Lift off for greener transportation offshore

As the wind industry battles the challenge to reduce its own impact on CO_2 emissions in the making of greener energy, could flying cranes be a possible solution for transporting spare parts, tools and equipment for turbine service and maintenance? PES was fascinated to learn more about the possibilities of the technology from Co-founder and Technical Director of Airflight, Mikkel Kærsgaard Sørensen.

PES: Welcome to PES Mikkel. We're delighted to be starting off a new year with a new name in the publication and can't wait to introduce you to our readers. With that in mind, perhaps you could start by giving us a brief introduction to Airflight and what you do?

Mikkel Kærsgaard Sørensen: Hi and thank you for having me here today! I'm excited to be here and share a little about our company with you. Airflight is a Danish tech company that builds flying cranes. These are large, fully-electric, industrial drones that can fly with a 200kg payload.

PES: What would you say is the main-stay of the business, in relation to the wind industry in particular?

MKS: We specialise in the transportation of spare parts, tools, and special equipment for wind turbine service and maintenance.

When maintenance is being performed on wind turbines, they are shut down and thus, not producing energy. In both onshore and offshore wind farms, our flying cranes deliver the necessary equipment to the service technicians much faster and cheaper than current processes. This reduces wind turbine downtime and allows the technicians to get the turbines back to producing green energy faster.

We focus on service and maintenance operations because about 98% of all the spare parts, tools, and special equipment used for these operations are within our payload capacity. Someday it will be cool to use our flying cranes to lift an entire turbine blade and more, but that is a future goal.

PES: Yes, while the industry itself is driven by the need for greener living, there are lots of ways that its operations might be conducted in a more energy efficient manner aren't there?

MKS: Yes, definitely, and the wind industry is quite good at integrating new technologies to reduce CO_2 emissions in all areas of its operations. However, there is still a long way to go and this is partly driven by the fact that wind turbines are massive machines to build, maintain, and eventually, dismantle which requires powerful equipment to do so.

Airflight is on a mission to make a huge impact on CO_2 emissions in the wind industry. Each flying crane is fully-electric and is able to save up to 2,000 metric tons of CO_2 per year.

PES: What do you think have been some of the challenges in this regard until now? Is it a problem of distance, location and the sheer size of the wind farms that makes it difficult to run them in a green way?

MKS: Yes, that is exactly correct. Distances, locations, and the sheer size of wind farms and wind turbines all contribute to a huge need for transportation of materials, equipment, and people to operate in this industry. Incorporating greener transportation solutions in the wind industry will have a massive impact on CO_2 emissions.

We do this by supplementing, and in some cases, replacing traditional ships, cranes and helicopters for maintenance operations which are much slower and more expensive, and create heavy CO_2 emissions in comparison to our fully-electric flying cranes.

For example, we will be able to fly directly from the helipad of an offshore SOV to the desired turbines and back again, instead of sailing an SOV or CTV several kilometres to the desired turbines. This drastically reduces the amount of fuel consumption for SOVs and CTVs offshore. We can also transport flying cranes in a box van for onshore operations, which creates significantly less CO_2 emissions than transporting a mobile crane, helicopter, or other heavy machinery.

PES: What improvements do you think can be made operationally to make wind farms themselves a greener option?

MKS: Investing in greener technologies to perform current operations.

PES: Could you explain a bit more about how the flying cranes work?

MKS: Flying cranes are large, fully-electric, industrial drones that can fly with a 200kg payload. They are classified as UAVs, or Unmanned Aerial Vehicles, which means they are controlled remotely, just like the small drones you see today. Airflight's flying cranes are built as an octocopter, meaning they have eight arms and are propelled by eight powerful electric motors. This multicopter design gives much higher precision than a traditional helicopter design, which uses one large rotor.

The flying cranes literally look like giant drones. They stand at over 2 metres tall and are 7 metres in diameter. Each flying crane can land on a 3m x 3m area and fold down to a compact 2m x 2m x 2m size for transportation.

We call them flying cranes instead of drones because they are specifically designed for ultra precise, vertical hoisting operations in high wind speeds. Everything from the overall aerodynamic design to the exact electrical components we use are all integrated for this purpose. This makes them the perfect machine to transport spare parts, tools, and special equipment for wind turbine service and maintenance.

PES: Do you have any examples of them being used already in the wind industry so we can get an idea of their advantages?

MKS: This is an interesting question actually,

Mikkel Kærsgaard Sørensen

because there are no flying cranes being used in the wind industry today. The closest thing to it are helicopters, which are not as precise for payload delivery, primarily used offshore. They are also not as safe since they require human pilots to operate, and cost up to 10 times more than the operational cost of a flying crane.

That being said, operations where the wind industry does decide to use helicopters today provide massive advantages of speed and accessibility that other current means of transportation cannot compete with. Our mission is to provide these same advantages, but at a more affordable price, with increased safety as they are unmanned.

Another example is that small drones are widely used in the wind industry for blade inspections with cameras. They are just not used to transport equipment. Most drones today cannot carry more than 1-25kg of payload.

PES: Are the flying cranes subject to agreeable weather conditions in order to fly though?

MKS: In aviation, we obviously prefer good weather conditions, but wind turbines are, of course, built where the wind often blows to generate the most energy. Our flying cranes are specially designed to operate in these conditions. They will be completely waterproof and able to perform highly precise operations in light rain and wind speeds up to 15 m/s, which is better than the operational limits for hoisting operations in the wind industry today. As we develop our products, we will push these operational limits even further.

PES: Surely, they must present a more cost effective option for OEMs, not to mention saving time too?

MKS: Definitely. We are collaborating with the wind industry and we have calculated that each flying crane will be able to save between 1,000-19,000 operational hours and between 1m-2.5m Euro per year when they are being fully utilised. This is in addition to the nearly 2,000 metric tons of CO_2 emissions we can also save per flying crane per year.

These are massive time, money and CO_2 emission savings for the wind industry and it is why we are excited to help this green energy industry take a giant leap into the future for maintenance operations.

PES: Of course, we can't overlook the fact that such solutions rely on the use of digital technology. Would you agree that whilst this is developing at pace in the wind industry, it's not without its drawbacks?

MKS: The way I see it, the world is only moving in one direction when it comes to digital technology. So, the more we can use this to our advantage, the better. Of course, no technology is 100% perfect, but when it's done right, it makes far fewer errors than humans do. Here, I can only say that the advantages heavily outweigh any potential disadvantages.

PES: What would you say to wind farmers who may be hesitant about using and relying on technology in this way?

MKS: I would like them to know that there is no need for hesitation. Using rotors to make a machine fly has been used for decades in helicopters and drones. It is a proven, safe and redundant technology that has been around for years, it just seems intimidating to see it at the scale that we have built.

If you feel comfortable doing operations with helicopters, which is common practice today, you should have no problem using a flying crane. They are the future and will only become more common as the industry progresses and more uses are discovered.

PES: Are there any new developments already in the pipeline for Airflight?

MKS: Yes, there are always new developments in the pipeline. We are obsessed with making the world's best flying crane. We have a big focus on optimising the flight time, precision, controllability and transportability of our flying cranes.

PES: How do you see this type of technology being used in the industry in the future? Is this just the beginning of its capabilities, do you think?

MKS: I believe that this technology will revolutionise the industry completely, and it will definitely grow into many other areas of the wind industry. As battery and alternative fuel technologies develop, flying cranes will be used to transport from onshore to offshore and carry larger and larger payloads. Perhaps someday not too far from now, we will be able to install entire turbines using flying cranes.

PES: As the wind industry continues to raise the bar with new innovations and evolutionary developments, what might the future look like?

MKS: Wind energy is one of the world's biggest contributors to green energy production. It gives the world a chance to reverse climate change and leave the world a better place for future generations than we found it. It is an industry of constant evolution and innovation, which means that it is here to stay.

I believe that one of the largest ways this will affect the wind industry is that there will be a massive shift to offshore wind farms, which can use larger turbines to produce green energy and/or green hydrogen. In the future, most of the world's wind energy will likely come from offshore farms.

PES: And for Airflight, what do you think the future will hold in 2022 and then beyond?

MKS: With Airflight, everything is possible. Today, we are doing well in our current niche wind energy service and maintenance niche. In the future, we will definitely expand into solving more problems for the wind industry. Not only that, but many other industries such as shipping, agriculture and construction also have obvious issues that we can solve with our flying crane technology. Wind energy service and maintenance is a great beginning for us, but it is certainly not the end.

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