ADVANCED OFFLINE-PROGRAMMING SOLUTION FOR YACHTS

As more and more yacht manufacturing processes are automated, there is a great potential to significantly reduce the downtime of machines and robots by offline-programming. BAVARIA has already an automated manufacturing line. The offline-programming software of CENIT gives BAVARIA new perspectives and efficiency in the field of contour milling, drilling and gelcoat spraying.

► ABOUT BAVARIA

Since 1978, BAVARIA yachts have been synonymous with premium quality, solid and lasting values as well as an outstanding price-performance ratio. More than 3.000 motor and sailing yachts per year leave the shipyard ranking among the worlds largest and most successful yacht manufacturers.

BAVARIA continuously develops sailing yachts and motorboats, which range from the SPORT 28 motorboat to the CRUISER 55 sailing yacht. All boats are purely produced by order from the dealer; a method that enables each customer to configurate an individual yacht for their taste. Our worldwide dealer network guarantees BAVARIA customers a professional delivery and first-class service on site. The shipyard employs approximately 550 workers and produces yachts ranging from 28 to 55 feet. Up to now, BAVARIA has manufactured more than 30,000 yachts and exported over 85%. The production is currently split into 60% sailing yachts and 40% motorboats.

BAVARIA applies its experience from the past three decades with innovative production methods. The shipyard has one of the most state-of-the-art series production facilities for sailing yachts worldwide. From hull lamination to final delivery, BAVARIA yachts pass various assembly stations covering a distance of more than six kilometres. CAD/CAM software and high-precision robots in combination with long-standing experience and technical skills our high-qualified employees ensure excellent teamwork.

BAVARIA
WHAT A YACHT

www.bavaria-yachtbau.com

> **"We significantly improved our manufacturing efficiency and quality by introducing Cenit's FASTSUITE."**
>
> Wolfgang Krapp,
> Teamleader Robot and NC Programming, BAVARIA

► APPLIED MANUFACTURING TECHNOLOGIES

The yacht industry is still characterized by manual work. But the yacht manufacturers are thinking about changing their manufacturing environment towards automation. BAVARIA has already changed: Precise CNC machines and robots are installed to obtain a repeatable, higher and constant manufacturing quality. There are machines for milling cut-outs and drilling hole patterns at hulls and decks. Robots are spraying gelcoat in molds.

The machines and robots are time-consumingly teached, preventing them from their main task: producing yacht components. The main reasons for this circumstance are on the one hand the flexibility of the hull or deck due to the typically huge size of yachts and on the other hand imprecise workholding fixtures. Furthermore, yacht manufacturers usually face many variants of one boat type. Therefore many manufacturers tend to teach their machine, fearing the calibration of offline-programmed tasks. The CENIT software portfolio FASTSUITE in combination with useful customizations are delivering the right antidote against this deep-rooted fear. BAVARIA has introduced the advanced offline-programming solution to its manufacturing environment.

► ALL MANUFACTURING TECHNOLOGIES IN ONE SYSTEM

The 3D offline-programming system FASTSUITE for robot and machines is based on the world-wide accepted PLM-infrastructure of Dassault Systèmes. The system comprises powerful, scalable functionalities and support for many manufacturing processes. The user has access to CAD data at any time, e.g. during the design or manufacturing planning phase.

Advanced Offline-Programming Solution for Yachts

This results in reliable data import and comfortable data preparation for the offline-programming of yacht manufacturing processes.
Another big advantage of the FASTSUITE is the independency of machine tool and robot suppliers. Hence, a standardized programming methodology is possible for companies with a very heterogeneous machine and robot park. The system can handle simple robot cells as well as very complex multi-robot cells. External axes, conveyor tracking, triggers and tilt-and-swivel-tables are precisely controllable.
Many automation and customizing possibilities makes the solution round. Complex tasks can be hidden behind some mouse clicks. As a consequence a lot of precious development time can be saved.

► APPROACH FOR SUCCESSFUL YACHT OFFLINE-PROGRAMMING

The new offline-programming approach for BAVARIA bases on the FASTSUITE and considers especially the workpiece flexibility. Offline-programmed measurement tasks are executed at the machine. In the next step, the acquired measurement data is used to calibrate the workpiece globally as well as calibrating offline-programmed cut-outs and holes locally. The global measurement applies the 3-point-method to determine the real deck position inside the working room of the machine. The measurement of working zones – sometimes around hundred zones – are defined to calculate and correct the machining data according to the difference between the real workpiece and the virtual one. This approach is the key to successful offline-programming of excellent yachts.

► APPROACH FOR SUCCESSFUL OFFLINE-PROGRAMMING FOR HULL AND DECK

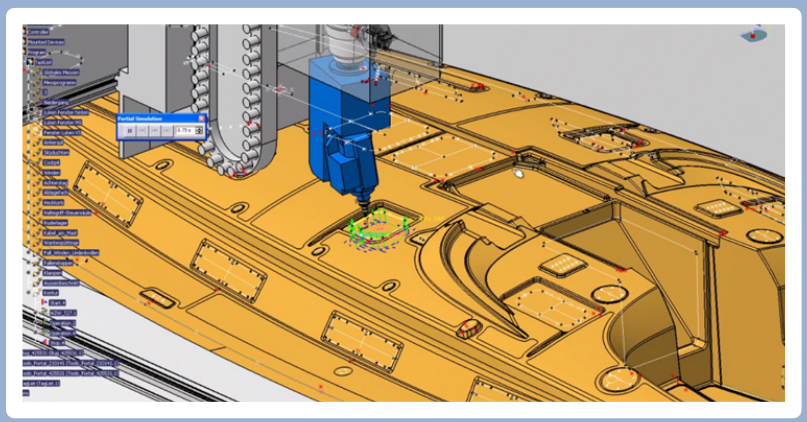
The offline-programming of holes and contours differs between serial and optional contours and hole patterns. Serial contours are e.g. outline contour, hatchway, porthole, chest and main winches. Whereas optional elements are intended for individualization, e.g. additional winches, numbers of engine and cabins. The milling technology is realized by CENIT's offline-programming solution FASTCURVE. Holes are defined by the FASTTIP application.
As soon as the serial and optional contours and holes are programmed for milling and drilling the main program for an individual boat can be generated. A dialog supports users assembling an optimized program: Optional contours are selected and multiple tool changes are avoided by computer-assisted sequencing. According to the users input the main program is automatically built out of the aforementioned programs for contours and holes. Before downloading the program to the machine the output code is simulated and checked against collisions. Afterwards the output of the customized postprocessor – generated by FASTPOST – can be downloaded to the machine. The local calibration is already included.

► OFFLINE-PROGRAMMING OF BLAMELESS GELCOAT SURFACES

BAVARIA uses robots for gelcoat deposition. A robot installed on an external linear axis sprays the gelcoat in a mould. FASTSURF – a surface-based offline-programming system – supports the creation of reliable surface coatings. The surfaces of the hull are selected and contour strategies are specified. The solution not only simulates the robot movement, but also calculates and visualize the gelcoat deposition on the virtual workpiece at any time.

► CONCLUSION

Offline-Programming is always the appropriate mean to sustainably increase the efficiency in the yacht manufacturing area. This is especially true, if workpieces with many variants are considered. The offline-programming portfolio FASTSUITE offers powerful functionalities to successfully accomplish even the highest yacht manufacturing requirements. BAVARIA has already identified and realized this potential.
At BAVARIA, processes, e.g. milling, drilling and gelcoat spraying, are advantageously programmed and simulated in detail. Toolpaths are optimized and sequenced according to real circumstances. The actual program for an individual boat can be derived from stored offline-programmed contours. Therefore, manufacturing starts with an optimized and collision-free program. Machines and robots show noticeable more productivity right from the start. Downtime and ramp-up times are drastically reduced.
In former times, BAVARIA used to manually working. The automation combined with an advanced offline-programming solution was a new experience. "The gathered experience with the FASTSUITE was very positive.", mentioned Wolfgang Krapp, Teamleader Robot and NC Programming. "We saved a lot of time, which we can now invest elsewhere."
All things considered BAVARIA benefits from significant time and cost savings realized by reducing non-operation periods of manufacturing facilities.



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