

# INTELLIPORT

The Karmsund Port Authority will begin a major development of the Husøy cargo port in Karmøy local authority during 2017. This represents an investment of roughly NOK 300 million. Karmøy local authority has been a very able facilitator so far, and will also help to coordinate the next phase of the project. More than 700 000 cubic metres of spoil are to be removed from sites associated with the cargo terminal and used to reclaim land from the sea. All in all, some 22 hectares of new acreage will be developed. A future-oriented approach is being taking to planning the development and the port upgrade. The Karmsund Port Authority aims to build a facility which is high-tech, efficient and environment-friendly.

*“WE ARE BUILDING A SHOWCASE FOR THE PORT OF THE FUTURE”*

Concern about climate change is high on the agenda world-wide. According to the UN intergovernmental panel on climate change, the average global temperature will have risen by 4.3°C in 2100 if greenhouse gas emissions continue at past rates. The world is ready to take this seriously, and the historic Paris agreement – whereby all nations have undertaken to cut greenhouse gas emissions – came into force on 4 November 2016.

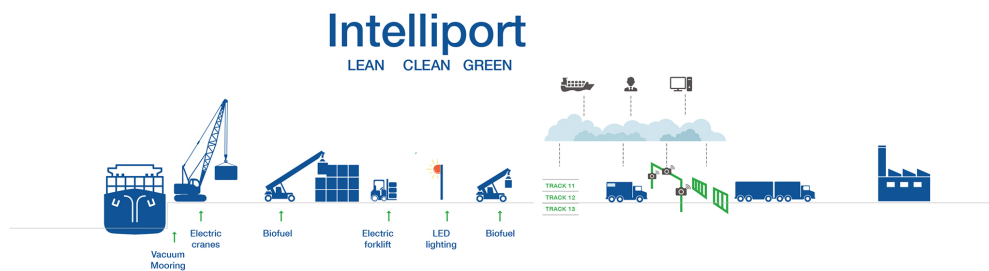


In a response to the Paris agreement, the International Chamber of Shipping (ICS) – the global organisation for shipowners – has proposed that a detailed and binding plan for further reductions in carbon emissions be developed for this sector. The shipping industry already has a good record for such cuts. Data from 2014 show that its total carbon emissions had been reduced by more than 10 per cent over five years, despite the growth in activity.

*“THIS SHOWS THAT THE SHIPPING SECTOR IS CONSCIOUS OF ITS RESPONSIBILITY, AND THE KARMSUND PORT AUTHORITY WANTS TO BE BOTH A FACILITATOR AND A DRIVER IN PLACING THE ENVIRONMENTAL PERSPECTIVE HIGH UP THE AGENDA, BOTH REGIONALLY AND NATIONALLY”*

In parallel with its major climate challenges, the world faces what has been termed the fourth industrial revolution (Industry 4.0). This is rooted in digitalisation and automation, and is frequently described as “a development where the internet merges with production and products”. Norway’s Marintek research institute has launched the Shipping 4.0 concept to encompass the rapid expansion of digitalisation and automation in the maritime sector.

Many exciting developments are taking place at the interface between environmental concern and new technology. With that in mind, the Karmsund Port Authority has adopted “lean, clean and green” as a guideline for its work. This conveys such goals as being efficient, low-cost and simple, being well-organised and unfussy, and using as much renewable energy as possible. Attention will not be devoted to the environment at the expense of efficient and economic operation. The Karmsund Port Authority is considering a number of technological solutions which will yield a highly efficient and cost-effective port. Its technology, efficiency and environmental project has been named Intelliport – the intelligent port system.



## *Vacuum mooring*

The Husøy terminal is centrally located on the main shipping channel along the west Norwegian coast, which means virtually zero deviation and the potential for very efficient calls. In order to exploit this advantage to the full, the Karmsund Port Authority is planning to install vacuum-based automated mooring.

This solution is currently in use at three locations in Norway. Two are at Lavik and Oppedal, which lie on opposite sides of the Sogne Fjord and are connected by *Ampere*, the country's first battery-powered ferry. Since this vessel spends only 10 minutes at the quay, efficient mooring and a rapid start to charging are extremely important in order to keep the battery packs as fully charged as possible. The third port with vacuum mooring is the export facility used by Swedish iron-ore producer LKAB in Narvik.

The vacuum mooring system is being delivered by Cavotec, the company which holds the patent for this technology. It allows a large ship – like a bulk carrier, for example – calling at Narvik to moor in an incredible 40 seconds, compared with 30-40 minutes using traditional hawsers. Given that conventional mooring and casting off also exposes personnel carrying out these operations to risk, the Karmsund Port Authority is convinced that vacuum mooring is the technology of the future.

In collaboration with Wärtsilä, Cavotec recently unveiled the next generation of this automated system for mooring and charging battery-powered ships in a single operation. It is aimed first and foremost at battery-driven ferries, but will also be interesting for cargo ports in order to facilitate the electrification of other vessels.

## *Fuel*

In addition to offering induction charging for battery-powered ships, the Karmsund Port Authority wants to make provision for other types of environment-friendly fuel. Norlines, one of the port's current users, already makes regular calls at Husøy with *Kvitbjørn* and *Kvitnos*, its two LNG-fuelled ships. They use 18 per cent less energy than the vessels they have replaced. Carbon emissions are reduced by 38 per cent and nitrogen oxide emissions by 90 per cent, while sulphur oxide and particle emissions have been completely eliminated. An LNG tank which provides bunkering for such vessels is planned in the port.

Biofuels could be an option for older ships. These include hydrotreated vegetable oil (HVO), a relative new option. The HVO production process yields a biofuel of very good quality which can be used directly in existing engines. It is made from various vegetable oils and abattoir waste. The Karmsund Port Authority wants to look at opportunities to also offer bunkering with biofuels.

The port authority firmly believes that the availability of environment-friendly options is important if shipping companies are to opt for them.

*THE KARMSUND PORT AUTHORITY AIMS TO BE NOT ONLY A FACILITATOR BUT ALSO A DRIVER FOR PERSUADING ITS USERS TO MAKE ENVIRONMENT-FRIENDLY CHOICES.*

## *Lighting*

Conscious use of lighting in the port offers several benefits. Zoning allows lights to be used only in areas where work is taking place. That provides big energy savings compared with lighting the whole facility during the evening, and minimises the impact on the port's neighbours. As its size increases, that will become an even more important consideration.

Many opportunities are available for conscious use of lighting. It is a simple matter to divide the area into zones where light management is controlled from a mobile phone, so that terminal workers can themselves turn on illumination where they need it. Sensors can also be installed to switch on the lights by motion or the like. Should an even more automated solution be required, ASC Energy and other companies have launched complex systems which autonomously determine illumination needs in each zone based on activity and light conditions, and manage lighting on that basis.

A relatively simple way to save energy with lighting is to rely solely on LED lamps. This investment is being made by the Karmsund Port Authority as part of the development project in order to cut energy demand and achieve quicker activation/deactivation of lighting.

### *Port cranes*

Enhancing efficiency is one of the key concerns in planning the Husøy development. In order to achieve efficient ship loading/discharging, an investment must be made in port cranes. Strong signals on the need for such equipment have also been received from port users.

Environment-friendly electrically driven port cranes, which only need to run on diesel oil for certain operations, represent a natural option for the Karmsund Port Authority. An array of cranes will be assessed in the longer term, given that the port handles a great many different types of cargo and large volumes. A number of cranes are accordingly needed to achieve maximum efficiency.

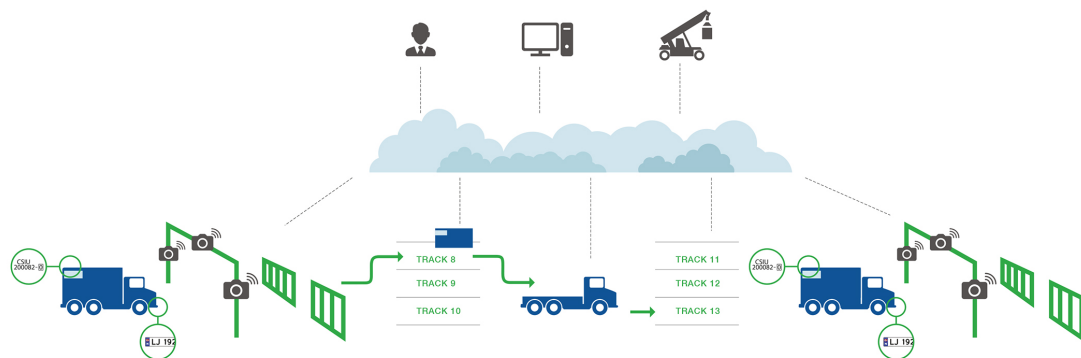
### *Terminal vehicles*

Various vehicles serve within the terminal for moving cargo, including tractors and forklift trucks. These will also form part of the Karmsund Port Authority's environment-friendly profile, and will generally run on electricity. The development of driverless (autonomous) vehicles is advancing at record speed and, as these are tested, the port authority will monitor progress closely and look at opportunities for using innovative vehicles in the terminal.

### *Automated gates*

To make fetching and delivering freight more efficient, the Karmsund Port Authority will be investing in an automated entrance gate to the terminal. This system means that advance information is provided on vehicle registration number, driver and – where relevant – the container or trailer to be collected/delivered. The arriving vehicle passes through a portal which reads its number plate and checks this against the details preregistered in the system. If these match, the gate opens. The terminal operator has then been notified that a given goods vehicle is on its way to fetch a specified container, and can have this ready. Experience from other ports indicates that such intelligent systems can reduce the time lorries spend at the terminal by 50 per cent. That has a positive environmental effect, while also enhancing efficiency and capacity for both hauliers and the port.

Furthermore, the freight will be photographed arriving at and departing from the port, so that possible damage and claims can be dealt with more effectively than before.



## *IT*

Good IT systems are an obvious requirement for achieving the goal of a service-oriented port. Modern electronic data interchange (EDI) and application programming interface (API) solutions are a must-have for efficient and future-oriented port operations.

### *API solutions*

API systems support information exchange between terminal/shipping companies, freight owners and the port in real time. This can involve data about transport as well as orders and payments for various services. API solutions allow customers to decide for themselves when they want to access information, which is moreover always up-to-date. That creates a better customer experience. Users receive a full overview of their orders/consignments and costs directly in their own system – they will no longer need to log into any part of the Karmsund Port Authority systems for a status check. The process from placing an order to establishing the status of the consignment is much faster.

### *EDI solutions*

Electronic transfer of structured data between organisations is used to move documents or commercial data from one computer to another – in other words, from one trading partner to another – without human intervention. EDI provides an integration solution which can be run together with API. It is a collective term for applications which function across systems at all logistics companies and assumes that the customer has a single computer programme for

marking, generating and transmitting dispatch information. Most logistics companies (transporters) have well-developed EDI solutions today. The Karmsund Port Authority must ensure that its systems can connect with these so that it becomes part of an efficient logistics chain.

### *Energy hub*

Broad agreement prevails that ports will be an important energy hub in the future. In their input to the Norwegian Transport Plan (NTP), the transport sectors say that a grant scheme should be considered to back investment in efficient and environmentally positive ports. Special mention is made of facilities which could be developed into energy hubs. In its 2015 annual report, the Norwegian Coastal Administration specifies that the “energy hub” concept applies to ports which give vessels access to charging infrastructure, land-generated electricity and environment-friendly fuel. The Karmsund Port Authority also wants to provide all this. In addition, it will be relevant to look at battery charging infrastructure for towing vehicles, lorries and terminal vehicles. These are also expected to be introduced in the near future.

Very substantial supplies of power are essential for an energy hub. The Karmsund Port Authority has a good dialogue with its partners on this aspect, and an electrical substation is to be established close to Husøy. With an eye to the future, it will also be natural to look at other renewable power sources. One example of thinking along new lines is provided by India, where the 12 largest ports are installing solar panels, but both wind and wave power are equally interesting in Karmsund’s northerly latitude.

### *The way forward*

Taking a long view is important when assessing the solutions to be introduced. The Karmsund Port Authority aims to build a terminal which not only ranks as modern today, but will also be bold and forward-looking – a port for the future. It wants to do this in collaboration with other players. Suppliers and developers of innovative and environment-friendly technology are interesting partners in that context.

A steering committee drawn from the biggest port users and important partners has been appointed to ensure that the development work is pursued in line with user views of their future needs. That provides important inputs for the Karmsund Port Authority in its desire to adopt efficient, capacity-expanding technology solutions which its customers want to utilise.





### *Scenario*

The port authority envisages the following scenario at Husøy within a few years.

A hybrid cargo liner using electric or diesel propulsion to ship containers from Rotterdam approaches the terminal on a dark October evening. The cargo being carried and its onward route have already been registered in the shipping company's own system. Integration solutions allow this information to be transferred automatically to the Karmsund Port Authority's logistics centre. The latter has a real-time overview of the ship's position and its expected arrival time. Important data are automatically transferred to the Karmsund Port Authority via the Norwegian Coastal Authority's SafeSeaNet internet-based reporting system. Shipowners use this solution to send mandatory information on arrival and departure times automatically to the Karmsund Port Authority's systems.

Through its integration with these systems, the haulier responsible for taking a consignment from the port to its recipient can also see the ship's expected arrival time and plan the job in their own system. This identifies which lorry and driver is to fetch container CBHU 307526 8 at the Husøy terminal and transport it via over the Rogfast road and tunnel network to the recipient on the island of Kvitsøy. The information also appears automatically in the logistics centre's system.



When the vessel is 50 centimetres from the quay, the arms from the vacuum mooring system are extended, initiate induction charging and attach to the hull. Within 40 seconds, the liner is berthed and charging its battery packs. Lights in the relevant quay zone switch on and the Karmsund Port Authority's electric port crane discharges the containers. These are placed in depot 2. Both the shipping company and the haulier can see from their systems that the containers have arrived at Husøy and where they have been put. Via the web portal, the container's recipient can read that: "Your consignment has arrived at Husøy at 22.18 on 24 October. It is due to be fetched for onward transport at 07.20 on 25 October." If the recipient has opted for a text message, they will also be notified by phone. The recipient sees that this fits well with their desire to receive the container at about 08.00 on the following day. At 07.20 the next morning, the haulier's electrically powered lorry arrives at Husøy to collect container CBHU 307526 8. As it passes through a portal, the lorry's number plate is automatically read and checked against preregistered arrivals. Since it has arrived at the specified time, the green light is given, the high-speed gate into the area opens and the driver is told to park in space 4. At the same time, the system generates a report that the lorry is on its way to this point to fetch container CBHU 307526 8. A driverless vehicle fetches the container from the depot and drives to parking space 4. Container CBHU 307526 8 is loaded onto the trailer, which is then driven to the exit. Its number plate and container number are read in a portal and the container is photographed to document its condition on leaving the area. The system checks that number plate and container number accord with the advance registration and opens the gate. The lorry leaves the area at 07.30 with container CBHU 307526 8 and sets off for Kvitsøy, where it reaches the recipient 30 minutes later.

Text: Tine Osmundsen and Tore Gautesen

Photo of master plan: Tor Inge Vormedal

Photo of container ship berthed: Karmsund Port Authority IKS.