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MoorDyn+ formulation

1. Weight of a mooring line

The properties of the mooring line are computed as:

$$\rho = \frac{m_{air}}{A}, \tag{1}$$

$$A = \frac{\pi}{4d^2}, \tag{2}$$

where ρ is the density of the mooring line (kg/m^3), m_{air} is the mass in the air of the mooring (kg), A is the area (m^2), and d is the diameter (m).

$$W = (\rho - \rho_w)\ 9.81\ A, \tag{3}$$

where W is the weight of the mooring line per metre when it is submerged (N/m), ρ_w is the water density (kg/m^3). Then, the total weigh of the line (W_t) is computed according:

$$W_t = W l_u, \tag{4}$$

where l_u is the untrenched length of the line (m).

2. Equilibrium state

This equilibrium state can be achieved by following the next formulation:

$$F_n = \frac{2N}{l_u} \sqrt{EW}, \tag{5}$$

where F_n is natural frequency of each mooring line (rad/s), N is the number of segments, l_u is the untrenched length of the line (m), is E is the elasticity modulus (N) and W is the weight of the mooring line per metre when it is submerged (N/m). Then, the F_n should be performed according:

$$\frac{F_n \frac{1}{2\pi}}{10} < \frac{1}{dt_m}. \tag{6}$$

where dt_m is the integration time step. Following (6), the $dt_m$is computed as:

$$dt_m < \frac{1}{\frac{(F_n \frac{1}{2\pi})}{10}}. \tag{7}$$

3. Definition in the XML

Formulation	XML
ρ_w	<rho>
m_{air}	<massDenInAir>
d	<diameter>
l_u	<length>
N	<segments>
E	<e>
dt_m	<dtM>