

Hydrodynamic load input for structural analysis

MARIN internal use only

DYNFORC

DYNFORC calculates the hydrodynamic forces, inertia loads and mooring forces acting on moored floating offshore structures in waves. The output of the program serves as input for strength analysis by for example the MSC-NASTRAN program..

Computational approach

DYNFORC (1977) has been successfully used in several industrial projects, of which examples are shown in the illustrations. DYNFORC is based on the wave diffraction program DIFFRAC, which makes use of three-dimensional linear potential theory.

For the computations the construction is represented by finite elements and the mean wetted part of the hull by plane elements. The finite elements schematise the construction's properties by means of nodal points and beams. The plane elements represent a distribution of source singularities while each contributes to the velocity potential describing the flow around the hull of the structure.

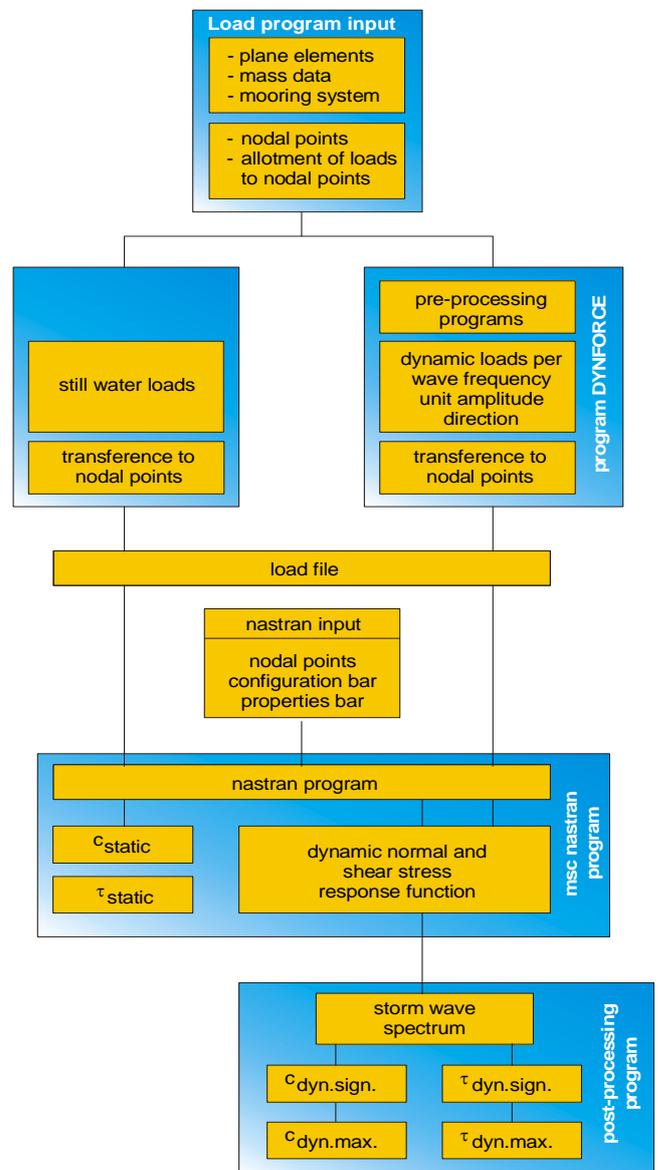
Input

- Structure's geometry (body plan)
- Construction drawings of the vessel
- Detailed mass discretisation of the vessel
- Mooring arrangement
- Water depth

Output

The results per wave frequency are:

- Loads acting on the masses which are distributed over the structure
- Dynamic pressures on the wetted surface due to the waves and the rigid body motions
- Mooring forces on the vessel



Review of the total packet on strength calculations



These external dynamic loads are transferred from the calculated points of application to the appropriate nodal points of the finite element model. For a range of wave frequencies load files are generated.

These can be supplied on magnetic tape to serve as input for the strength calculations. In case these strength calculations are performed at MARIN, the eigen-value calculations and the strength analysis are based on the MSC-NASTRAN general purpose finite element program.

Finally post-processing programs determine the total significant and most probable maximum Hencky-Von Mises equivalent stresses in the structure under a given storm wave spectrum.

References

- Wichers, J.E.W. and Boom, W.C. de; "The Dynamic Loads for the Strength Design Of Moored Offshore Structures Under Storm Conditions", OTC Paper No. 3249 Houston, 1978, Vol. III, p. 1701.
- Oei, T.H.; "Strength and Buckling Aspects of a Moored Barge in Storm", NASTRAN User's Conference, Munich, 1979.

For more information please contact the department [Maritime Simulation & Software Group](#);

T +31 317 49 32 37

E msg@marin.nl