as coupler, buffer and anti-climber characteristics.

The effect of vertical misalignments at the point of impact can be simulated. Vertical and longitudinal force, displacement, velocity and acceleration data is output, allowing analysis of couplers and anti-climbers at each interface along the train as well as predicting wheel to rail displacement.

FINITE ELEMENT MODELS

Oleo can provide special elements for energy absorption devices such as couplers, buffers and anti-climbers for use with FE codes such as LS-Dyna and Radioss crash.

TEST AND SIMULATION

Oleo has a long history of testing and simulating the performance of its gas hydraulic units for rail and industrial applications. The hydraulic characteristics are non linear and velocity dependent. Oleo has developed proprietary mathematical algorithms for the purpose of simulating buffer performance.

The simulations are matched by a long history of testing full size units to ensure a high degree of correlation.

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