

WELDING ANALYSIS WITH THE HOT SPOT METHOD



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346

Objective

The fatigue strength represents one of the main objectives of mast projecting; special attention is dedicated to the welded joints around which it is more likely that phenomenon, like breaks occur.

At the same time, on welding areas, it is difficult to carry out a theoretical evaluation of the strains as here there are lots of residual thermal stresses and a concentration of strains due to the presence of the weld itself.



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346

This is why it is necessary to have the adequate methods for the strains evaluation.

A particularly innovative method for this scope is the “hot spot” method, thanks to which in combination with the most modern FEM calculation systems we can estimate the fatigue life of the welded parts and evaluate possible mast improvements.



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346

Using the method for the strains evaluation implies to carry out the following:

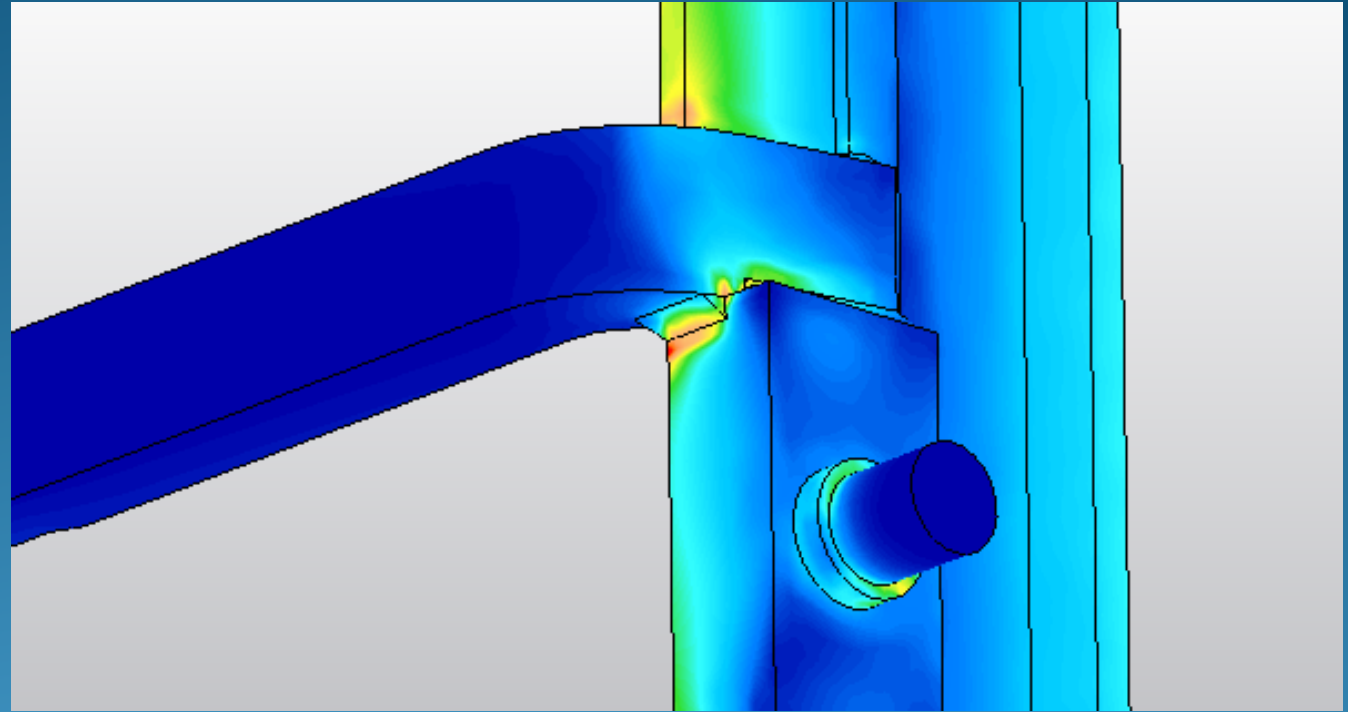
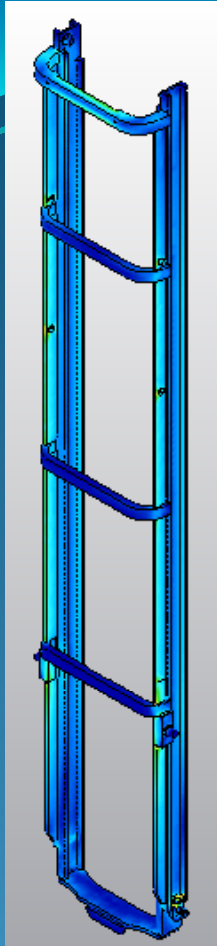
- FEM Analysis of the 3D model
- Identifying critical areas
- Strains analysis results based on theoretical calculations
- σ_{hs} calculation



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346



LIFT-TEK
ELECAR MASTS
Lift Technologies 

 **CALVI** HOLDING s.p.a.

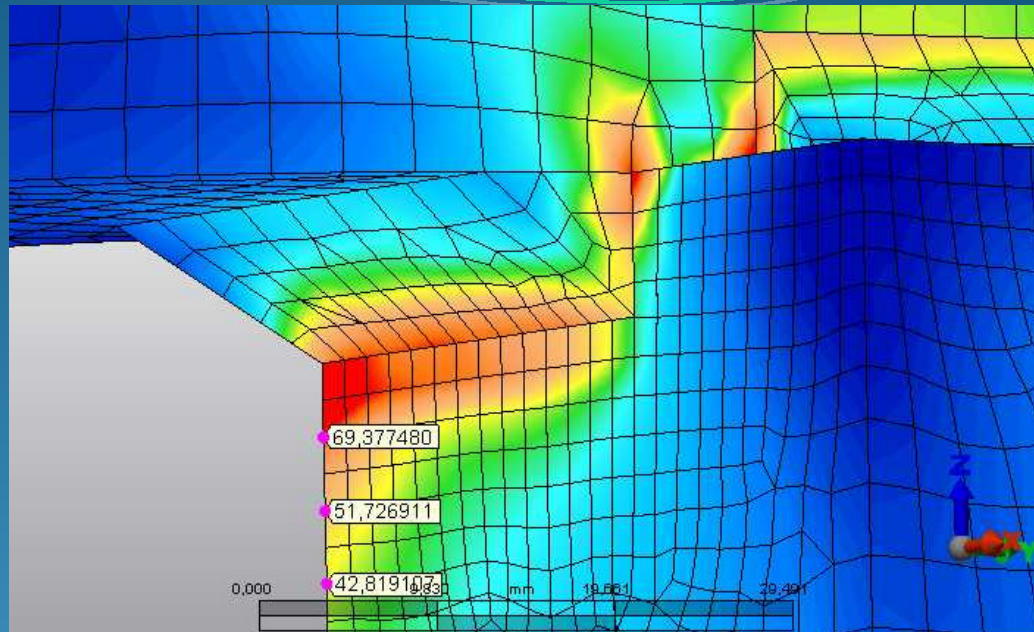
LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346

σ_{hs} is calculated through the following formula:

$$\sigma_{hs} = 3\sigma_A - 3\sigma_B + \sigma_C$$



Where A,B e C represent the three points respectively at a distance of 4, 8 e 12 mm from the weld concerned.



LIFT-TEK ELECAR S.p.A.

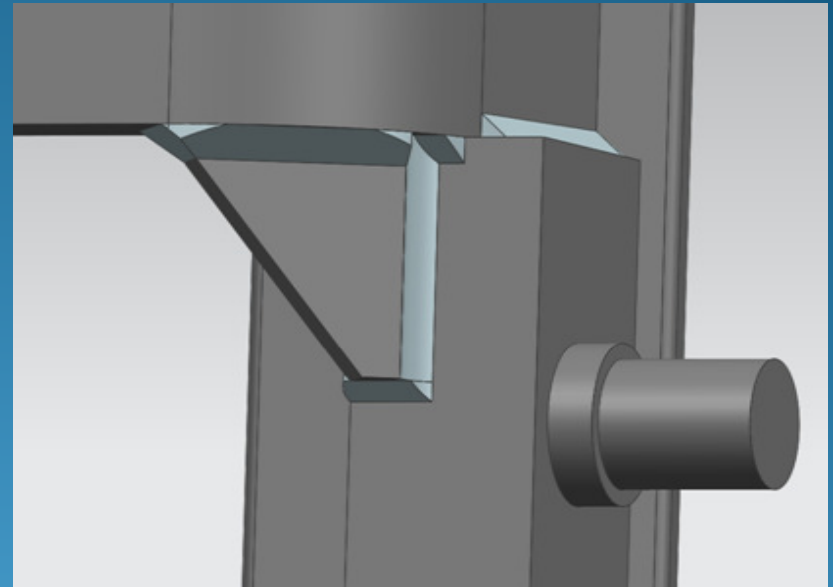
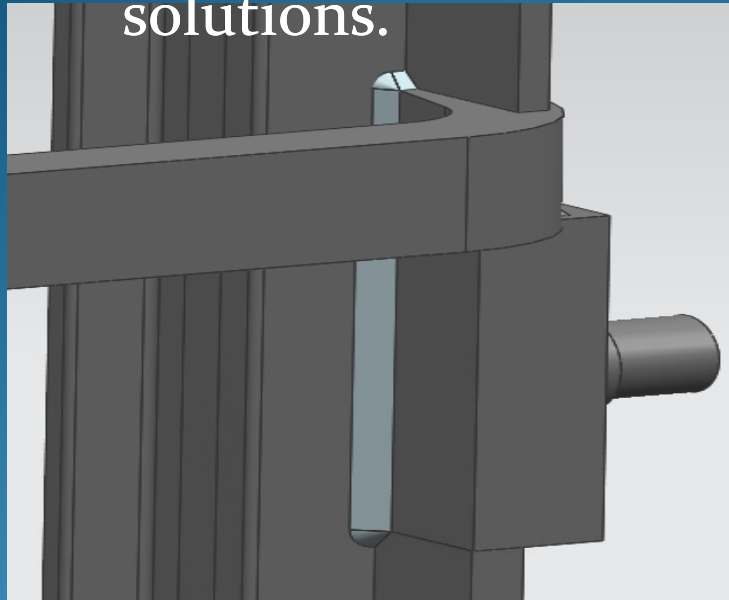
Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346

This strain value compared with the relative strain class level, which for the steel in the working condition of a mast, is equal to 90 Mpa, gives an estimate of the number of cycles.

σ_{hs} \longrightarrow FAT \longrightarrow number of cycles

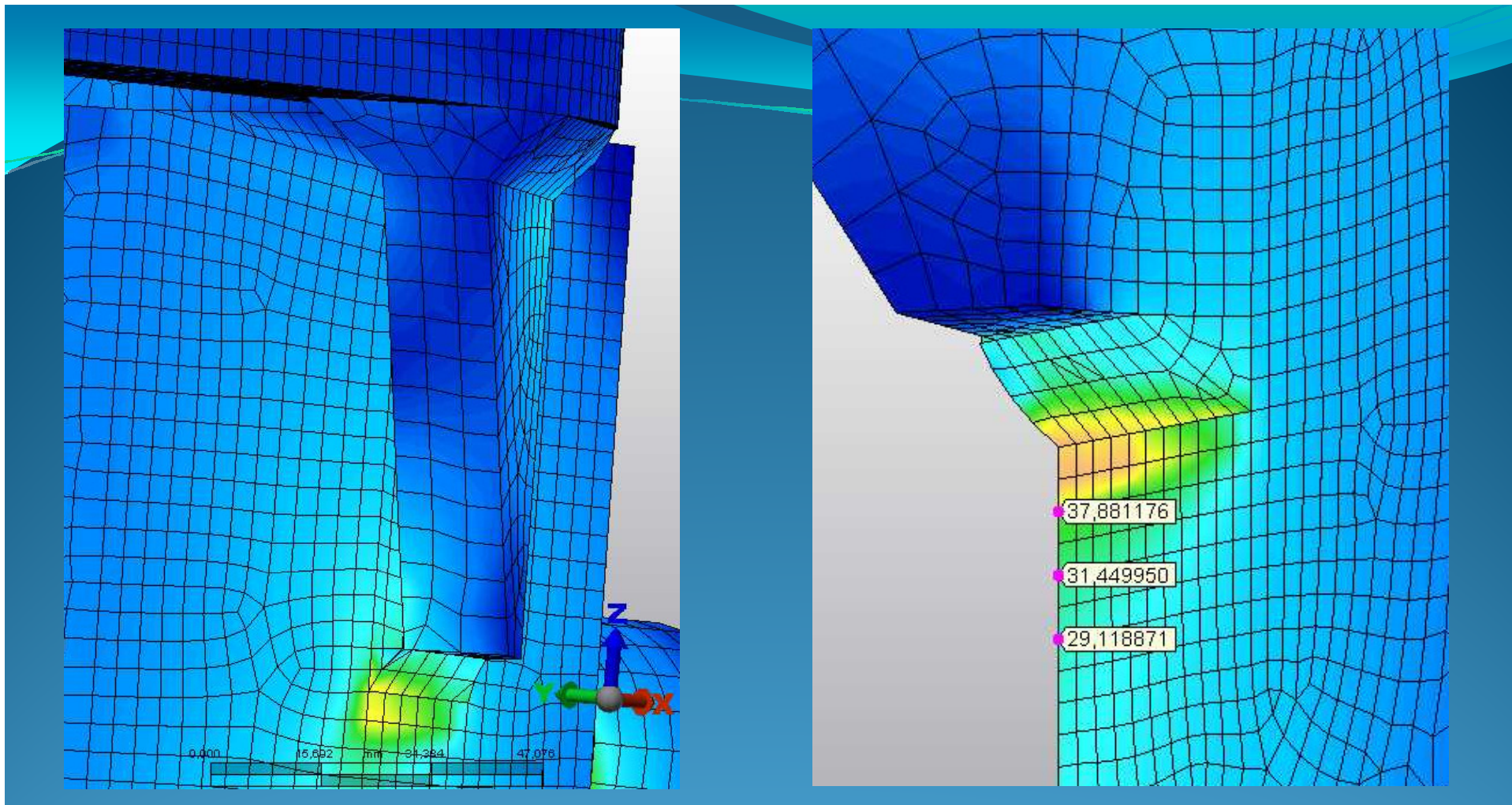
With quick calculations and accurate results as well as correct positioning of the hot spots, we are able to study the most suitable stiffenings to apply to our masts and satisfy all our customers requests with improved solutions.



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346

The σ_{hs} value of the 3D model in the example seems to be 100% higher compared with the one which shows the stiffening, resulting in a clearly much longer fatigue life.



LIFT-TEK ELECAR S.p.A.

Via G. Galilei - 29015 Castel S. Giovanni (PC)

Tel. 0523 843241 – Fax. 0523 881346