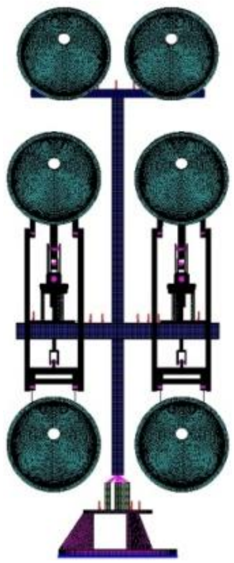
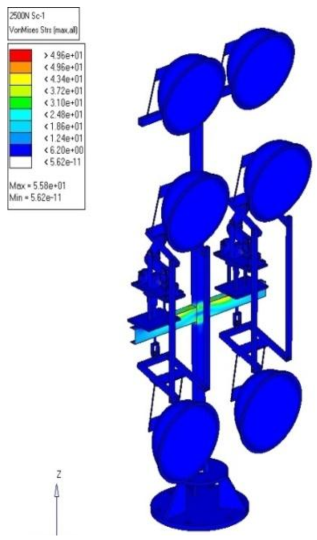
FEA Analysis



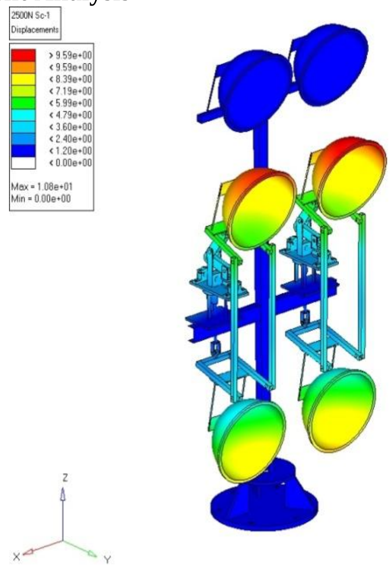
Meshing is basically discretization, in which the whole geometry is divided into number of regular geometries. In 2D FE modeling, if there is a choice between triangles and quadrilaterals with similar nodal arrangement prefer quadrilaterals. Triangles are quite convenient for mesh generation, mesh transitions, rounding up corners. The 3D element selected is hexahedron. The meshing type used for the 2D element is surface meshing and for 3D element volume meshing is done. Total elements in the meshing model of light mast tower are 2 64,580 and the corresponding nodes in the meshed model of the light mast tower are 2, 67, 279.

Stress Analysis



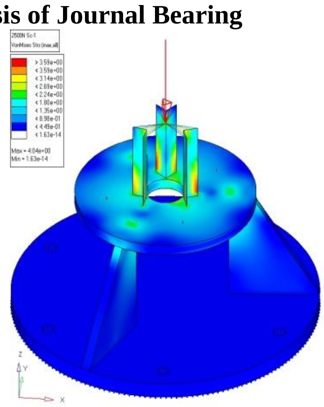
The results of the stress analysis of a complete light mast tower reveal that the maximum stress occurs in the frame where the overall mechanism for the movement of the dome lights is mounted. The maximum stress value is 55 mpa and the allowable stress of the M.S material is 200 mpa. Therefore, we can conclude that the design is safe enough for its application and working. If the stress will increase beyond the allowable stress of the material then their occurs a failure.

Displacement Analysis



Since the lights of the light mast tower will move in the particular direction then, there is possibility of excessive displacement caused due to the heavy mechanism of the Gearbox and leadscrew assembly. The maximum displacement recorded is nearly equal to 10 mm for the domes of light mast tower which is negligible as the total height of assembly is 30 cm which is quite large compared to the displacement recorded for the lights. Hence , we can conclude that the structure is safe in the case of displacement analysis.

Stress Analysis of Journal Bearing



The journal bearing is the most important part of the whole assembly as the total weight of the assembly is concentrated on the journal bearing. Considering the total weight of assembly the stress analysis for the journal bearing is carried out and the results are observes as , The maximum stress acting on the supports is equal to 4mpa so the bearing design is safe.

3. Conclusion

This light mast tower is a very crucial element of any mine. The proposed mechanism is allowed to rotate the lights which are mounted on the tower about its vertical & horizontal direction. When the light mast rotated about horizontal axis by 90^o, we can focus the light in the vertical plane. This will enable the light exactly beneath the tower. When the light mast is rotated about vertical axis by 180^o, we can focus the light in the horizontal plane. Using this motion we can focus the light away from the tower horizontally. By setting lights using these operations, we can rotate the entire light mast assembly by 360^o which will enable the light around the tower.

These operations which are incorporated in the design can hold maximum of eight lights in the any required position without any jerk & over stressed conditions in operation.

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