Newsletter SARC BV

December 22, 2016

The previous newsletter on PIAS dates back from October 2015, so it is due time for a status update. Before going in the technicalities, please let us first elaborate a bit on our communication channels on news and novelties, as also discussed in the manual:

"Significant software changes or enhancements are communicated in news messages, which are distributed through different channels:

- All news about modifications and enhancements of PIAS — as well as other SARC related news such as trade fair presence — is placed on the website and published in Linkedin group SARC BV.
- Additionally, news on crucial PIAS modifications, for example those who lead to changed calculation results, is send by e-mail, for which you can (un-)subscribe with a mail to sarc@sarc.nl.
- Once a year the main modifications of PIAS are summarized in a newsletter which is sent by mail to those who subscribed. These newsletters are also collected on the website.
- Finally, on a number of subjects which touch PIAS some background references are available, in the shape of papers, as presented on a conference or published in a journal. The majority of these papers is in English, with an occasional one in Dutch."

So, although some of the relevant software changes and enhancements of the past year have already been communicated through other channels, they are nicely summarized and illustrated below. Please pay special attention to the last subject, because that could imply changes in computation results.

New Logo and phone numbers

Since its establishment in 1980, SARC has been using the Good Vibes font for its logo. On May 1st SARC celebrated its 36th birthday, which we consider to be a good opportunity for a fresh logo:

The logo designer has motivated his creation with these words: "A wave is the most identifying visual form that symbolizes water in its purest way. Water is the only constant element SARC always takes into account. Incorporating the wave as the integral part of the letter 'A' guarantees such a strong and iconic visual appearance. The logotype – as a typographic only logo – by itself is one of the strongest categories of logos. When executed right, it will become the company's synonym". In the curly shape of the A the former seascape of our business cards and leaflets is reflected, as depicted in one of the designers' design sketches:

SARC's telephone numbers have changed. The general number is now +31 850409040 (although the former +31 35 6915024 will remain in service for some time). Furthermore, each employee of SARC crew can be reached directly, at below numbers:

SARC	+31 850409040
Marion Goddijn	+31 850409041
Mark Visser	+31 850409042
Guido Vijn	+31 850409043
Douwe Plukkel	+31 850409044
Egbert van IJken	+31 850409045
Herbert Koelman	+31 850409046
Casimir Koelman	+31 850409047
Remco v.d. Berkt	+31 850409048
Bart Soede	+31 850409049
Johannes van Houten	+31 850409050
Bastiaan Veelo	+31 850409051
Raffaele Frontera	+31 850409053
Abraham de Ronde	+31 850409054

Probabilistic damage stability: enhanced algorithm for the determination of damage case dimensions

PIAS' Probdam module is equipped with functions for damage case generation and for the automatic determination of damage boundaries. The algorithm for the latter has been enhanced for two reasons:

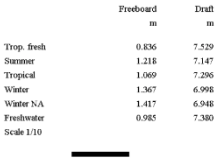
- To accommodate damages over centerline (as already announced in the newsletter of October 2015).
- To be able to handle non-foursided compartment shapes. With PIAS' old compartment definition module Compart all subcompartments were limited to four sides. Newlay, the replacement module of Compart, supports a wider variety of shapes, including subcompartments having from three to twelve sides. Because all damage stability modules are being prepared to support this extended definition, the Probdam damage case management library must be updated accordingly.

The update of this algorithm has three consequences:

- The found extent of damage can be slightly different than with the previous algorithm. By the way, the manual contains a short elucidation on the process of finding the damage boundaries.
- Not each and every damage case is indeed possible, given the rules and constraints of SOLAS2009. This new algorithm has been further optimized to find matching damage boundaries, where with the previous algorithm it could have been concluded that the damage was impossible.
- Although finding the extent of damage may be a time-consuming process, the old algorithm was highly optimized to do it as swiftly as possible. The new algorithm has to evaluate more complex cases – over CL, and non-foursided – which inevitably will result in occasionally longer processing times. However, please be assured that SARC has used every option to keep the performance high. In this respect contemporary computer hardware facilities can also be employed, with PIAS' octothreading speed enhancer, which is scheduled to be released within some weeks.

A version of PIAS' Probdam with this enhanced algorithm is available for download since September 6, 2016.

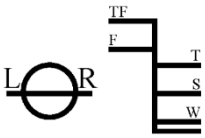
Revised freeboard module from PIAS



	Freeboard m	Draft m
Trop. fresh	0.836	7.529
Summer	1.218	7.147
Tropical	1.069	7.296
Winter	1.367	6.998
Winter NA	1.417	6.948
Freshwater	0.985	7.380

Scale 1/10

Although the freeboard calculation module of PIAS is not core of the suite, it is still intensively used in many phases of the ship design process. For that reason we have taken up this module — from which the origin lies 20 years back — and brought it in line with the look and feel of the other PIAS modules. One enhancement is that hullform parameters can now directly be derived from PIAS' hull model. The applied algorithms remains unchanged, so computation results will not be affected.

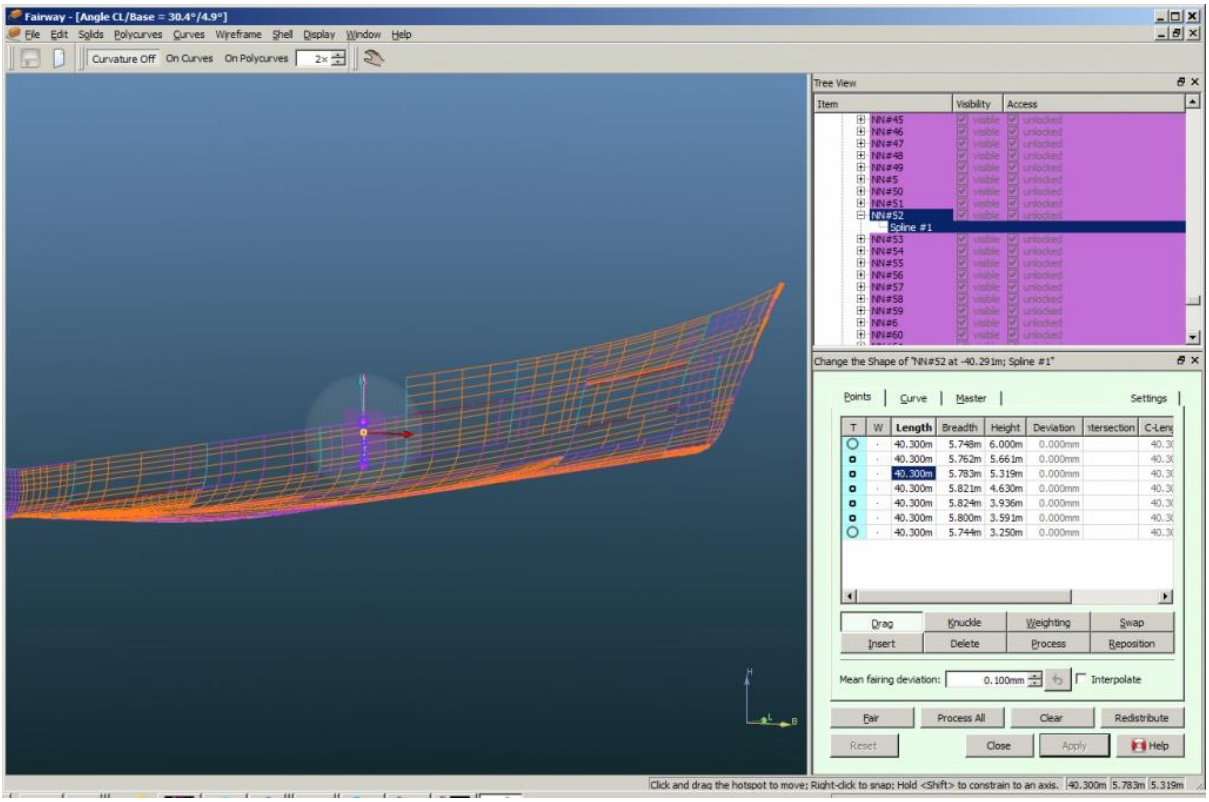


Support for the computation of paint areas of compartments

PIAS' Newlay module – for definition of the internal geometry, such as planes, bulkhead and compartments – has been enhanced with a function to compute the area of the outer surfaces of compartments. These figures are intended to serve as a guide for the **paint area** of compartments.

Fairway support for *trimmed surfaces* in IGES import

For many years the hullform modeller of PIAS, Fairway, has a capacity to import the hull shape from files in (several formats of) IGES or DXF format. We noticed a rising application of *trimmed surfaces* in IGES, for that reason the Fairway import now also supports this IGES sub format.



More output languages

From its early days PIAS has been available in Dutch and English, including the supporting material such as the manual. Supported output languages have been quite some time English, Dutch and German (for the most commonly used PIAS modules). The last years, the language set has been extended to:

- Output in French and Russian, for the most commonly used PIAS modules
- LOCOPIAS in Chinese and French

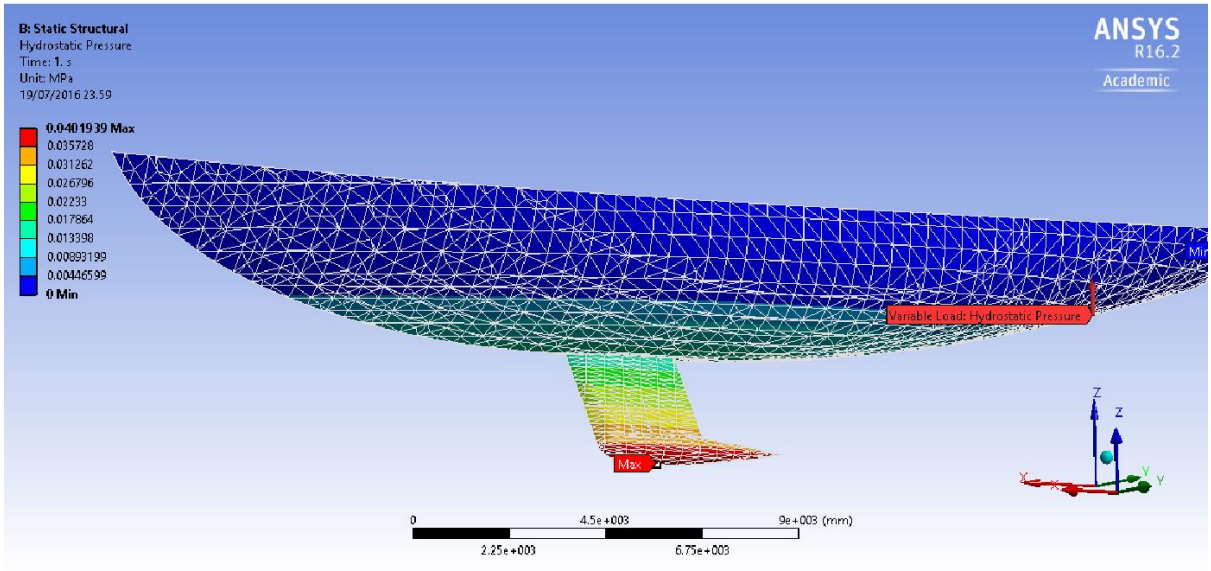
For the support of multilingual PIAS please refer to the corresponding manual section.

STL output from Fairway

Already for more than twenty years, Fairway contains an export facility to STL files, which are the de facto standard for 3D printing applications, and are also used in other geometry exchange applications. Recently, this output has been enhanced with:

- Varying triangle sizes.
- Specific settings aimed at CFD applications.

Please refer to the relevant manual section for more details.



SARC says farewell to Windows XP

PIAS' internal library has been enhanced in order to benefit from facilities of more recent versions of MS-Windows. This implies that future versions of (LOCO-)PIAS will not be able to operate on Windows XP. For program users who still rely on XP a backdoor will be available for some time. This has to be set internally by SARC, so if you require an XP version please inform SARC.

Output of intact and damaged maximum allowable VCG'

Tables and graphs of VCG' limits were until recently only available as *maximum allowable VCG'*. With the present PIAS version the output can also be given as *minimum required G'M.* Not a major enhancement, but a small feature which will please some of the users.

Revised inclination test module

The design of the original version of PIAS' inclination test module, Incltest, was drawn up around 1988. In the course of the years, quite some changes and extensions have been made to the program, but the basic structure has roughly remained the same. Comments and desires of many users have been

collected over the years, and have recently been used in the implementation in a completely new module, which will replace the present one in December 2016. Some enhancements are:

- Integrated support for the use of ballast water as test weight.
- More comment and text fields.
- Enhanced output, including depiction of the ship's deflection, sketches with positions of test weights and a graph of heeling moment vs. inclination.
- As alternative to the determination of final G'M as average of all measurements, a least squares method can be applied in the graph of the previous bullet.
- More flexible way of defining movements of test weights.
- Integration with PIAS' tank definitions, so just giving ullage or sounding will suffice to retrieve volume and CoG.
- Drafts can now also be given on (pre-defined) draft marks.
- Better-arranged lists of weights to add, remove or relocate.

More details can be found in the corresponding manual chapter. When using this new module, please take care of the modified method for giving movements of weights and strokes of pendulum, which is elaborated in a dedicated manual paragraph.

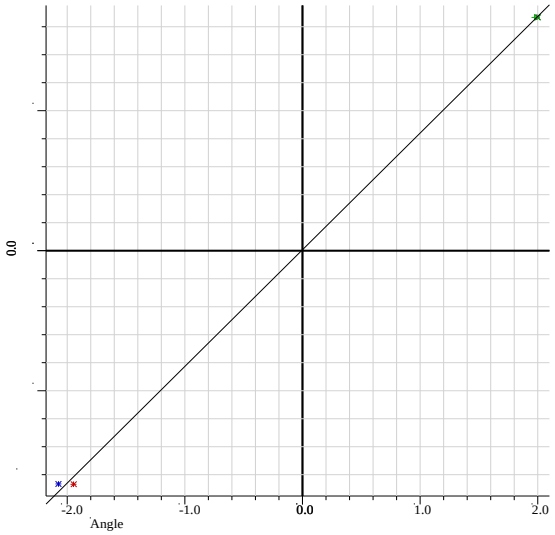
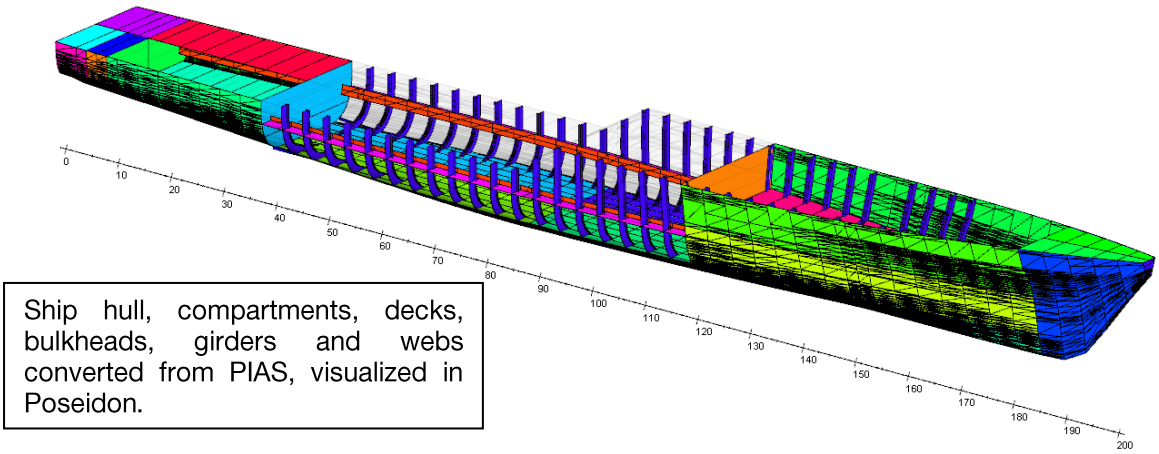


Diagram of heeling moment vs. Angle of inclination, as produced by the revised inclining test module.

Data transfer from PIAS to DNV•GL Poseidon

We have reported earlier on the development of a function which converts PIAS' data on hull and compartments to the import format of Poseidon, a scantling program by DNV•GL. Recently, this interface has been extended, and now includes:

- Relevant main dimensions and other general numerical data.
- Table of frame spacings.
- The hull form, represented by all frames of the PIAS model.
- The shape of transverse and longitudinal bulkheads, and decks.
- Compartments.
- Plating per compartment, with a default plate thickness.
- Global loads: the (envelope of) longitudinal shear forces and bending moments.
- Local loads: deck loads, compartment fillings and wheel loads.
- The basic structure of girders and webs.



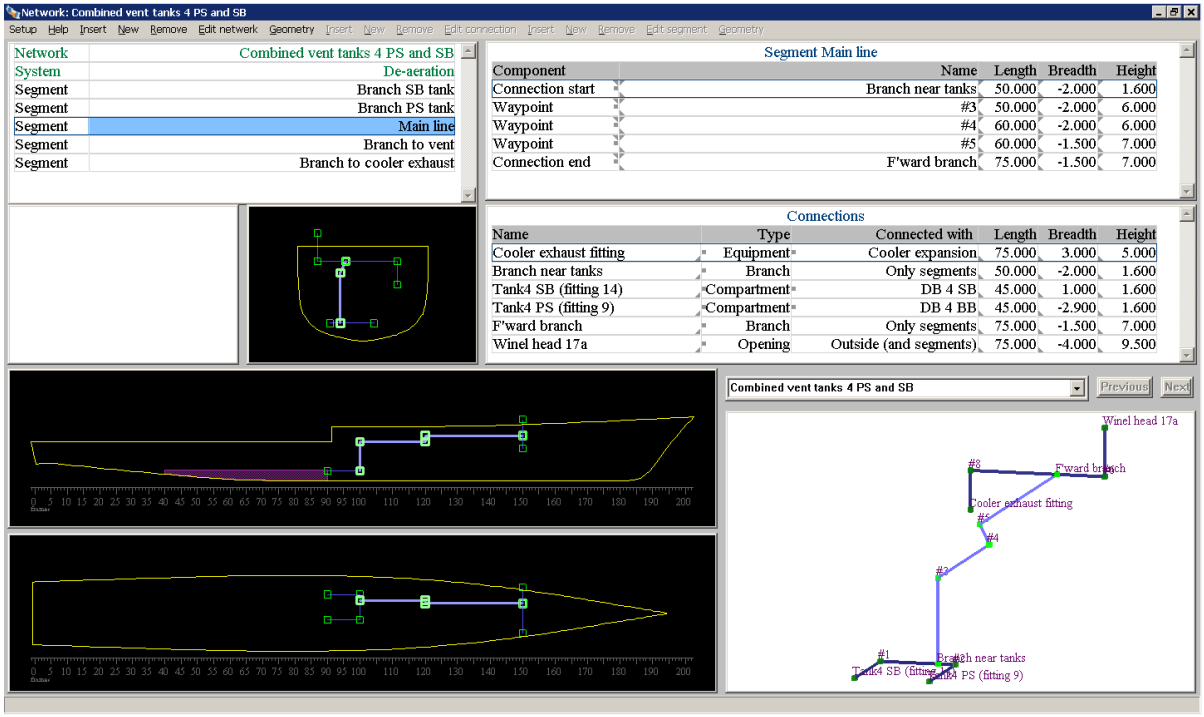
Ship hull, compartments, decks, bulkheads, girders and webs converted from PIAS, visualized in Poseidon.

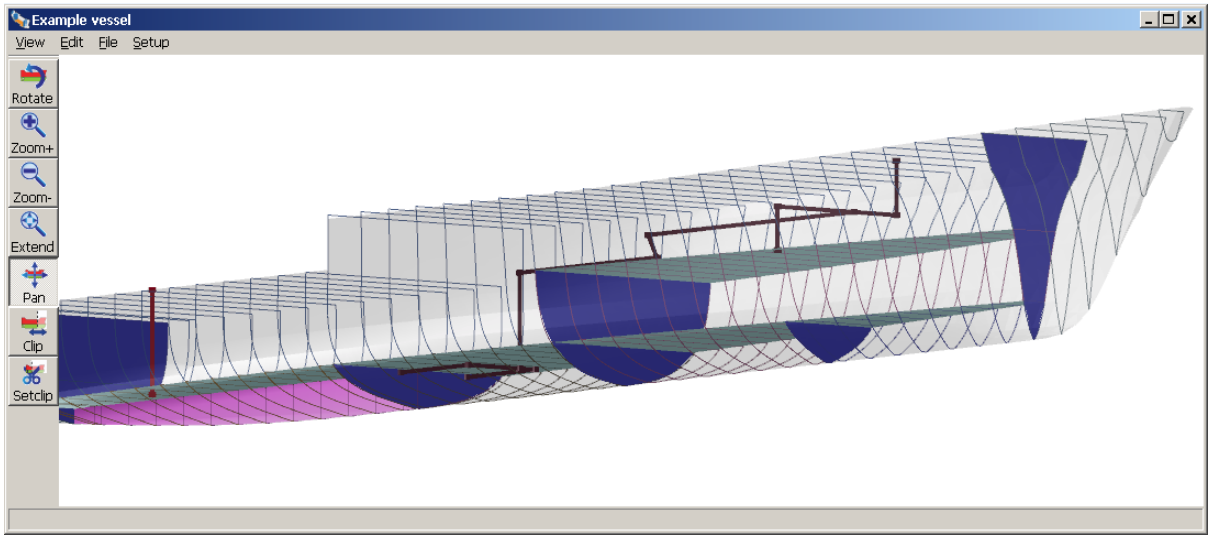
The start of the integration of piping in design and engineering

Connections between compartments, as well as internal openings, play an ever larger role in the assessment of damage stability. Already for some twenty years this can be modelled in PIAS by so-called 'compartment connections'. That facility serves its purpose, however, a drawback is that the real geometry of the connections is not available; they are more or less 'virtual' connections. This subject is enhanced at this moment by including the real shape and connection properties of the piping system into PIAS. Including components, such as a pressure relief valve or a vent check valve. Once finalized, this information is available for two purposes:

- To be used in the calculation of deterministic and probabilistic damage. With this new data structure the effects of cross-flooding can be integrated into the probabilistic damage stability calculation of PIAS' Probdam module.
- To be communicated with other (i.e. engineering) computer programs.

A short overview of the data structure can be found in the manual.





Propagation of damage case

In damage stability requirements for European Inland Waterway tankers (ADN) one of the requirements is that each opening should have a minimum clearance to the damaged waterline of 10 cm. In PIAS that can be set as criterion, however, an additional question could be what happens if flooding should be assumed to take place through this opening. In order to make this analysis, PIAS has been extended with the 'propagation of damage case' mechanism, on which more details can be found in the manual.

Integrated stability assessment to Portside and Starboard

In PIAS, computations of intact and damage stability could be made to starboard and portside separately. Also a setting existed which made the calculation automatically to the side of the initial heel. The assumption for that choice was that the initial heel side will most probably be the side of worst stability. But not always, if, for example, the ship has an initial heel to SB, while an opening at PS is submerged at a much smaller angle than a SB opening, PS might be the critical side.
In order to assess such a situation more thoroughly, an additional setting has been in included, which is called *portside and starboard*. The manual elaborates a bit more on this. It might occur that a computation to PS & SB gives slightly different results than to SB and PS separately. The manual explains why.

Octothreading

For ordinary office PC's Moore's law appears to have come to its end; where over the decades processor speed has doubled every two to four years, this has more or less come to an end today. As an alternative, PC's have more and more been equipped with multiple processors or cores. Unfortunately, adding more processors does not automatically make them being used; the reason is that only tasks that are intrinsically suitable to be parallelized can be distributed over multiple processors, and only at a higher software level such tasks can be identified. This implies that application software should explicitly be adapted to use this additional computer power, first to identify parallelizable tasks, and secondly to exploit multiprocessing, task by task. Some ten years ago, a number of computation intensive tasks in PIAS has been adapted for dual processing, with the Windows functions as available in those days. Nowadays, the Windows platform offers other features (notable thread pools) which are more efficient when used on a larger number of processors. That technology has been included in (parts of) PIAS, and is applied up to a number of eight parallel processors. Hence the name *octothreading*, which is available as additional PIAS function number 100.10.20.

A difference in computation results

For the implementation of *octothreading* some core procedures of PIAS had to be adapted. In that process the accuracy of one particular algorithm could be increased a bit. This algorithm exists already for more than twenty years, but increased computer power allows this refinement to be implemented now. Due to this modification some hydrostatics and stability-related results of PIAS might differ from previous PIAS versions. If you need compatible of results with elder PIAS versions — for existing designs or elder projects — you can set that in PIAS' Config module.