On the inter-subjective, alias 'objective' identification of the propulsive performance of ships on model and full scale

An executive abstract prepared for the 30th ATTC 2017 at NSWC Carderock

based on the 'blurb', the preface and the executive summary of my third volume of 2015 on

Future Ship Powering Trials
And Monitoring Now!
"All my poems are occasional poems, they are inspired and deeply and firmly rooted in reality. I do not believe in poems plucked out of the air.

[Alle meine Gedichte sind Gelegenheitsgedichte, sie sind durch die Wirklichkeit angeregt und haben darin ihren Grund und Boden. Von Gedichten aus der Luft gegriffen halte ich nichts.]

Johann Wolfgang Goethe, in the conversation with Johann Peter Eckermann on 18.09.1823. [Translation]: MS.

PROBLEM
The 'realities' that have inspired my 'poems' concerning the powering performance of ships since 1980 are the evident deficiencies in theory and practice of testing on model scale and of trials and monitoring full scale.

The evaluation of model propulsion tests are, as in Froude's days, still based on 'separate', 'incoherent' hull towing and propeller open water tests, performed at flow conditions not only widely differing from those at the propulsion tests, but which cannot be performed on full scale under service conditions.

Following Fritz Horn's vision of 1935, using the tools available today, the theory underlying my 'poems' is not the Poetics of Aristotle, but the theory of axiomatic models, the grammar of formal languages adequate for talking in a rational fashion about the micro-universes under consideration.

Accordingly they are phrased in terms of coherent conventions and interpretations, solely based on quasi-steady propulsion tests to be performed on model and full scale in the same way at any service conditions. The evaluation requires no prior data, as theoretically necessary and demonstrated earlier in case of steady traditional trials, and, no thrust measurements, as practically necessary and demonstrated in the present exercise. [Research still going on.]

IMPORTANCE
The conventions of the rational theory of propulsion, promoted since 1980, provide a common, sound, thus lasting basis of 'considerable' importance for research and development concerning methods of future efficient and reliable trials and monitoring.

This third volume, celebrating the quasi-steady propulsion tests with the research vessel METEOR in the Greenland Sea in 1988, is presenting the report on the 'final' evaluation of the quasi-steady 'model' propulsion test of 1986 together [in the meantime considerably up-dated], with explanatory letters and notes.

MS 15.04.2017 18:48 h
**Continued from front end-paper**

**SCOPE**

Different from various documented preliminary, unsatisfactory evaluations in the 'final' evaluation not only the routines have been 'streamlined', but the axiomatic model and the corresponding terminology and symbols as well.

Complete analysis of the propulsive performance of a model based on the quasi-steady test of only two minutes duration and comparison with traditional results demonstrate the extreme efficiency and reliability, respectively, of the rational procedure proposed.

The recent analyses published show, that even if the model thrust data are ignored, current, resistance and propulsive efficiency have been identified reliably, thus indicating the course to be held in developing the standard ISO 19030 aiming at efficient, reliable trials and monitoring of the powering performance full scale under service conditions.

The final section is devoted to my Written and Oral Contributions to the Reports and Discussions at the 27th ITTC Copenhagen 2014. Further, notes on References, concerning fundamental standards in particular, and Archives, are provided for ready reference.

**READERS**

This third volume on the rational theory of ship propulsion and its application to trials and monitoring is another 'letter' addressed to my colleagues and my students, as well as to whom it may or must concern, governing bodies and pertinent committees of the ITTC, ISO and IMO in particular.

**AUTHOR**

In 1997 Dr.-Ing. Michael Schmiechen retired as Deputy Director, Head of Research and Development, from Versuchsanstalt für Wasserbau und Schiffbau (VWS), the Berlin Model Basin. As ausserplanmässiger (apl.) Professor he has at the same time been released from the duty to lecture on Hydro-mechanical Systems at the Institut für Schiffs- und Meeres-Technik (ISM), Technische Universität Berlin (TUB). But since then he has continued to lecture on professional problem solving at ISM until 2011 and he is still continuing his fundamental work and promoting its results around the world.
Preface

The work reported in the third volume of my Festschrift written to commemorate my METEOR tests of 1988 in the Greenland Sea is humbly dedicated to the memory of Fritz Horn (1880 - 1972), Professor of Ship Theory at the former, up to the end of the first war 'Königliche Technische Hochschule Charlottenburg' (KTH), since the end of the second war 'Technische Universität Berlin' (TUB).

His vision of 1935 [Schiffbau, No's 18, 1920], subject of preliminary tests at Wageningen and Tokyo discussed at the 4th ITTC May 1937 at VWS Berlin, the Prussian Versuchsanstalt für Wasserbau und Schiffbau, as documented in the Proceedings (Mitt. VWS Berlin, Heft 32, 1937, 54-63, 67-68), finally became reality in 2014.

The fundamental results of the happy end of the long 'hi'-story', that started on a summer weekend in 1980 with my first paper on 'an axiomatic theory of hull propeller interaction', have immediately been brought to the attention of colleagues, friends and fans and Members of all pertinent ITTC Committees as a St. Nicholas' present, announcing the publication of this complete report.

Two explanatory letters 'On Ship Theory and Paradigms' are followed by the complete Report, each of its Sections with 'Related notes' added. These notes reduce the very large documentation of the development on my website into a nutshell for colleagues prepared finally to join in the future developments of applications on model and full scale.

The present exercise demonstrates the possibility of extremely efficient reliable ship powering trials and monitoring full scale under service conditions, without requiring not only no prior data but, most important, no thrust measurements, nobody even noticing, that such trials are being performed. The results so far are my substantial contributions to the standard ISO 19030 under development

This collection of recent work is completed by my Oral Discussions to the Reports of the Technical Committee on Propulsion and the Specialists Committee on Performance of Ships in Service at the Full Conference of the 27th ITTC at Copenhagen in September 2014 and a Written Contribution.
On the 'objective' identification
of the propulsive performance
of models and ships in service

An executive summary

THE COMMANDMENTS OF RATIONALITY, OF OBJECTIVITY
AND, LAST BUT NOT LEAST, OF EFFICIENCY

"Thou shalt not talk in terms of incoherent models and of
incoherently interpreted concepts."
"Thou shalt not introduce more parameters in vain than
you can identify reliably without any prior data."
"Thou shalt not adhere to traditional trials, quasi-steady
trials being necessary and possible for performance moni-
toring in service anyhow."
2 Moses 20, 1 – 17. Paraphrases: MS.

Problem
The problem stated in the title is a fundamental problem of the theory of
ships, the latter being much more than Coloured Fluid Dynamics, in fact
being 'on top' of any performance prediction. The problem is reliably, i. e.
'objectively' to prove any predictions, not to say the 'promises' made con-
cerning the powering performance of ships.

Plan of exposition
In order to provide a survey of the development of the rational theory I am
promoting; I shall not repeat any of the many expositions of the rationale of
my work, but I shall outline the 'history' of my work up to now in more eas-
ily understood, rather crude engineering terms.

Model scale tests
Traditionally powering predictions have been and often still are, following
Froude's incoherent interpretation of the basic concepts, based on the results
of hull towing, propeller open water and propulsion tests with geometrically
scaled models of hulls and propellers at different flow conditions, and flow
not similar to conditions met on full scale.

Full scale tests
Thus scaling to full scale conditions based on past experience is necessary,
but the problem is, that corresponding full scale hull towing and propeller
open water tests, necessary to collect the necessary experience, are practically not possible, definitely not routinely under service conditions.

My conclusion

This situation is not my fault! But in view of the dilemma I have drawn the only reasonable conclusion and consequence. In 1980 I have proposed a coherent model and a corresponding procedure of quasi-steady testing, which gets along without hull towing and propeller open water tests. And in the late 1980s I have successfully applied this method on model and full scale on the METEOR under service conditions in very heavy weather.

Model test technique

In the following years the technique has been developed to maturity for model testing. The results compare perfectly well with results of the traditional procedure based on model hull towing and propeller open water tests as documented in this volume. This 'coincidence of results is not necessary, but useful for linking up with past experience, as far as any are available.

Traditional trials

In the late 1990s, when I saw the 'incredible' draft of the standard ISO 15016 on the assessment of traditional trials, it occurred to me, that based on a half sentence in my report on the METEOR tests, a much more transparent, 'objective' method was possible. Contrary to the traditional method it does not require any prior data.

ISO 15016 disaster

Despite being error prone, inherently wrong as I demonstrated explicitly long before it became a standard, and thus being no longer acceptable, being inadequate for most of today's purposes, the current, long overdue revision of the standard ISO 15016 perpetuates this deplorable state of affairs by adopting the 'incredible' STAimo method based on a joker to be pulled out of the sleeve.

ANONYMA and PATEs

My rational method has been developed to maturity and its power has finally been demonstrated in the ANONYMA project and the first Post ANONYMA Trial Evaluations of two sister ships in the East China Sea. The ANONYMA project has been documented in the first volume, the first PATEs are documented in the second volume.

Monitoring

Traditional trials are not at all efficient and completely unacceptable for monitoring purposes. So I came back to the quasi-steady testing, realising that reliable thrust measurements, as I have successfully made on board the
METEOR, are not routinely possible. Again this is not my fault! But I drew the consequence and developed a method to identify the values of the resistance, of the propulsive efficiency and finally of the thrust deduction fraction etc requiring no thrust measurements.

Quasi-steady 'model' test

The first exercise along this line, published in the first volume, suffered from a stupid error, which has subsequently been repaired. The remaining problem, the identification of the current, is subject of the solution proposed and published in this volume.

Familiarity with tools

In the course of nearly thirty five years a full range of 'practical', though fundamental problems, heretofore unsolved, have been solved by approaching them pragmatically based on a thorough understanding of their nature and familiarity with current epistemological, logical, statistical and numerical tools, necessary adequately to deal with them. Even at this advanced stage the development is of course not finished, but considered as work in progress.

Developments

The routine for the identification of the current and the powering characteristic of the propeller in behind condition is absolutely stable and an extremely sensitive tool for scrutinising the data. But in the process of 'streamlining' all programmes for routine applications some basic routines have been found still lacking stability, for reasons yet to be identified and 'addressed'. [Continued below.]

A conclusion

A surprising fact is, that the community concerned has not yet taken advantage of the dramatic gains possible in research, technology and routine applications, still trying to solve the problems with the inadequate language and tools of our great-grandfathers and adhering to the doctrine 'Not invented here!' But again this is not my fault!

Current research

The final results of the analysis of the ten stationary states 'passed' during my quasi-steady 'model' trial of 1986, that took only two minutes (!), are to be found in the eight worksheets in the 'News flash' on my website.

Next, a detailed procedure will have to be developed for the analysis of a similar full scale test of twenty minutes duration in some sea state. Dr. Klaus Wagner is already attempting to reanalyse the METEOR data as far as still available in the METEOR Report published.
References

Survey papers

Complete references to my work on propulsion and trials are to be found on the 'Bibliography on propulsion in general' and the 'Bibliography on ship powering trials' including links to papers and presentations on my website, of which only the introductory sections containing [earlier] survey papers are documented here.

Schmiechen, M.: Future Ship Powering Trials and Monitoring Now! Principles of rational conventions further clarified, consistently applied in a particularly delicate case and lessons (to be) learned. VWS Mitteilungen Heft 62, post mortem, Berlin 2013. See also 'Festschrift' Volume 1, pages 1-44.


Schmiechen, M.: 25 Jahre Rationale Theorie der Propulsion. Fritz Horn zum 125. Geburtstag. Prepared for the STG Summer Meeting at Magdeburg 17.-19.05.2005, which had to be cancelled. The paper has been presented at the 100th STG Annual Meeting at Berlin, held November 16 to 18, 2005. With many references to files containing detailed derivations of results. Jahrbuch STG (2005). Closely related is the following theme lecture.


Contacts

Prof. Dr.-Ing.
Michael Schmiechen
Bartningallee 16
D 10557 Berlin/ Germany
m.schm@t-online.de
www.m-schmiechen.de