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Norway/Netherlands Maritime Innovation Trip Report

Last month six Port executives joined maritime industry leaders and Washington Department of Commerce staff to visit Norway on a fact finding trip to learn more about maritime innovation initiatives. Norway is the world’s Silicon Valley for ocean industries.

Trip Participants

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Stephanie Jones Stebbins, Port of Seattle	Kenny Lyles, Port of Seattle	Eric Ffitch, Port of Seattle
Joshua Berger, Maritime Sector Lead – WA Dept. of Commerce	Brian Bonlender, WA Dept. of Commerce	Chris Green, WA Dept. of Commerce
Justin Van Emmerik, Vigor	Josh Pruzek, Vigor	Will Ayers, Elliot Bay Design Group
Erik Larsen, Rolls Royce	Jennifer States, DNV-GL	Dan Smith, Crowley
Cosmo King, IO Currents		

Initially the group was hosted by Innovate Norway, a government agency dedicated to advance opportunities in blue economy, clean energy, ocean space, smart cities, art and culture. After several days in Norway, the Port team traveled onto Rotterdam to visit the Port there and its maritime innovation center.

The trip was invaluable and provided several takeaways that can support Washington’s maritime industries as well as Port operations:

- Norway’s leadership in maritime clean technologies (ex. Batteries) offer clear examples of systems that can power Washington’s next generation of ferries and harbor vessels.
- Batteries could also work to support Port operations. The maritime division is exploring how barges or other vessels could provide charging support or shore based power to Port customers.
- Innovation centers in Wilhelmsen and RDM Rotterdam provide useful models for a Port maritime innovation center. Wilhelmsen is starting internal ventures and investing in new relevant start-ups as it works to digitize the traditional maritime industry. The company is willing to provide technical expertise to the Port’s initiative. RDM is operated by the technical university and demonstrates how workforce development can play a central role within innovation centers.
- Port XL is a maritime accelerator supported by the Port of Rotterdam and private industry. It is expanding its efforts, looking to open a US office, and may be a good partner to work with on maritime incubation/acceleration initiatives.

- Port staff visited a renewable fuels facility within the Port of Rotterdam and also visited Port leaders to discuss sustainability efforts. The Port of Rotterdam invited the Port of Seattle to join the World Ports Climate Action Program.
- There is significant funding coming from public and private sector players, both in Norway and in the Netherlands. In Norway, the level of investment is aided by the long-flourishing fossil fuel sector, which is now turning its efforts toward developing clean energy resources. In both countries, the Paris Accord was discussed as a settled matter giving industries no choice but to turn their attention away from fossil energy sources. Public governments are assisting this transition by matching private sector investments with public funds, as both government and industry accept the reality of transitioning away from fossil fuels over the long term.

Norway Highlights

Norway is the fifth largest shipping nation in the world and a global maritime leader. The country is especially out front when it comes to sustainable maritime technology. Of the first 50 LNG propelled vessels ever built, 95 % were Norwegian. AMPER, the world's first electrical car and passenger ferry powered by batteries entered into service in early 2015 in Sognefjorden, Norway. The ferry carries 120 cars and 360 passengers, but only uses 150 kWh per route, which corresponds to three days use of electricity in a standard Norwegian household. Both are examples of the ability and willingness in the Norwegian maritime industry and the government to innovate for a better future.

Norwegian Maritime Industry

- 🌐 89,000 Employees
- 🌐 \$52 Billion Revenues/Year
- 🌐 23% of Norwegian exports
- 🌐 5th largest fleet in value

Driving Norwegian Innovation

Innovate Norway is a 51% State and 49% County owned government agency with 34 offices around the world. Innovate Norway uses a combination of funding and technical expertise to drive innovation in key clusters (blue economy, clean energy, ocean space, smart cities, art & culture). The agency's environmental grants and innovation contracts facilitate technological and entrepreneurial advances.



BLUE MARITIME CLUSTER

GLOBAL CENTRE OF EXPERTISE
NORWAY

Maritime Cleantech Cluster

- Innovate Norway provides funding and technical advice to clusters across the country
- Maritime cleantech cluster formed in 2011 – probably the most advanced cluster in Norway

- 74 employees including innovation project managers, a project coordinator, EV advisor, communications and CEO
- 90 partners across many sectors, companies large and small, public and education
- Participating companies pay for benefits of cluster services/resources
- Competing companies cooperate on innovation, new products, R&D, big projects (hydrogen ferry)
- Katapult - government funded research center, projects focused on ocean innovation center, digital and sustainable energy, etc. Katapults help drive innovation faster and often spur new ventures. Kind of an Air BNB model where partners make their equipment available in return for government capital
- Idea – concepts – prototype – scale very helpful for small innovative companies needing equipment or access to technology to test/validate new products

Ferry Innovation

Norway’s ferries cover 130 routes and carry 21 MM vehicles per year. The ferries are private and operate under government contracts. The State’s procurement policies drive safety, zero/low emission, and long term development of clean technologies (LNG (21 ferries) Battery (70-80 ferries) Hydrogen (coming)).



The group visited with Wescon Green Solutions, Servogear, Wartsilla, Kongsburg, Corvus, and several other companies who are part of the maritime clean tech cluster. These companies have all been collaborating to develop clean technologies for ferries and other maritime applications. Many of these companies export their products and services – maritime is one of Norway’s top traded sectors. Visits with these firms and tours of Norway’s electric ferries provided inspiration to Washington State’s ferry designers on the trip.

Autonomous Vessels

Kongsberg Maritime is developing the first 100% fully autonomous container ship. The goal of Autonomy is to improve safety and energy conservation. Skill shortages in the maritime industry are also driving autonomy. Expect usage of unmanned vessels to increase to 50% by 2050. There will still be a need for people at sea!

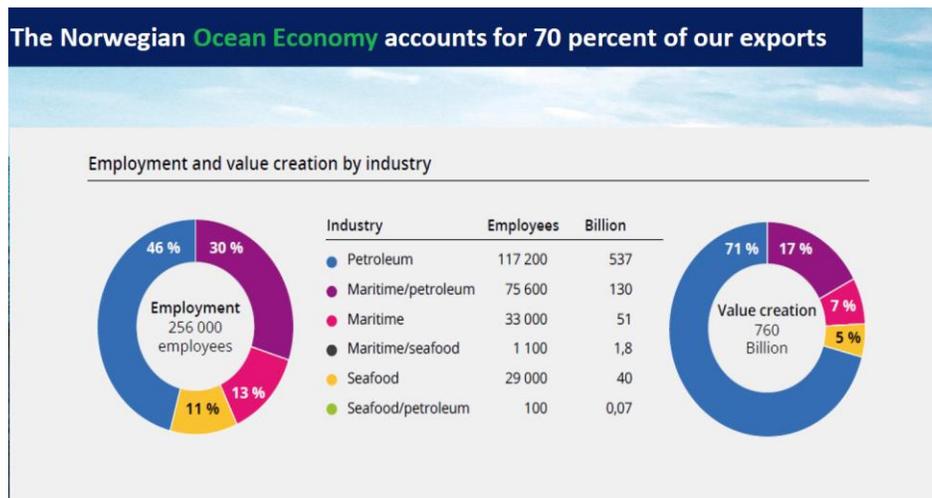


Wilhelmsen Innovation Center

- Created center to advance digital innovation efforts, company working to increase pace of digitization across maritime industry
- Company just starting this digital venture
 - Starting internal ventures and investing in new relevant start ups
 - Ex – Doolittle founded by former Microsoft employee, Arif Sharique helping bring software/coding to maritime. In house development becoming more popular but companies face challenge of hiring coders/IT help.
- Wilhelmsen applying digital to traditional lines of business
 - use a lean startup model, evaluate and scale promising ideas quickly
 - **ex.** Introducing product tracking like Amazon
 - **ex.** Automated boiler water maintenance helps reduce risk of boiler failure
 - **ex.** Digital mooring ropes with sensors inside the rope
 - **ex.** Software identifies and tracks needed ship repairs

Other Highlights from Norway

- Norway advancing Green global shipping initiative (Narve Mjos)
- Port is Norway are also developing Port Index which establishes priorities for vessels based on their commitment to sustainable practices (ex. Cruise)
- Uses Green Loans to fund companies for investments in pollution prevention, green technologies, etc. A type of incentive financing program.
- Maritime energy transition outlook to 2050
 - Mapping emissions for the Norwegian fleet
 - 10% of ship emit 50% (they are the biggest ships)
 - Seaborne transport projected to grow 37% by 2050
 - Electrification of maritime transport and energy infrastructure a big priority



Renewable Fuel Facilities and Markets

On Thursday September 20th the Port team flew from Bergen to Amsterdam to learn more about sustainable aviation and maritime biofuels. We met with Paul Paoletta and Lana Marter with Neste. The company provides a variety of sustainably based fuels and products to the aviation industry – with refining plants in Rotterdam, Finland and Singapore. We discussed the potential application to the Maritime Industry, as this is one of few technologies that will feasibly decarbonize ocean going vessels. During our conversations we learned that:

- Sustainable fuels are 4x as expensive vs traditional fuels at this point in time, parity will take a long time
- CA uses RINS, tax credits, LCFS, etc. to drive price parity
- Neste started renewable fuel sales efforts with private sector and company now working to get local/state governments on board
 - Economics favor diesel
 - Airlines want cost parity with current fuels
 - Special financing tools needed to scale use of sustainable fuels (ex. private co. off take agreements)
- Feds (specifically military) can help demand although there's no momentum (or lost momentum) during the current administration
- Aviation has no alternatives (electric) so they should get priority for available biofuels. This would also be the case for Ocean Going Vessels.
- Currently certain feedstocks are deemed sustainable others are not. Neste indicates that we need to change this recognizing that regions have unique feedstock opportunities
 - Feedstocks – garbage, crops, dairy waste

About Neste.

Neste is a publicly traded company on the Finnish stock exchange (fact check) The company has 5,000 employees and generates \$16.2 B revenues/year. Within the renewable fuels industry the company has advantage of size/scale being a publicly traded company with a strong balance sheet. Most of their current competitors are much smaller. Neste keeping eye on emerging partnerships with larger oil companies (Shell & SKYNRG). The company

- Is an industry leader in processing dirty oils/ greases
- Produces low sulfur bunker fuel
- Produces 880M/year of renewable diesel
- Jet fuel is 50% of company sales
- Neste MY, branded renewable diesel being sold in CA
- Renewable diesel is not biodiesel - it is a colorless, odorless, high performance fuel
- Neste has 3 low sulfur fuels made in Finland
 - Their renewable diesel all goes to the Scandinavian countries

Neste Rotterdam Plant Visit



Safety First!

- 170 employees - 1M tons of diesel per year (2,000,000 barrels)
- 620 mm Euros plant investments – plant started in 2012
- Port of Rotterdam recruited Neste (or encouraged them, as part of search for renewable companies)
- They use 15 different feedstocks and several different products to satisfy various local regulations (ex. no palm oil)
- Big customers are diesel manufacturers who need biodiesel to meet renewable regulations
- Plant in Singapore serves US - they met a time sensitive requirement that allows Singapore to be RIN eligible

Features/Benefits

- No sulfur, O₂ or anomalies, a high quality fuel
 - Smaller environmental footprint
 - Lower operating costs
 - Superior cold weather performance
 - Long shelf life
 - Easy switch, works in vehicles without need for conversion of equipment

Port of Rotterdam & Maritime Innovation

On Friday the Port team visited Port of Rotterdam headquarters to rekindle a long term relationship between sister ports. Our group met with Alan Dirks, one of the Port's environmental managers. He provided a good overview of Port operations:

- Port operations span 60km – Shell is huge customer spanning 24km along the river
- An “oil” port - they have 40 employees working to diversify beyond oil
- Cargo logistics 45% rail 30% truck
- The Port supports over 150,000 employees yet its industries have a poor reputation as work places. It is seen as a dirty “old” place to work
- The Port invests in Port XL, a maritime business accelerator that holds a competition once a year for top maritime ventures.
- We discussed the recently announced World Ports Climate Action Program, a groundbreaking agreement spearheaded by the Port of Rotterdam and announced earlier in September.

RDM Rotterdam

After visiting the Port of Rotterdam, the team took a thrilling water taxi ride to RDM Rotterdam. Originally RDM was a shipyard started in 1902. The company built vessels for Holland America (including SS Rotterdam). The facility went down slowly in early 2000, and the port bought it in 2002 because the place was becoming blighted. The Port reached out to the local technical university to operate center and then took seven years to redevelop the facility.



RDM Rotterdam campus

Dr Hans Maas, Dean of RDM Rotterdam hosted our visit and shared other highlights. RDM is part of Rotterdam University of Applied Science Education – 38,000 students spaced all over the city:

- RDM pulls university talent from across the city around specific projects (they have no permanent faculty at RDM)
- University requires student thesis so be in conjunction with a private company
- Practical experience embedded throughout 4 year program
- Shared facilities – fab lab and Field/test labs
- Almost all universities are public and every university costs the same (\$200 Euros/year)
- Port wanted to get next generation interested in the Harbor (why RDM)
- Get them ready for “Port of the Future”
- Port owns facility and doesn’t charge for common spaces
 - Goal – gets kids into maritime jobs with the skills needed for success (ex. train in IT for maritime employers)
- RDM/Port hosts events for kids of all ages starting with kids (8-18) in elementary
- Learning space at RDM...tenants must want to work with students
- At first entrepreneur’s didn’t come (in part due to recession), but situation has improved
- RDM expanding across the river (Port XL location)
- Creating a “Makers” district out of rougher older parts of port
- **Smart Port:** The Value added for Port of Rotterdam – innovation and trained people

Port XL

After visiting RDM the Port team visited Port XL, a maritime business accelerator supported by private industry and the Port of Rotterdam. Port XL is global – they have 11 employees with two in Antwerp, five in Singapore, and 4 in Rotterdam. The Port XL office provides bullpen spaces for their startups.

Port XL scans the world each year scouting for promising maritime startups. In the months leading up to their annual acceleration initiative staff will do research on hundreds of emerging firms targeting those with most potential in the maritime industry. Port XL uses private sector sponsors to screen the most promising firms down to 20-25 startups who participate in their “Selection Day” evaluation process where 10-15 companies are selected for the accelerator program.

Selected startups then go through an intensive 3-month program to build and launch their business. At a final event called Shakedown, startups showcase their innovations and progress. Highlights include:

- Startups must provide 8% stock or \$150,000 Euro (but XL hasn’t gotten any hard funds yet)

“The challenging times in all port related markets, like logistics, oil and gas, and maritime, require that we have a window on new technologies. PortXL helped us identify these trends, bringing new business models to our markets and challenging conventional businesses.”

Paul Smits
CFO, Port of Rotterdam



- 14 Corporate sponsors put in \$50,000 with gold sponsors paying more – they effectively pay for everything
 - Port of Rotterdam sponsors Port XL to identify firms and technologies they need
- XL staff makes cut from 1000 suspects to 200 promising ventures before they bring the sponsors in to evaluate these enterprises and further reduce the field to 20-25 candidate firms
- Participating startups get contract with one of our sponsors (provides early cashflow)
- Port XL has facilitated 84 contracts on behalf of 36 accelerator clients.
- Satellite office offer shorter one week programs designed to feed participants into Port XL's annual accelerator.
- Rotterdam is ultimately gaining brand recognition for innovation

Next Steps

The Port of Seattle delegation benefited tremendously from the lessons learned on this trip. The team will be advancing maritime innovation across the Port in a number of ways:

- Staff is exploring whether battery powered vessels could provide charging support or shore based power to Port customers.
- Innovation centers in Wilhelmsen and RDM Rotterdam provide useful models for a Port maritime innovation center. Staff needs to determine how these models apply to our own initiative but it is invaluable to see what other companies and Port districts are doing to advance maritime innovation. Being able to collaborate with existing partners in this arena can help ensure Port of Seattle initiatives are practical and effective.
- Port XL offers a partnership opportunity as they are looking to expand their United States presence. Staff will be following up with Port XL to explore partnership opportunities. We have discovered two Seattle based maritime companies who have participated in Port XL so this is a worthwhile partnership to explore even if we only emulate certain aspects of their program.
- The Port of Rotterdam shared information the World Ports Climate Action Program. Our Energy Goals are our programs are aligned with this program and we see potential benefits with aligning our actions with these other Ports. The initiative is recently announced and it is not clear yet how additional Ports can join. We are investigating.
- Other visits to Alta Sea in Los Angeles and the Coast Guard's Science and Technology Innovation Center in New London, Connecticut are also anticipated. These fact finding trips will enable Port leaders to forge productive relationships with other maritime innovators and to learn about best practices (and additional lessons learned) that can drive the Port's maritime innovation center.