

Customized bolting solutions for the wind industry

Words: Andrew Brindley

Atlas Copco has been providing tensioning solutions for the wind industry since 2005. The initial tensioners were supplied to European manufacturers for the build of wind turbines within their facilities.

As time progressed the range expanded to Asia and then the rest of the world. Due to the demand from the manufacturing plant progressing to other sections of the industry, tensioners quickly started to be utilised within installation and service.

Relationships with many OEMs grew rapidly, due to working together on key applications and continuously delivering bespoke customized solutions for a litany of different applications within the industry.

Due to the typical application spacing within the wind industry, bolt tensioners are often small in diameter, with a taller height dimension. Depending on where the tensioner will be used on the turbine, bolt tensioners can range from single to multiple stacked load cells, allowing a smaller footprint but higher loads, typically working up to 95% yield of the bolt. With higher stack load cell requirements, puller bars were then designed for the tensioners, in order to be fully operational and fit for purpose.

Original tools were designed to 1350 Bar based on customer requirements, but over the past 5 to 10 years, more requests have been made for higher pressures in order to keep smaller footprints for the progressive wind turbine designs.

One of the most important features included in our original wind tool design, and which is still an integral part of current wind tools, is the fail-safe system. This is to make sure that the puller bar is the first component to break at a specific point, allowing the tool to stay on the stud. Without this feature there is a high possibility of a tensioner leaving the joint at high force, which could result in injury to the user.

Atlas Copco designed features for wind tools such as automatic piston retract with the addition of swivels, to overcome restricted working conditions to make the tools more user friendly.

Working with specific customers we have designed a range of tensioners to suit their requirements. As the customer base increased, the demand for customised solutions of our Wind Tensioner Blade Tensioner (WTB) range quickly rose. Typical customisations are:

- **Larger stud protrusion:** usually for bolting 1x bolt diameter plus the bolt pitch is required, protrusions vary amongst the different turbine brands.
- **Taller or shorter bridges:** this can be because of application obstructions, different nut types and also to facilitate the use of washers on the joint.

- **Adding Chamfers or modifying footprints:** so we can increase the accessibility to use the tensioner on the application

- **Varying load requirements:** dependent on the joints and bolts used for the application. Grade 10.9 is the commonly used bolt material.

In a world of autonomous systems, the requirement for automation is starting to enter the wind industry. OEMs are quickly starting to see the benefits of cost and safety with the ability to include data collection in their daily processes. With Atlas Copco's wide and varied knowledge from other industries regarding data collection, we are now at the forefront of



implementing this into our designs, which we believe will help drive the transformation of the wind industry.

With the ability to apply the knowledge already gained from other tools and processes within the Atlas Copco portfolio, from industries such as automotive and aerospace, we can develop solutions faster, with no impact on the quality of the solution.

Not only are we still currently producing our standard range of tooling, but we have also created a new range of smart tooling. This has been developed to meet new industry requirements.

Looking to the future we see that applications are going to have smaller space constraints, with customers demanding full-data traceability. This is just following the trends of other industries, like the car industry, where the need for data traceability was paramount for the industry to continue growing.

Having the ability to record data and ensure that processes are being carried out correctly will not only naturally speed-up processes over time, but more importantly ensure turbines are being developed, manufactured and installed safely.

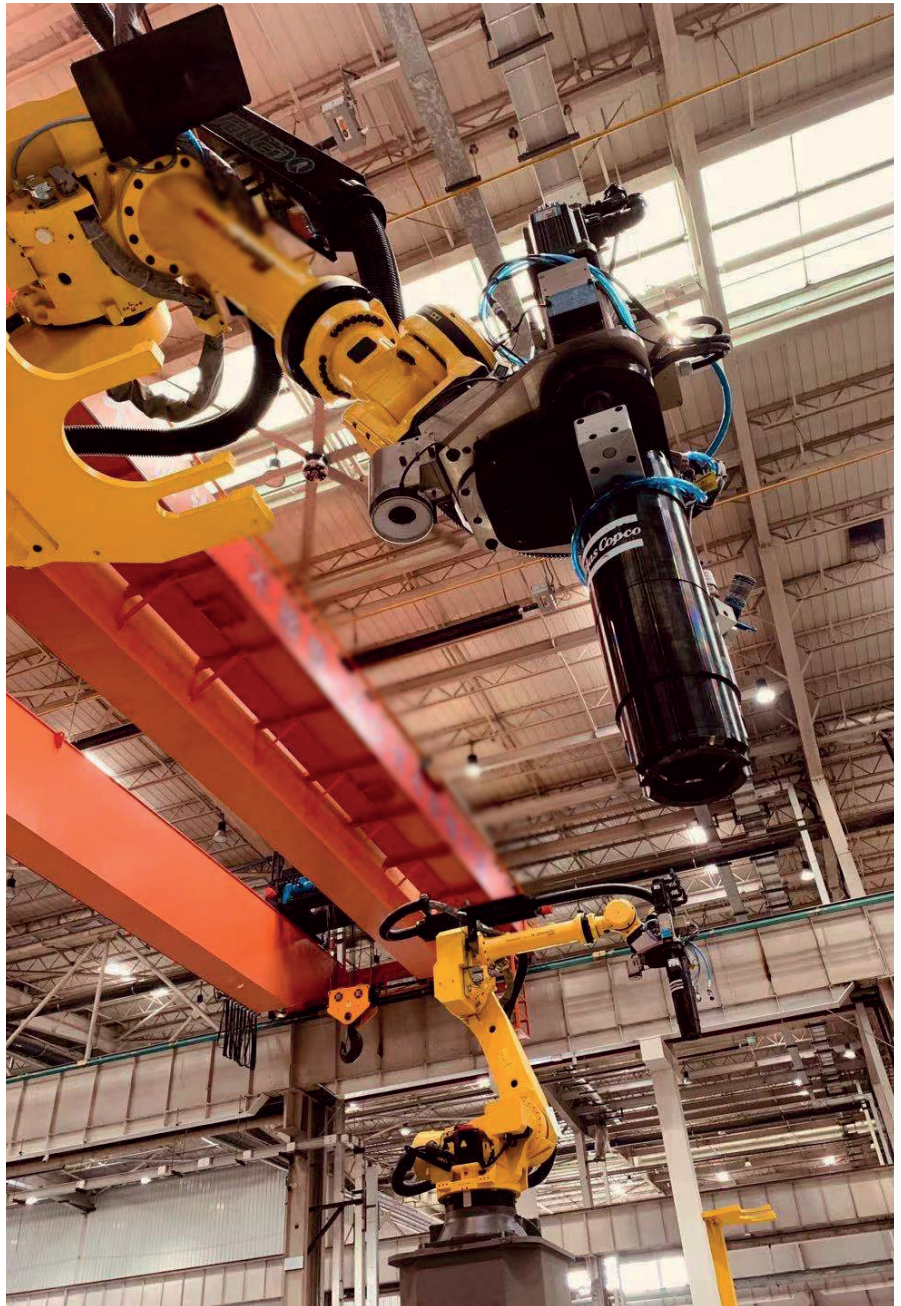
At Atlas Copco we want to continue to work closely with our customers to deliver the best solution tailored to their needs. However, we have also started to work with our in-house R&D team on a fully autonomous solution. Following the current trends of the market, we know that this solution would be very valuable to our customers.

Developing a tensioner with the ability to crawl and work through a tensioning sequence alone would save companies a lot of time and money, freeing up operators to complete other critical tasks. This gives us a large scope for further development, for example broadening our data capture specification to include more readings from the process which is taking place on the bolt.

Looking further into the future we believe industries will eventually move toward removing skilled labour completely from their processes onsite, to make it safer and to improve efficiency. In order to get there, we feel that there will be a requirement for remote data collection and global remote working.

Could you imagine a situation where the tensioner would be remotely operated by a skilled controller to complete the entire tensioning process thousands of miles away?

You could also potentially have the tool



light up green or red to notify the skilled operator if the application has been tightened correctly or not, which is a common feature in a number of Atlas Copco tools already. Also, we could see the use of uploading instructions and requesting data completely remotely.

If this process became a reality, it would remove the need for operators to travel long distances to work. This would improve

efficiency of the operators and save time and money for companies, as well as reducing the carbon footprint.

Overall, the energy industry is constantly evolving, and the wind sector will be a big part of that. Atlas Copco has a big responsibility to help support this evolution and transformation and it is hugely important as we strive for greener energy and a more sustainable world.

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Wanting to find out more about the possible shift towards more robotic processes for tensioning, PES asked Atlas Copco’s Proposal & Technical Manager Andrew Brindley for his thoughts on the topic. What are the advantages of such a shift from manual to robotic solutions and just how far away are they from becoming the norm for the industry?

PES: Are you seeing a big shift in the market from manual processes towards robotic solutions?

Andrew Brindley: Yes, we are noticing more requirements for automated tensioners being used in conjunction with robotic arms. We are particularly noticing this within the OEM industry. It’s been a relatively quick shift due to the advancements in modern technology, and the need for pinpoint accuracy on every application. Of course, standard tensioning solutions are still required, but having the ability to use them on robots has appealed to customers.

PES: What do you think is driving this change?

AB: One thing that has certainly driven the change is the demand for safer environments and greater efficiency. Some applications only offer a small working space, so having a solution which can work within these small spaces more efficiently solves a lot of the stress companies may have.

Also, there’s a desire for speed and increased accuracy, which is what customized solutions can offer. With some solutions needing minimum operator interaction, it gives increased accuracy and also frees up time for operators to complete other processes.

Another driver for this change is governments around the world fiercely wanting to reduce their carbon footprint. This in turn is making them look to develop and build more turbines at a cheaper cost, but with more efficiency. With the governments aiming at a lower cost, there are less materials and the space constraints are getting smaller, which is where our tools offer the most value.

PES: What do you see as the main advantages of smarter and potentially even customized alternatives?

AB: Within the wind market there is not a standard wind turbine design. Each company creates a bespoke turbine, which means that there is a requirement for bespoke tensioning solutions. Having a unique solution for your turbine application means that it will work specifically how you want it to.

Working closely with our designers and proposal team you can develop a solution which best suits you. Another advantage with some of the customized solutions is the ability to record data. So, you know if the job was completed correctly,

pinpointing any errors so they can be corrected before it becomes a much bigger issue.

PES: Are there challenges to overcome too though?

AB: The challenges are that the OEMs are continuously trying to make applications smaller, with more efficient processes and increased data collection. The smaller the application, the smaller the tensioning solution needs to be.

The key aspect for all of our solutions is safety, so being able to build-in all of these features into smaller tools can be quite challenging, but we understand that this is where the trend is going and we have the ability to help transition into smaller applications.

PES: Do you think we are likely to see fully automated robotic tensioners coming to market in the future? And if so, are we far away from this as a viable option already?

AB: Definitely. We can see there is a rising call for a fully autonomous solution where the tensioner will be able to independently move through the tensioning sequence without needing a robotic arm. This would be a big game changer, as it would make the process quicker and reduce space which is being taken up by the robotic arm.

The aim is that we will bring automated systems not only into the factory but also installation, maintenance, onshore and offshore. It’s important that these solutions are dynamic and adaptable, so they can be used where they’re needed. At Atlas Copco we want to help them work in a quicker, safer, smarter way.

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