Prof. Dr.-Ing.
Michael Schmiechen
Bartningallee 16
D-10557 Berlin (Tiergarten)
Germany

Phone: +49-(0)30-392 71 64
E-mail: m.schm@t-online.de
Website: http://www.m-schmiechen.de

MS 201308112100
201308312230
201404172000
201404182000
201404241600
201408091900
201408272000

To whom it may concern

Current at a quasi-steady ship 'model' powering trial

References

Reference:C:\model_test\mod_prel.mcd

Reference:C:\model_test\mod_rout.mcd

Reference:C:\model_test\mod_data.mcd

Input of filtered and stationary data

dat_filt := READPRN("Dat_filt")

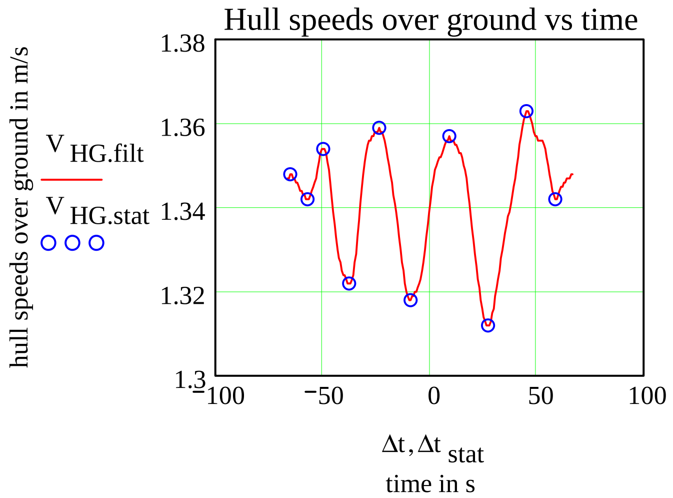
$\left[\Delta t \;\; N_{S.filt} \;\; P_{S.filt} \;\; V_{HG.filt} \;\; a_{rel} \;\; T_{S.filt}\right] :=$ dat_filt

dat_stat := READPRN("Dat_stat")

$\left[ind \;\; \Delta t_{stat} \;\; V_{HG.stat}\right] :=$ dat_stat

$k := 0 .. \operatorname{last}(\Delta t_{stat})$

$N_{S.stat_k} := N_{S.filt}(ind_k)$ $\qquad P_{S.stat_k} := P_{S.filt}(ind_k)$ $\qquad \Psi_{HG.stat_k} := \pi$



Identify 'tidal' period in the tank

The criterion adopted

In view of the small current amplitude to be expected the minimum of the mean current has been adopted as criterion for the selection of the current period.

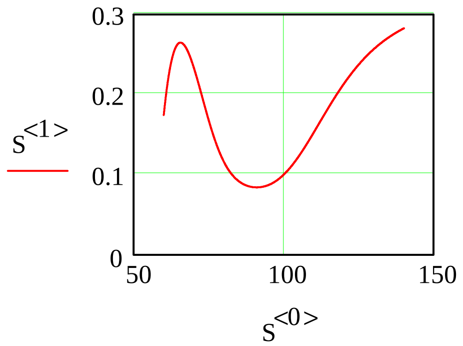
A check has shown, that the mean current identified equals the mean current identified with the harmonic component assumed to be non-existent.

Survey of mean current as function of the tidal period

$$C_m(n, T_i, \Delta T) := \left| \begin{array}{l} \text{for } j \in 0..n \\ \quad \left| \begin{array}{l} S_{j,0} \leftarrow T_i + j \cdot \Delta T \\ \omega \leftarrow \dfrac{2\cdot\pi}{S_{j,0}} \\ V_{WG.m} \leftarrow C0(\omega, \rho, D, \Delta t_{stat}, V_{HG.stat}, \psi_{HG.stat}, N_{S.stat}, P_{S.stat}) \\ S_{j,1} \leftarrow V_{WG.m} \end{array} \right. \\ S \end{array} \right.$$

$n := 8000 \qquad T_{ini} := 60 \qquad \Delta T := 0.01$

$S := C_m(n, T_{ini}, \Delta T)$



Find minimum

$SS := \mathrm{csort}(S, 1)$

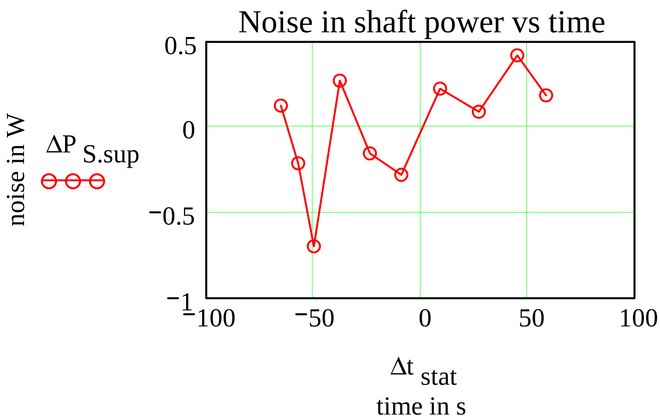
$s := \left(SS^{T}\right)^{\langle 0 \rangle}$ $\qquad s = \begin{bmatrix} 90.96000 \\ 0.08439 \end{bmatrix}$

$\omega := \dfrac{2 \cdot \pi}{s_0}$ $\qquad \omega = 0.06908$

All results identified at the quasi-stationary conditions

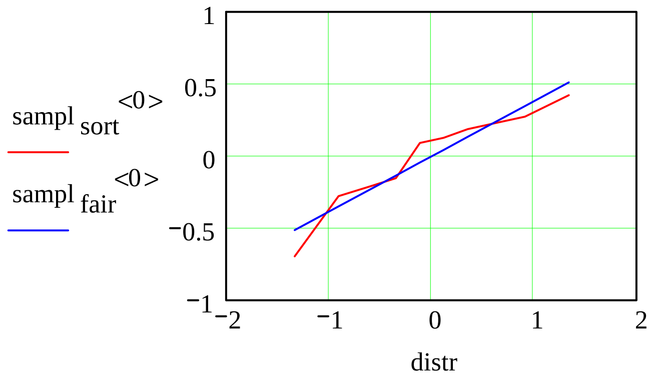
$$\begin{bmatrix} \Delta P_{S.sup} & v & V_{WG.stat} \\ V_{HW} & p & P_{S.sup} \\ J_{HW} & p_n & K_{P.sup} \end{bmatrix} := \mathrm{Supplied}\left(\omega, \rho, D, \Delta t_{stat}, V_{HG.stat}, \psi_{HG.stat}, N_{S.stat}, P_{S.stat}\right)$$

Residua scrutinised



Check of distribution

$$\left[distr \;\; sampl_{sort} \;\; sampl_{fair} \;\; distr_{par} \right] := \mathrm{norm\_distr}\left(\Delta P_{S.sup}\right)$$



$$distr_{par} = \begin{bmatrix} -0.00025 \\ 0.38311 \\ 0.12115 \end{bmatrix}$$

Current identified

$i := 0 .. last(\Delta t)$

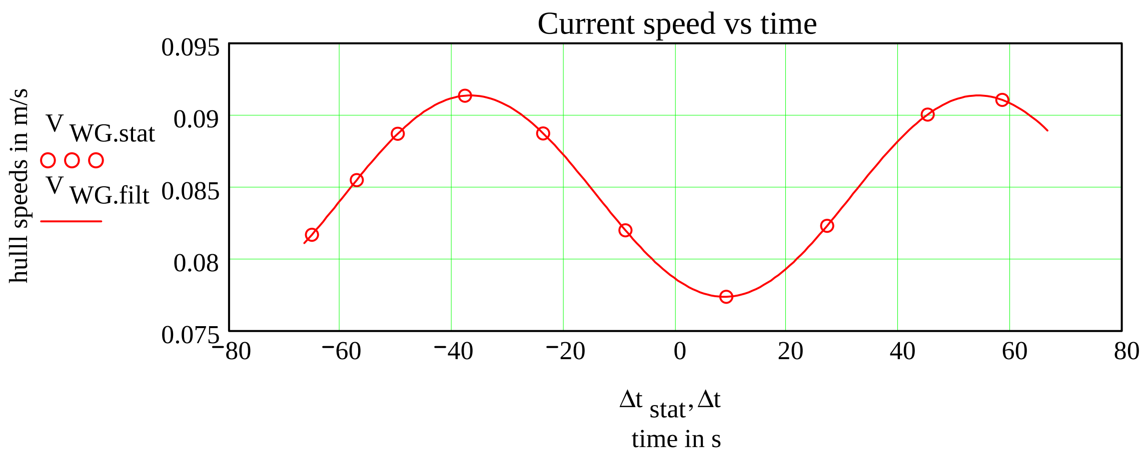
$V_{C.mean} := v_0$ $V_{C.mean} = 0.08439$ mean current

$T_C := s_0$ $T_C = 90.96000$ tidal period

$V_{C.ampl} := \sqrt{(v_1)^2 + (v_2)^2}$ $V_{C.ampl} = 0.00700$ tidal current amplitude

'Tidal' current at quasi-steady states

$V_{WG.filt_i} := VT(\omega, v, \Delta t_i)$

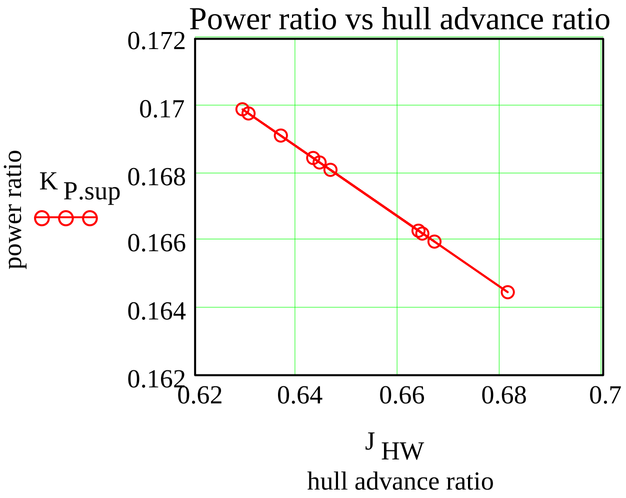


Store current values at quasi-steady conditions

$dat\_curr := V_{WG.filt}$

WRITEPRN("Dat_curr") := dat_curr

Propeller powering characteristic identified



Store parameters of powering charracteristics

$dat\_pow := [p \;\; p_n]$

WRITEPRN("Dat_pow") := dat_pow

Conclusions

Identifying the current in the model basin and the propeller powering characteristic in the behind condition, based on the quasi-*stationary* conditions passed during the quasi-*steady* trial, is a method already applied in 1989 and mentioned in the Proceedings of my 2nd INTER-ACTION Berlin '91, thus paving the road for full scale applications.

The investigation of the current in the tank, 'usually' performed only in cases of doubt, of 'tank storms', poses special problems not to be expected on full scale.

The tidal current model adopted maybe considered as inadequate, even 'wrong' on model scale, in 'towing' tanks. But 'according' to the motto, it turned out to be 'particularly' useful.

The mean current identified in the present case is 'considerable', but not unlikely, as the test analysed has been the eighth in a series of quasi-
steady tests.

On full scale also the powers required due to the motion through the water and due to wind and waves can be identified separately and thus, with the propulsive efficiency identified before, even the hull resistance and the wind and wave resistance! *Nota bene*: No thrust measurements being required!

For the standard ISO 19030 under development the rational procedures successfully developed on model scale will be fundamental.

Altogether this completes the triumph of Fritz Horn's vision and proposals tested before and discussed during the 4th ITTC at VWS Berlin 1937.
At that time it 'only' suffered from inadequate conceptual, experimental and computational tools and further developments were disrupted by the second world war.

END
Current etc at a quasi-steady ship 'model' powering trial