THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Proceedings of the REAPS Technical Symposium

Paper No. 24:
ALKON from Lay-Out to Production on the Example of a Double Bottom

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Proceedings of the
REAPS Technical Symposium
June 15-16, 1976
Atlanta, Georgia

Research and
Engineering for
Automation and
Productivity in
Shipbuilding

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This paper concerning the evolution of the use of ALKON at C.A. is the fourth presented at the occasion of an AUKON Users Club meeting.

This time, we have chosen to present a concrete application of what a set of ALKON norms, when directed to a specific part of the ship structure can achieve.

The part of the ship concerned is the double-bottom, both in engine room and in cargo area.

The ship is a container ship convertible into cargo ship ordered in October 1975 and for which keel laying will take place beginning of 1977.

As we have already outlined in the introduction, the "DOUBLE-BOTTOM" is one specific part of the ship structure for which one can easily imagine that an ALKON norm (or set of norms) can be applied.
The reasons which make easy the design by norms of a double-bottom are the following:

10) A double-bottom is a well delimited part of the ship-structure.

   It is composed of:

   Shell-plating between two boundary transverse-frames

   Tank-top plating including holes, openings or casings between the above transverse limits

   Girders running longitudinally including holes and stiffeners

   Floors in transverse frames, crossing girders, intercostal or not, including holes and stiffeners

20) A good "picture" of the complete double-bottom can be obtained from above i.e. looking at a horizontal projection of the tank-top.

   Starting from these facts the guidelines of a double-bottom set of norms will be:

   Generation of tank-top, based on the principle of giving maximum information concerning the underlying girders and floors

   Approximate positioning of holes in successive floors and girders along a line of holes

   Generation of floors and girders

   Possible modification of hole-positions in a single floor/girder

   Drawing of the resulting lay-out
In practical use from lay-out phase to production, we will proceed through the following steps:

1°) - Preparation of the lay-out according to the above guide-lines
   - Drawing of the lay-out

2°) - Automatic splitting or dividing of floors and girders when they intersect each other

3°) - Introduction of all the divided parts of floors and girders in the composition of a block-drawing
   - Execution of a block-drawing of double-bottom block

4°) - Transfer of double-bottom parts to production-phase for:
   . production transformations
   . production identification
   . list of pieces, nesting and so on
   . sketches of assembly-parts

III- GOING THROUGH THE STEPS -
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We will briefly go through the steps and will underline which are the items to take care of and which difficulties may arise.

"1.1 - Preparation Of the lay-out and drawings

We must first of all, as this has not been done before, state that this starting phase has been developed together with the drawing of the lay-out by AKER/SRS (especially Mr. K.JACOJH:N from AC).

Generation of the tank-top

To obtain as a result the drawing of the tank-top (fig. 1) we have to generate successively by using appropriate norms:
a) - **Tank-top contour in the area of the double-bottom**: on the drawing, the tank-top contour is shown as an arrangement of contours projected horizontally even when the tank-top is composed of planes which are not at the same horizontal level (change of height) or if some portions of planes composing the tank-top are inclined.

The resulting contour seen horizontally can then have knuckle-points.

b) - **Traces of girders in the tank-top**

c) - **Traces of floors in the tank-top**

d) - **(b)opening contours in the tank-top**

As a general remark, this intermediate result contains information concerning the hierarchy of a crossing between floors and girders (which one is going through, which one is intercostal).

**Generation of floors and girders**

For all the floors and all the girders, which, at this point, exist only under the form of their trace in the tank-top, appropriate norms will generate:

- Contour of the floors, as intersection in the transverse plane of contour of tank-top and contour of shell
- Contour of the girders by the same method, but with the difference that for girders
- We will obtain two contours: the actual contour, the projected contour in the XZ plane

Then, will be added to each floor and each girder:
- the local stiffeners
- the holes

Everything is now ready to produce, after the tank-top drawing, the drawings of:

- the girders in projected view *(fig. 2)*
- the floors at every frame *(fig. 3 some floors)*

These *dri-wings*, after some modifications/additions (updating of records in the database), can be used, if ready at the right time, as a very good basis for classification drawings.
3.2 Automatic splitting/dividing of floors and girders when they intersect each other.

This step, for which the corresponding norms have been written at C.A., is intended for preparing the two next steps and consequently:

- all parts belonging to a block must be generated separately
- the same parts, most of them being already single production parts to be nested, must be ready for transfer to the production

This automatic step starts from the complete girders and complete floors and divides them at butts (in the case of girders) or between girders (in the case of intercostal floors).

It is the job of the norms to recognize each case of intersection between a girder and a floor and also to determine on each side of one element going through if the left/right part of the element divided is watertight or not.

For each girder/floor divided in several parts, there is an automatic identification system, and the list of identifications is stored (composition matrixes) so that the drawing norms will later refer only-to that list for drawing or not the part, if the part is or not included in the block.

One remark has to be made here: the standard version of double-bottom norm package generates only floor-parts with a contour between tank-top, shell and (if necessary) one or two girders, but in the case of a duct-keel for instance, close to the central girder, we have to re-generate semi-automatically (that means with a non-standard norm) the duct-keel special parts.

Another exception to the standard version is the case when an intermediate tank-top divides the floors horizontally. "This can only be solved by the afore-mentioned semi-automatic method.

The result of this step can be an intermediate drawing of no official use showing all the girders and floors divided and identified.

3.3 - Introduction of double-bottom divided parts in the composition of a block-drawing

Execution of the block-drawing

At this point, the specific way of generating a double-bottom must have produced-standard records in the database to allow the standard process of execution of block-drawings developed at C.A.

The link has been realized by the preceding step.
Now, there will be a big composition list of everything included
in the block, everything divided by the limits of the block and
so on.

The computer has only administration work to perform in
order to draw sequentially the whole content of the block.

When we analyse the contents of one view in the block drawing, it
is composed of :

Contour of the parts which are in the projection plane of the view

Contour holes in the above parts

Traces of longitudinals penetrating the surface (or stopped on it)

Traces in the plane of the view of the parts included in other
surfaces.

(for instance in a transverse view, for double-bottom we will have
traces of tank-top, shell and girders)

This can be seen in some extracts of block-drawing of the said
double-bottom (see fig. 4 - 5 - 6 - 7).

3.4 - Transfer of double-bottom parts to production

As we have seen before, the work performed for preparation of
block-drawing is not far from what the production is waiting for.

We will give the list of the production transformations which have
still to be executed :

Adding of cwerlength on some parts when necessary assembly
purposes

Take care of bevel when the angle between Floor and girder or
between floor-part and shell is more than a certain value

Replacing of traces of stiffener parts by marking lines in
contours

After that the production parts can be used :

- for nesting purposes
- for assembly sketches
- for lists of contents of blocks, assemblies and so on.
It is the first time at C.A. that we have run the complete process on an extensive part of the double-bottom and not only for test purposes.

The results are very promising if we have the following conditions:

In the first step (for classification drawings) the man in charge of the AUXXON design of the 'double-bottom must be very experienced with the input-preparation of norms and must be in good contact with the people in charge of designing the d.b.

Modifications of the design are a common fact when designing double-bottom, especially in engine area.

The computer and drafting equipment turn-around must ensure a good response.

The conclusion is, that, for other parts of the ship-structure especially for ships with a double-hull the guiding principles of the double-bottom norms might be applied.

The 27th of April

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