

### ORE RECLAIMER MACHINE – CVRD – ITABIRA – MG

PCE made a structural evaluation of a Companhia Vale do Rio Doce (CVRD) Ore Reclaimer Machine. It was made by a numerical simulation using the finite element method and by deformation measurements of some points.

The necessity of such evaluation became because fails happened at the equipment, like cracks on the column, rupture of the column close to the rotation gear, rupture of a rotation crown tooth, rupture of the torque arm support of the bucket wheel.



Ore reclaimer machine

Linear static analysis was made using the finite element method (FEM) with Algor Inc. software. The analysis used elements type PLATE, TRUSS, BEAM e 3D BRICK, depending on the modeled component.

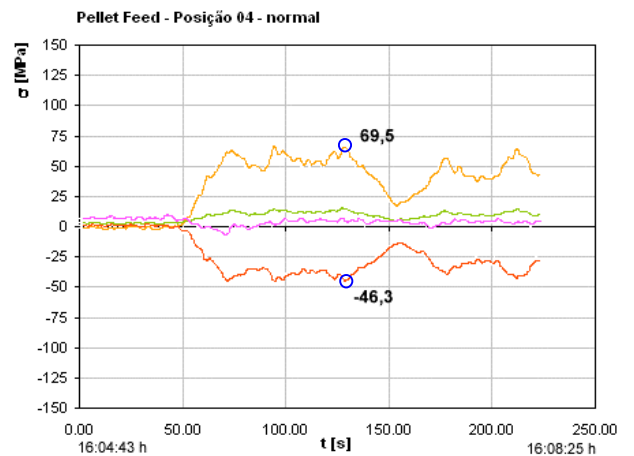
As a form to check the numerical model, the reclaimer was instrumented with strain gages and the level of stresses measured on these points during normal operation. These stresses were compared with the model results on these points.

The next figure shows one of the measurements point (covered with a film to protect the equipment against the weather).

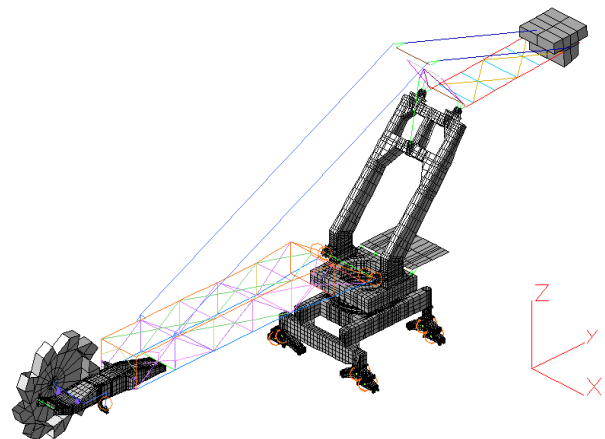


Sensor at one tie beam

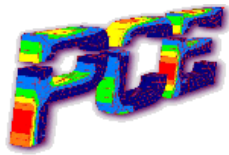
The graph below shows the results of the measurement at one position of the machine during the operation.



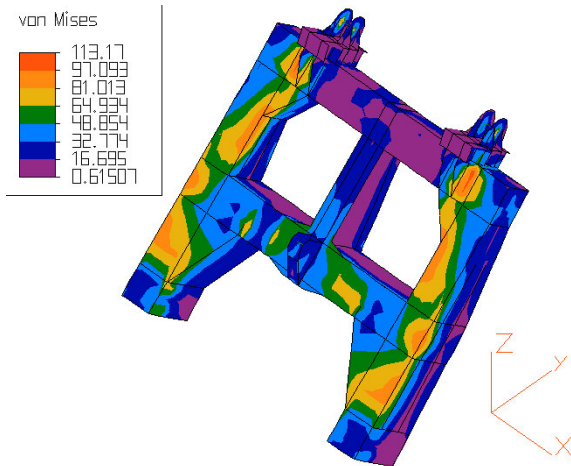
The figure below shows the finite element model.



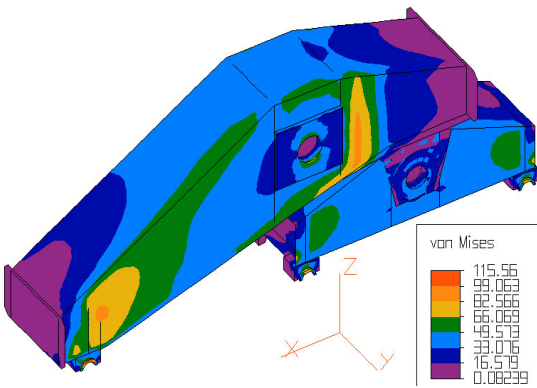
Finite element model



Next are shown some results.

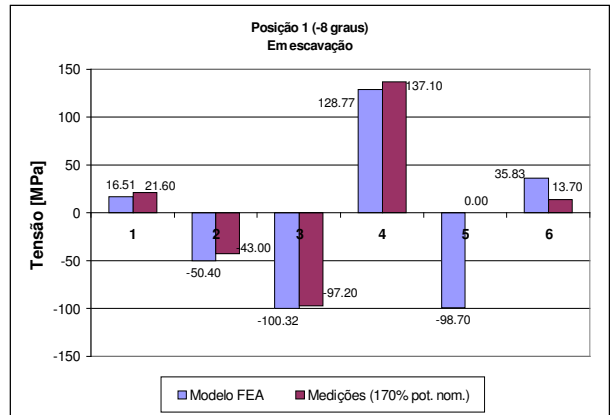


Own weight + excavation, crane arm at  $-8^\circ$ , superior columns region. Von Mises stress (MPa)



Own weight + excavation, crane arm at  $-8^\circ$ , translation set Von Mises stress (MPa)

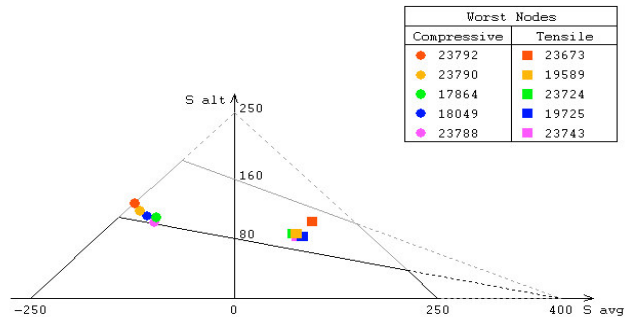
The measurements at excavation with the bucket wheel acting with an equivalent FEA model, with 170% of nominal power were compared, according to measurements of the electric current of the bucket wheel rotor. This comparison is shown below.



Result comparison: FEA model x measurements for the position (-8 grades), at excavation.

Excavation power considering the bucket wheel engine at 170% of the nominal power.

A fatigue analysis was performed using the maximum principal stresses. The result as fatigue life is shown with the Haigh diagram.



Critical nodes fatigue Haigh diagram of the wheel-support beam. The 80 MPa line characterizes the limit for welded regions.

Using Algor Inc. software and instrumentation techniques it was possible to make a complete structural evaluation of the Ore Recalimer Machine and, from these results, suggest modifications to increase the life of the equipment.

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