Wallem to install DNV Navigator on 190 ships

Wallem Ship Management has agreed a deal that will see the company install a software system from DNV Maritime Partner across its fleet of managed vessels.

Captain Deepak Honawar, Wallem’s director of safety and quality, and Kaveh Mansoorian, DNV senior customer service manager, signing the contract in Hong Kong.

Wallem Ship Management in Hong Kong has ordered the DNV Navigator software system for its managed fleet of more than 190 ships.

DNV Navigator is a decision support tool used onboard ship to assist the Master in managing port operations. This new contract with Wallem is the largest ever signed for the software system, and was agreed after the successful completion of a trial programme.

Using the application, more than 1,200 port clearance forms are automatically filled in with ship data so that required paper work can be prepared quickly.

It includes a database of information about all world ports and terminals, including publications and data from UKHO, IHS Fairplay and other sources. Arrival and departure procedures for all major ports are available, as well as a nautical library providing maritime-specific information.

A Master’s Notes functionality is included, which is used for sharing port specific knowledge within the fleet. Information can also be shared with other systems, such as gangway control systems and ECDIS.

The contract with Wallem additionally includes a Work and Rest Hours module to manage compliance with the Maritime Labour Convention 2006 and the Standard of Training, Certification and Watchkeeping for Seafarers. Any violation of regulations will be identified, and user-defined reports can be generated.

Software growth

This new contract with Wallem represents a significant coup for the DNV software team, which celebrated the subscription of the 2,000th ship using its software when it was implemented by the container vessel HS Chopin, owned by Hansa Shipmanagement in Hamburg, during the fourth quarter of 2011.

The company has managed to reach this level in less than 10 years, with DNV Navigator having been introduced in 2002.

“Industry feedback indicates that the on board paperwork burden is reduced by as much as 90 per cent,” said Odd Arne Haueng, head of DNV Maritime Partner.

“This enables ships’ officers to focus on what should be their primary responsibility, that is operating the ship in a sound and safe way both at sea and in port.”

Wallem commenced roll-out of DNV Navigator across its fleet in March 2012.

“It is easy!”

Pawel Bury, IT Manager, Intership Navigation

Cyprus based and German owned Intership Navigation operates close to 80 ships in a global trade. Intership has more than two years of experience with the new software.

“IT is easy to install, the crew handles their private crew mail on their own, and our IT department has the complete overview via the web”, says the experienced IT Manager Pawel Bury.

And even more important, Pawel adds “Dualog are easy to talk to. They are small enough to listen, but big enough to be responsive.”
Leveraging vessel data for efficient ship operation

Following an extensive programme of research and investment, Japanese company NYK Line is in the process of implementing a range of technologies that will use data transferred directly from its vessels by satellite to improve operational efficiency. Hideyuki Ando, Monohakobi Technology Institute (R & D company for NYK Line) spoke to Digital Ship about NYK’s vision for the future.

Constantly increasing bunker prices, the recent economic downturn and an increase in the number of international regulations have made management of fuel oil consumption a vital concern for ship operators.

The economic crisis and subsequent slow recovery have added to the strain that shipping companies are experiencing, and additional pressure to improve their energy efficiency has been exerted by initiatives such as the recently adopted Ship Energy Efficiency Management Plan (SEEMP) and Energy Efficiency Design Index (EEDI), mandatory from January 2013.

This ship efficiency framework aims to create improvements in energy efficiency through more efficient engines and propulsion systems and improved hull designs on larger ships, in order to achieve reduced fuel oil consumption and resulting CO2 emissions on a capacity basis.

In this environment, a large number of different approaches to reduce the fuel used by vessels have been tested and applied over the last number of years.

Japanese shipping company NYK currently operates around 800 vessels, necessity consuming vast quantities of fuel oil, as well as producing emissions, that it is eager to reduce.

In this regard, the company is constantly innovating and improving its fleet operation with the aim of optimising safety, economy and protection of the environment. One of its most innovative concepts is the NYK Super Eco Ship 2030, which represents the Japanese shipping company’s vision of the future.

This concept has been developed in accordance with NYK’s ambitious goal of achieving zero emissions by 2050, in cooperation with the Monohakobi Technology Institute (MTI), Elnornatic (a marine consulting company in Finland), and Carroni Progetti (a ship designer in Italy), as Hideyuki Ando, project manager, technical strategy group, MTI, Monohakobi Technology Institute (R & D company of NYK Line), explains.

“Such a concept is hoped to lead to the development of shipping operations, including cargo handling and traffic infrastructure,” notes Dr Ando. “Moreover, we hope that NYK Super Eco Ship 2030 will inspire many young people to pursue shipping services or marine technology.”

While the NYK Super Eco Ship 2030 is a vision of the future, as part of the project’s development NYK has already begun the implementation of a considerable number of fuel-saving technologies.

As Dr Ando explains, at NYK, similar to many other large companies, a ship information management system (SIMS) is employed. This information management system draws on data collected both onboard and on shore.

A device on the ship that NYK calls ‘FuelNav’ collects data from a number of different sources, such as the engine and data logger in the engine room (containing data from the main engine, the FO flow meter and the torque meter) and the VDR/ECDIS (importing data from the GPS, the Doppler log, the anemometer and the gyro compass), as well as the motion sensor on the bridge.

A monitoring system on board the vessel then allows the master to view and assess the collected data.

After the information is collected NYK uses the ship’s satellite communication system to transfer the data to its operations centre in Singapore, where it is evaluated and compared with technical analyses supplied by NYK’s research institute.

Shore-based staff in the operations centre use a ‘SIMS viewer’ for hourly trend monitoring of various indicators, including speed, M/E RPM, fuel oil consumption and other conditions, as well as to compare planned and actual schedules.

Ultimately, a voyage analysis report is created, with a breakdown of the fuel oil consumption for each voyage. This is sent to the master of the vessel and the operator in order to provide feedback.

The onboard data is also sent to weather routing service providers to help to improve their services.

Developing energy efficient operations

NYK’s expressed target is to have zero emissions by 2050, and one important stepping stone on the way to achieving this goal is optimal operational management, through a process which NYK calls its ‘PDCA cycle for improvement’.

PDCA stands for ‘Plan, Do, Check and Act’, or take corrective action. This scheme, which is currently being implemented on the company’s container vessels, represents a comprehensive and all-encompassing view of ship operational efficiency.

“The PDCA cycle is one of our visions in order to fully optimise our fleet operation,” explains Dr Ando.

“We are still in the progress stage, and this method belongs to the most advanced examples of container fleet operation applied at NYK today. Additionally, once the numerous remaining issues for bulkers, tankers, car carriers and other ship types are solved, we are hoping to expand the PDCA cycle to all our vessels.”

NYK has found that effective communication between ship and shore and unimpeded information flows between all stakeholders are essential in order to improve operational efficiency effectively. As such, satellite communications play a key role in the implementation of these systems.

As Dr Ando explains, the information and communication systems need to function in tandem in order to encourage stakeholders to participate in energy efficient operation, suggesting that offering incentives to stakeholders may be a useful step.

“Even financial incentives might be in order,” he says. “For example if a fuel oil reduction is achieved through an extremely high effort or brought forward through a very good idea, this stakeholder should be rewarded.”

However, he also admits that this is easier said than done.

Firstly, every stakeholder needs to fully understand the target and to be aware of how a change in schedule can affect the fuel oil consumption. Additionally, an extensive information sharing process is required in order for all decisions to be based on accurate information.

As such, an important prerequisite before any information sharing system can be established is a fully capable satellite broadband connection.

“In order to improve the system, we need maritime broadband, such as FleetBroadband or VSAT,” says Dr Ando.

“This is especially important in view of the necessary real-time information sharing. In order to optimise our vessels with regards to energy efficiency, large data transfers and full-time connectivity are essential.”

Weather routing

NYK started its research and development of energy efficiency measures with the trial of an on-board weather routing system in 2005-2006.

“Before the modern weather routing was developed, the traditional weather services could do no more than help to avoid severe weather,” says Dr Ando.

“Nowadays, weather routing providers, such as WNI (Weather News Inc) or AWT (Applied Weather Technology), are moving forward to minimise the fuel oil consumption and to provide optimal weather routing.”

“There is a huge demand from operators for optimum weather routing, which we, at NYK, regard to contain the best balance of safety, schedule keeping, economy and environment.”

Although, NYK considers the use of weather routing to be highly effective, the shipping company has also found that the providers need to cooperate with shipping companies to optimise their services with regard to fuel oil consumption.

These service providers require comprehensive information, including detailed ship performance models to calculate the best route for each weather and vessel type. In addition, the calculations should take into account the individual vessel’s RPM, speed and fuel oil consumption, as well as ship motion and performance in severe weather.

“This information, which is used to calculate the ideal speed for any condition (draft or weather), as well as to gauge the effect of ageing on hulls and propellers, needs to be obtained from the vessel operators.”

“This kind of technical understanding is absolutely essential in order to give
correct and comprehensive advice," explains Dr Ando. "FuelNavi, the highly sophisticated models that are needed in order to pro-
duce optimum weather routing, the ship performance model and the weather fore-
cast are subject to errors, which is why the
simple feedback from the vessels is always
needed."

The live measured wind and ship motion data are invaluable feedback for
weather routing providers. The actual wind speeds can be compared to the fore-
casted wind speed, and the ship motion data (maximum roll angle in one hour) can
be matched against the forecasted wave
height. This way forecast systems can be refined.

In order to remedy this information gap
and to further optimise its vessel opera-
tion, NYK has developed a system that
combines weather routing and perform-
ance monitoring.

The shipping company first uses a weather routing model to devise a theoret-
ic route guidance which includes
"Hourly speed, RPM, fuel oil consumption and weather data, as well as information from the ship performance model."

Detailed performance monitoring, is then applied to provide comprehensive feedback on the actual voyage data, including the actual speed, RPM and fuel oil consumption, as well as live actual weather data.

NYK sends the analyses from the ves-
sels to weather service providers, who use this data in order to improve the accuracy of their forecast. Dr Ando notes that for this system to be effective the company requires broadband on the vessels.

"Real-time feedback," says Dr Ando, "is essential in order for the weather rout-
ing service provider to verify whether his assumptions are correct or not. This way, corrective action can be taken quickly."

"We hope that through the participa-
tion of a large number of vessels, the accu-
racy of the weather forecasts can be improved even more. Today's technology, in the long run the collection of weath-
er and current data through the shipping industry and the sharing of this data will be to the benefit of all stakeholders."

**Performance and fuel monitoring**

Probably the most important aspect of energy efficient fleet operation is the reduction of fuel oil consumption. One of NYK's key measures to achieve this is performance monitoring, collecting a variety of information from the vessels and assessing this data in order to monitor the fuel oil consumption and to take appropriate action to effectively reduce it.

NYK has realised how important it is to make both its seagoing and onshore staff aware of the importance of energy effi-
ciency and fuel oil consumption topics if it is to create a process of continuous fleet
optimisation.

"Again," says Dr Ando "the information
on fuel oil consumption and fuel technology is an indispensable prerequisite to collect, aggregate and share the correct and neces-
sary information at the right time."

To this end, NYK developed a performance monitoring device for onboard use, which was designed to pro-
vide crew with real-time information on
their vessel's fuel oil consumption. This device, previously mentioned FuelNavi, has been supplied to the entire
container fleet and collects a number of key operational indicators.

FuelNavi consists of a data collection box that is installed on the vessel and
interfaced with on-board equipment, such as engine data logger, GPS, anemometer, flow meter, thermometers for fuel oil and seawater, the rudder autopilot or the gyro compass.

Through the use of a PLC (Programmable Logic Controller) industri-
al computer, significantly more robust than
a commercial PC, NYK says it has achieved a high level of reliability with the solution.

"These PLC," explains Dr Ando "are
often used for the automatic control of
mission-critical plants. They work 365
days 24/7 without maintenance."

Further advantages of the PLC technolo-
gy, according to Dr Ando, include compar-
avely low implementation costs as well as the option and flexibility to customise
applications accordingly. The effect of the FuelNavi on our performance monitoring
is noticeable. In order to achieve the reduction of fuel oil consumption, was hardly notice-
able," says Dr Ando.

**Shore systems**

After the unsatisfactory trial of the onboard performance monitoring system, NYK decided to convert the FuelNavi solution into an on-shore monitoring sys-
tem. This led to the creation of the compa-
ny's sim information management sys-
(SIMS).

SIMS combines the critical performance data collected through the FuelNavi data collection box on board the vessels with additional navigational data, with this data then shared between ship and shore via a broadband connection.

Today, NYK uses a combination of
manually and automatically collected data for performance monitoring. Auto logging
data, which is collected hourly and auto-
atically transferred to shore via e-mail, is
complemented by a daily electronic log-
book entry, containing port depar-
ture/arrival information and other navi-
gational data, which cannot be collected automatically.

The shore monitoring software dis-
plays information on all vessels, including
their route, whether they are under way or in
port, and the departure and arrival des-
tination. The software also offers colour-
coded information quickly highlighting important aspects of operation, such as safety, scheduling and bunker costs.

Green, yellow and red lights indicate the status of the vessel. If a red light is dis-
played, staff onboard will know that cor-
rective action needs to be taken. This
allows the shore operation to manage the
fleet and to initiate immediate reschedul-
ing or changes in routes.

The effectiveness of the process is a func-
tion of how often NYK can transmit data
during its time at sea. Dr Ando explains:

"The quality of the corrective action taken," he says, "depends on the intervals
in which the data is monitored."

Traditionally, vessels usually reported the manually collected data once-a-day, for example in the noon-day report.

NYK has experimented with different intervals and found that the more often data is collected, the more accurate the resulting information. This analysis was performed through a testing programme
conducted by NYK using various different intervals on a VLCC vessel, over a period of three
time. The comparison between the tradition-
al, once-a-day data collection process and the envisioned FuelNavi approach, which collects data every hour, has provided NYK with interesting results.

In the traditional scenario, the results
for the OC speed and the log speed (over
ground speed equals speed over ground measured by GPS, whereas log speed defines speed through water measured by doppler log or electromagnetic log) are very similar, and it is likely that a graph would show the vessel is sailing at opti-
mum speed most of the time.

However, if an automatic data collect-
ion and reporting system is used the result looks quite different, with sample
data taken every second, and detailed
reports on the vessel performance and weather conditions created every hour.

With this greater depth of information
it becomes apparent that the vessel does not sail at a constant speed at all but speeds up and slows down, for example due to wind resistance or the effect of the current.

"Hourly reported data gives us much
more detailed information on the vessel performance and helps with the analysis
and decisions for corrective actions," notes Dr Ando.

"In general, the on-shore performance monitoring and fleet management option is very well received by the liner operation and we see the benefits of the FuelNavi system confirmed."

"In a next step we have combined the
SIMS with weather routing services. This way we not only review the past voyage but preview the coming voyage, which is a better approach to support optimum ship operation. Now, the data interface between our SIMS and the weather rout-
ing service are in good working order."

**Data analytics**

Of course, collecting information and monitoring the fleet performance are only useful measures if the resulting data is subsequently analysed and corrective action is taken. NYK notes that it is only through careful assess-
ment of where improvement is possible that its vision of highly optimised vessel operation and fuel oil efficiency can be realised.

"Shipping companies use a variety of
monitoring strategies and systems," says Dr Ando.

"These provide a large amount of data
which, if not processed further, is often just stored somewhere in the company. This
does not help. In order to carry out the ideal
improvement cycle (PDCA - plan, do,
check, act) it is essential for us at NYK to be able to pinpoint where corrective action
might most efficiently be taken."

At NYK, technical staff on shore con-
duct a wide variety of analyses on the total
fuel oil consumption data provided by the
ship information management system and the
FuelNavi solution.

Amongst the key aims of these analyses is understanding the different causes of fuel oil consumption, performance in different conditions, and estab-
lishing the ideal vessel speed for a variety of
vessels. The results are then subse-
sequently displayed with NYK's captains, opera-
ators, and ship management companies.

Through one analysis method, fre-
The FuelNavi system collects information from around the vessel, and uses it to display updated fuel consumption levels.

**Performance monitoring roadmap**

NYK is aiming for the ambitious goal of zero emissions in 2050, and this journey includes a series of milestones which have been highlighted by the company in a detailed roadmap for performance monitoring, including past achievements and future key goals.

"The roadmap shows how we have approached performance monitoring until now and what our vision is for the future," says Dr Ando.

While a number of measures outlined in the roadmap have already been accomplished, such as the on-board weather routing trial (in 2005/2006), the electronic logbook SPAS (from 2006 onwards) and the development of the fuel consumption monitor FuelNavi (in 2007/2008), other measures are in the planning stage or in on-going development.

"The big step towards and subsequent operations is real time monitoring, which necessitates the fleet-wide introduction of a broadband solution. Currently, FleetBroadband and VSAT is used only on some vessels, and a substantial number of ships still use an Inmarsat Shell solution. NYK is therefore planning to roll out a broadband connection on its entire fleet in the near future."

Another reason for the implementation of a broadband solution is the fact that weather routing service providers are developing the next generation of forecasts, which cover up to 15 days and offer high resolution displays of the currents.

"The high-resolution displays of current are very valuable for our vessels," says Dr Ando.

"However, in order to use this data, high bandwidth is needed to transfer the data from shore to the vessel. In order to improve the vessel performance, actual live data needs to be reported back and matched with voyage simulation data from shore and vessel."

NYK also believes it is essential to have good communication between the master on the vessel and the designated route manager onboard, and is currently assessing the potential introduction of a new position of route manager, which would be assigned to captains and chief engineers on shore.

The idea behind this role is that the captain on the vessel would be able to share live voyage data in real-time with the route manager, who would use their experience and expertise to discuss the optimal route and speed.

The exchange of live data should contain the actual sea state, actual wind and ship motion and other factors influencing the fuel oil consumption like weather risks, operational requirements, berth windows and requirements from the next voyage schedule.

This way, the vessel’s schedule can be continuously assessed, revised and agreed between ship and shore, and the optimum fuel oil consumption level reached.

"This is a new challenge for us and in order to reach this, we need broadband, and the NYK liner operation has started an IBIS project to evaluate all such possibilities," says Dr Ando.

"The different possible solutions will certainly take some time to be evaluated, but we are sure there will be reductions of fuel oil consumption through real-time information sharing. In addition, we believe that the information platforms will be utilised as SEEMP platforms."

NYK is also planning to expand its utilisation of ship performance monitoring data in order to improve its fuel-efficient ship design (with regard to new wave sensors, accurate wave and wind measurement, accurate torque and thrust measurement, accurate log speed management, accurate fuel consumption management and ship performance modelling), as well as to evaluate fuel saving coasts.

"We could have already successfully implemented such a new way of vessel performance evaluation," explains Dr Ando. "But this is an area where there are several necessary developments in the sensor technology."

In addition, NYK is assessing the option to automatically process the collected data on board and to calibrate the ship performance model through the implementation of a system identification technology.

"This is part of our vision of a smart ship," says Dr Ando.

"At NYK, we believe that information sharing among all related parties and cooperation are key for energy efficiency. In addition, the integration of weather routing and performance monitoring is a base system for energy efficient fleet management."

"Automatic data collection onboard provides high quality and large data sample for making data analytics and high level integration of weather routing, performance monitoring, real-time broadband network and organisations are our current and next challenges."