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Introductory Jingle

Innovate UK KTN connecting for positive change.

Matt

Welcome to the last in the series of the Maritime Innovation Sound Waves podcast. In this series, we have been exploring the trending topics that innovators in the port and maritime sector are always talking about. The maritime sector has undergone rapid change in the last few years, and it rises to address a transition away from fossil fuels to net zero operations, along with ambitious plans to embrace automation, digitisation, and striving to improve productivity and safety within our ports and maritime sectors. We've assembled a team of leading experts across the podcast series in their fields drawn from our Maritime Reports Innovation Network to discuss some of these topics. In this episode myself, Matthew Moss, Maritime Leader Innovate UK KTN, are joined by our very special guest KTN's very own Debra Jones, a Knowledge Transfer Manager in the Chemistry and Industrial Biotechnology team. And together today we're going to explore the topic of sustainably powered ports. Welcome, Debra.

Debra

Thank you, Matt.

Matt

So let's jump into the first question. A quite nice and broad one to begin with. What are the options for ports and perhaps the vessels within the ports when it comes to sustainable power?

Debra

So, Matt, I know you've already covered shore powered ports in a previous episode of the podcast. And I think probably most people would be in agreement that electrification is the sensible choice for sort of onshore applications, where it's possible to do so. So I know that renewable grid power is obviously not available absolutely everywhere, but where you have got renewable grid power, it makes sense to do that. Where renewable grid power is not available, obviously, you'd be looking for alternatives for the powering of the equipment around the port. So there are other options that we can use for things like this. We can use a lot of machinery that can be shamelessly stolen, borrowed from other industries, such as construction, or mining. You know, there's lots of things that are potentially available here. Alternative fuels, like biofuels can be used to replace conventional fossil fuels. But again, the feedstock for these and the actual fuel availability is not available everywhere. Other potential options include things like hydrogen. Again, where you are in the country and what kind of fuels you have access to, will sort of shape the options that you have around the different fuel types. But other sorts of, I mean hydrogen is quite sort of popular at the moment. But there are quite a number of other fuels that could be used, such as, again, more popular ones that are up and coming in popularity are methanol and ammonia as well. Both of those are options for using either vehicles that zip around the port or cranes that they use to move things around the port. But also, potentially hydrogen, ammonia and methanol can be used to power the vessels themselves.

Matt

Indeed, and I think the key thing for the ports and maritime sector is there's a lot of unique use cases where these equipment are used, especially the heavy machinery and indeed, the vessels themselves. So there's no clear cut winner of yes, we should use hydrogen through everything or electrification for everything. It's very likely that we're going to see a mix of these different fuel or energy vectors, depending on the ultimate use case. So it seems like the starting point for if you're a port operator, is to look at what you're using your equipment for and your port. And then from there use a data driven approach to identify what is the best fuel for you to use. Now, of course, that, as you alluded to there, sometimes comes down to availability of those fuels. But there's many options out there, it's just which is the best one at this stage. So moving on from that question, I guess the question that naturally precedes that, is how mature are some of these alternative fuel technologies?

Debra

So some of the technologies are very mature, and some are absolutely in their infancy. So there's a lot of development work that can be done even for some of the more mature technologies actually, in the specific applications. But things like biofuel is, yeah, there are biofuel refineries at the moment there is biofuel in production. It's a fairly mature technology. However, it's not really available at scale. Maybe we'll come on to talk about it a bit more. But there's a lot of issues around feedstocks, and I guess we'll come on to that and some of the other technologies as well. So lots of questions are, and again around biofuels, depending on where you are in the country, your choice of feedstock for your biofuel is likely to be different. So lots of things to think about there. A lot of the hydrogen technology is very mature again, mostly around, I mean, I don't know whether anyone's listened to the Hydrogenerally podcast, which is very specifically around hydrogen. But there's lots of different grades of hydrogen, lots of different ways of producing hydrogen, some of which are cleaner than others. So a lot of the grey hydrogen technology, the fossil fuel based hydrogen technology is very well developed. Whereas some of the green hydrogen, the renewable hydrogen technology is much less well developed and less economically viable at the moment. We've got lots of examples around the country, again, probably mostly in different industries. For example, Toyota has got a hydrogen powered forklift truck. And there's examples in the UK of hydrogen ferries and battery powered electric ferries, that, you know, again, the technology is well developed, outside of the applications, it's bringing the technology into those applications, very specifically for the power or energy requirements of the specific application, that's probably the least well developed part of it.

Matt

Absolutely. I've seen many examples in the UK and internationally, and some funded through the Clean Maritime Demonstration competition, of examples of where this technology is mature. And it's just leveraging the capabilities from other industries to bring it into the maritime and port sector. So technically, it's feasible. Cost wise, perhaps it's a little bit challenging, especially in a sector that is very driven by cost. Cost is seen as king. So providing that business case to invest and adopt these technologies, maybe as the next natural step to really get them implemented in the sector on a large scale. So maybe if we take hydrogen, ammonia, methanol as perhaps the four running alternative fuels. Maybe you could throw synthetic diesel eFuels in the mix there as well. Where are they currently sourced from for our listeners, and what perhaps, might be a future production pathway and

maybe an even greener production pathway? Because as you alluded to there, perhaps the current production methodologies are not as green as the ultimate fuel uses.

Debra

Yeah, most of the current fuels that are used in these applications are often sourced from fossil fuels. So I mentioned grey hydrogen earlier. Grey hydrogen is hydrogen that's produced by processing fossil fuels to make hydrogen and released in carbon dioxide. So, a lot of the initial work in moving to cleaner hydrogen in the UK is around moving from grey hydrogen to blue hydrogen. And this is done by capturing the CO₂ that is released during that process and storing it, or utilising it to make something else and to make another chemical intermediate. So ultimately, that's a sort of a medium term goal. But obviously, the ultimate goal is to be producing hydrogen, from renewable energy, and ultimately, from the electrolysis of water, which leaves you with, assuming you're using renewable power, clean water, and there's sort of no additional processing energy costs. Then you're making green hydrogen. This green hydrogen is very much key when you're looking at the other fuels as well. I mean, you've talked about ammonia. Ammonia is currently produced via the Haber-Bosch process from hydrogen. So if you're starting off with grey hydrogen, you're going to end up with grey ammonia. Whereas, if you're starting off with green hydrogen, using renewable energy in those processes, you're going to end up with a much cleaner ammonia, which is obviously more desirable. And the same is true for methanol, and that we currently have no methanol production in the UK. The last methanol plant that we had in the UK closed down, I think in the last decade. So we currently have no green methanol production in the UK at all, or no methanol production in the UK at all, let alone green methanol. So I think some of them, there almost needs to be the build up of a business case, use case for methanol, and if the demand is there, then I think we can probably produce those chemicals. And then it's important to note that methanol isn't just suitable as a fuel as well. It's quite a valuable chemical intermediate. It's the building block of a lot of other chemicals and I guess that's an entirely different topic around defossilize the chemicals industry, because it's very difficult to decarbonise the chemicals industry, because a lot of the products, by definition, are carbon containing. So it's about de fossilisation, rather than decarbonisation. But it's, I guess, it's important to mention that going back to the point of green hydrogen, that's an absolute key underpinning technology for all of these future fuels. And if you look at synthetic fuels as well, you're looking at, currently, they're being produced via taking natural gas, turning it into syn gas, and then re forming that syn gas into longer chain hydrocarbons. To make synthetic e fuels. Again, that's not sustainable if you're getting your hydrogen and your carbon source from fossil fuels. So we need to be looking at green hydrogen, and carbon capture either from direct air capture, or from sort of industrial gas, industrial flue gases, which has higher concentration and therefore currently easier to do. But again, this green hydrogen, you need renewable energy. At the moment, I don't think there's enough green renewable energy to produce enough green hydrogen for even half of the applications that we've talked about. And there's going to be a huge amount of competition for green hydrogen as well. We've just listed what, four potential fuels that can be made from it. There's obviously the using the hydrogen directly in a combustion, you could do that you can put it through a fuel cell to power the ships themselves. There's lots of different options. And all of those options are going to be competing for the same feedstocks be that water, or renewable electricity. So a lot of the work has been done at the moment is around clusters as well. So if you're in an industrial cluster, it's fairly easy to get access to hydrogen, not necessarily green hydrogen, but hydrogen. But if you're somewhere that's not

in a cluster, that's really quite hard to do. And I think a lot of the public funding at the moment has focused around producing hydrogen clusters. But I think there's probably going to need to be more of an emphasis in the future around sort of decentralised production and production, where the use case is fairly close to the site. So yeah, green hydrogen is mine, we need to be putting more effort, energy, and money into developing green hydrogen technologies as an underpinning technology for all of the future fuels.

Matt

I think in order to get that green hydrogen as well, we need to focus our efforts in decarbonising the grid, because there's absolutely no point in producing hydrogen, if we don't have it. It's not coming from green sources where we need that renewable electricity. Otherwise, we're going to have carbon, perhaps in the lifecycle from the very beginning. So if we can eliminate carbon throughout the whole chain, and we've successfully decarbonised multiple industries, because as you alluded to there, hydrogen has many, many use cases. Perhaps a little touch upon biofuels and the feedstocks that go into that. Obviously, there's many different feedstocks out there. And there's many complicated production pathways to create fuels from bio, from a biogenic sort of feedstock. I know you've done a lot of work and sustainable aviation fuels in the past. Are there any similarities with the maritime industry that we could learn from and draw from? Where are the feedstocks going to come from? Is there enough to go around?

Debra

So that is a really good question. And it's particularly topical at the moment. I'm not sure that there's any concrete answer. And I think it's possible that the UK doesn't have enough biogenic carbon to meet the needs of the industries, all the different industries that want to use it. However, there's a report in the EU, and it suggests that there is enough to satisfy all of those needs. So I think, again, the whole industry needs a sort of portfolio approach as to what the best fuel to use is, based on the application that you're using it for and where you are sourcing the fuel from. So in the UK, there are already certain feedstocks that are allowable for sustainable aviation fuel production. So anything that in the UK would be considered to be competing with food as a feedstock is not currently, and has no plans to be included, as a potential aviation fuel feedstock. And I think we would all be in agreement that that's the right thing to do. We don't want to be taking resources away from food production. But you know, again, if you're in an area that's very heavily wooded, you might have a lot of wood waste. Be that like little small twigs that are taken out of the forestry when the Forestry Commission are doing their wood maintenance, you know, you're gonna get different feedstocks available in different places. And I think that's probably key to the industry as a whole deciding, we need to play to our strengths. And I don't think we should be picking any kind of winners at this point. I think picking winners is a bit like picking lottery numbers, sometimes, although I guess the odds are slightly greater. But we should be looking to develop all of these technologies. And we should be looking to utilise all of our resources as best we can, with the minimum impact, with the minimum negative impact on everything else. So I think yeah, biofuels are, again, the cost needs to come down. So biofuels as well as the fuel availability, feedstock availability, the cost needs to be brought down for them to become economic.

Matt

I think there's a general consensus that we are going to pay more for these sustainable fuels in the future, it's just how much more we are willing to pay. And obviously, between aviation, maritime, the logistics sector, we don't want to be competing for feedstocks, we don't want to be competing for fuel that will fund more of an energy crisis than we're already in. So we want to make sure that each of our modes of transport has the right fuel for their use case, and that there's enough to go around. So making sure that all the technologies receive the correct level of funding so that if a winner naturally emerges, perhaps we're ready to capitalise on that. But equally, if perhaps it's less advantageous for the UK to go in a certain direction we have, we're not starting from ground zero, we do have a little bit of fundamental work done already. So we're not scrambling around trying to catch up to the rest of the world. And it's especially important for these international sectors such as the maritime and ports world.

Debra

I think that's it, isn't it, because, you know, it really is like aviation, it is international. And it's not very helpful if we have a UK policy that doesn't necessarily line up with the rest of the world, or makes it more difficult for us to compete with the rest of the world. We're seeing the same in the aviation industry, because if you make it difficult or more expensive for an airline to buy fuel, where you are, at some point, it becomes sensible for them to tanker the fuel around, which obviously is an energy penalty on them. And it burns more fuel carrying the fuel for the return journey. So it has to make sense economically and policy needs to be aligned internationally.

Matt

Exactly. So we're almost a trifecta of balancing the energy requirements, with the carbon requirements, to the cost requirements. So we need to get them all in a balance so that we can choose the right option going forward. So I'm going to wrap up the podcasts now. Thank you very much, Debra for joining us as our special guest on this episode. As I mentioned earlier on, unfortunately, this is the last one in the series of our podcasts, the Maritime Innovation Sound Waves podcast. Do make sure to check out the rest of the podcasts in this series, as well as other related podcasts on KTN's website, or you can even find them on Spotify. We've covered many pivotal topics across the maritime sector in this series of podcasts and these topics and these challenges. We're going to continue facing these for over the next few years, even all the way up to 2050 where we need to hit our net zero goals. These range from smart digital green shore powered and finally sustainable powered ports. So thank you everyone for listening in. And hopefully you've enjoyed the podcast series. Do make sure to check out the Maritime Reports Innovation Network section of the Innovate UK KTN website. You can also find news, funding opportunities and events to get involved with in the sector. So thank you very much everyone for listening.

Outro Jingle

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