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Stormy times ahead for wind turbine industry?



2010 was a year of highs and lows for European wind power. One of the highs is that the EU is on course to exceed its 20 percent renewable energy target. One of the lows was the significant slowdown in the annual number of wind energy installations.

Despite the massive year on year growth in total wind power capacity over the past 10 years, newly installed European onshore capacity in 2010 fell 14 percent to 8.4GW from 9.7GW in 2009. There was slightly better news with offshore capacity jumping 51 percent but from a much lower capacity figure of 582MW to 883MW.

In the UK, the reduction in the new capacity installed last year was a sizeable 24 percent lower at 962MW with the industry having to deal with several difficult situations as well as the global economic downturn. Like the oil industry the best and easiest extraction sites are chosen first so as time goes on, it is the industry has to move to more difficult/less economic sites. For contractors this means more remote and steeper gradient sites which results in increased risks and more difficult and expensive access. Whether this is related to

the rising number of major turbine related crane accidents occurring in the past 12 months of so is hard to say. Most appear related to moving vehicles and cranes between turbines or operating in wind conditions that are close to the maximum with higher gusting wind speeds causing problems.

Unfortunately turbine sites - by their very nature - are positioned in the windiest areas, so higher than average wind speeds are a given and monitoring wind speed and direction during erection is critical. And remember, a crane can operate in a higher wind speed than the load it is lifting - particularly with large surface area items that are relatively light, such as rotor blade assemblies.

The UK and Ireland has some of the best (power producing) wind farm sites in Europe. Turbines are able to harvest the necessary wind power using lower height towers - 80 metres - rather than the more usual 100

UK current installed onshore capacity

307 projects
3412 turbines
Total capacity 5737MW

metres on the continent. But with most of the more efficient sites already taken, the tower size now has to increase in line with the rest of Europe just to produce the same output.

The UK's leading specialist wind turbine lifting and installation contractor is Irvine-based Windhoist which offers both heavy crane hire and full installation contracts to the principal wind turbine manufacturers such as Vestas Celtic, RePower, Siemens, Nordex, Acciona, Enercon and Gamesa throughout Europe and beyond. Since its formation in 2005, the company has installed more than 2,500 turbines with a combined power output of 4,600MW.

New onshore UK capacity added 2004-2011

Year	Number of projects	Capacity MW
2011 to date	20	497
2010	41	1192
2009	41	1099
2008	39	544
2007	31	459
2006	22	621
2005	23	459
2004	12	241



The Windhoist parent company - McNally's Crane Hire - became involved in the wind industry more than 12 years ago installing small capacity (400 to 800 kW) turbines in Ireland and Northern Scotland, using its 120, 180 and 400 tonne capacity cranes. However, the addition of a number of 500 tonne capacity Liebherr LTM1500's allowed the erection of turbines up to 1.5MW with minimal boom attachments and rapid site relocation capability.

McNally completed its first wind project in 1999 using a 400 tonner to erect 600kW turbines for Vestas. However with an increasing number of energy clients looking for a fully integrated package, the company eventually formed Windhoist offering heavy cranes and mechanical/electrical services primarily in the UK and Ireland. The addition of a 600 tonne Demag TC3300 lattice crane allowed it to complete projects such as the installation of 10, Nordex N80 turbines in Kings Mountain, Sligo and also allowed McNally's Crane Hire to extend its crane services.

Top 10 leading countries in wind power

2010	
Country	Total capacity MW
China	41,800
USA	40,200
Germany	27,214
Spain	20,676
India	13,065
Italy	5,797
France	5,660
UK	5,204
Canada	4,008
Denmark	3,757

2009	
Country	Total capacity MW
USA	35,159
Germany	25,777
China	25,104
Spain	19,149
India	10,926
Italy	4,850
France	4,492
UK	4,051
Portugal	3,535
Denmark	3,465

McNally's crane fleet has benefitted from Windhoist's success and has grown to reflect its expanding wind industry business, including the purchase of the UK/Ireland's first 1,200 tonne Liebherr LTM 11200-9.1 telescopic crane with 100 metre main boom and 126 metre luffing jib in September 2008. A further model was added to the fleet in 2009 and the crawler version (LTR11200) was shipped to Australia in 2010.

Its operations have also grown with depots in Ireland, Scotland and Victoria, Australia. In fact, the LTR's first contract was erecting 37 Vestas V90 turbines to a height of 80 metres in Australia.

Liebherr designed the LTR11200 primarily for the erection of wind power plants with the crawler's narrow track chassis ideal for moving fully rigged with its main counterweight installed - a total weight of up to 415 tonnes - over the narrow roads of the wind power parks. Its telescopic boom, Y-suspension, lattice fly jibs and superstructure were all adopted from the LTM 11200-9.1 All Terrain crane. However there is a feeling in some quarters due to a number of 'accidents' that highly tuned telescopic crane booms are too sensitive for wind turbine erection work. And that a lattice boom machine is better able to cope with the wind conditions and with crawlers the dynamic loadings on the boom when moving.

Declan Corrigan of Windhoist disagrees: "Every crane model, configuration and lifting operation has its limitations. Those who know us are aware that our installation activities are centred primarily upon telescopic cranes and we have built up an excellent safety record. I suppose we were fortunate in having gained significant experience



on the 84 metre boom LTM1500 which made the transition to the 100 metre boom LTM11200 much easier for us - yes it's not a lattice boom and its limitations must be respected. We recently erected 51 rotor units in early June/July on the Clyde Wind farm project under very unfavourable wind conditions - installing up to three per day with one LTM11200 - all without incident. The vast majority of crane related incidents on windfarm sites

metre towers where its key advantage is the vastly reduced rigging infrastructure. Most of our competitors favour lattice boom cranes and I have no doubt these high-profile incidents with telescopic cranes are viewed and discussed in the worst possible light."

Foreseeable incidents

There have been several 'wind' related accidents involving large telescopic cranes, such as one last



There have been several 'wind' related accidents involving large telescopic cranes

are not due to crane failure, the fault usually lies with the ground conditions, site infrastructure or the way the crane is set up and operated. We chose the LTM11200 - with the 100 metre main boom - for the niche UK market installing 80

month with an LTM11200-1 owned by Brazil's largest crane rental company Locar. The accident was said to have been caused by a strong gust of wind that moved the rotor off-centre causing a massive side loading on the boom.



McNally's Liebherr LTR11200 at the Waterloo wind farm near Clare, South Australia

"From what we understand the crane was configured with 70 metres main boom, adaptor, excenter section, 10 metre extension and NZF fly-jib with Y-Guy boom support," says Corrigan. "This combination is useful in hilly terrain where large rigging areas are not readily available but this is a LONG boom combination and Liebherr make no secret of the fact that it must be operated carefully. Wind factors, particularly lateral loading, must be carefully assessed for any lifting scenario. Whilst the crane can detect and manage wind

loading on the rear of the boom it cannot do so with side-loading but this applies to any crane type and relies on operator discretion."

So is there anything to the concerns over the use of telescopic's for wind farm erection? "Look at it this way, crane manufacturers will claim that 600 - 700 tonne class lattice boom crane rigged with 115 metres of boom can take down a 100 metre diameter rotor from 100 metre hub height in wind speeds up to 11.5 metres per second. Whilst the crane may be deemed perfectly capable of withstanding such wind loadings, little consideration is given to the way the suspended rotor behaves and no contingency factor has been included. The discussion on permissible safe wind loadings seems to ignore the most important factor i.e. how would the lifting operation cope with a sudden, unexpected, windspeed increase."

"The stupidity of planning rotor lifting at 11metres per second indicates a failure to comprehend all hazards. Where the wind increases unexpectedly it is far more likely that the control interface will be compromised before the crane structure fails ie a tagline will snap or a blade bag rupture before boom failure occurs."

"Windhoist's written policy is not to lift a rotor off the ground if the wind speed is more than nine metres a second," he said. "Lifting rotors in high wind speeds is a



dangerous practice. What other companies choose to do is their own decision."

Tracking between turbines can also be problematic. There have been several cases - two within the last 18 months - of narrow tracked lattice boom crawler cranes tipping over between turbine positions - one, a 350 tonne Weldex lattice crane at Maesgwyn wind farm site in South Wales and a similar unit owned by KR Wind in Sweden. In both cases the cranes were tracking fully rigged and ballasted and the edge of the road gave way causing the crane to overturn. A similar accident with a Liebherr LTR11200 was narrowly avoided in Germany earlier this year thanks to the prompt and professional attention of the crane's operator Burkhardt Hartinger of Karl Hartinger Kranbetrieb of Rimbeck. In that case the crane's ability to retract its boom before moving, stabilise itself after it started to sink and then and remove its counterweight were all big advantages of the telescopic crane.

"If you operate these narrow tracked cranes you have to have specific procedures for your operators such as examining the roads before travelling on them and ensuring a road that is fit for purpose. As far as I am aware road bearing capacity may have been an issue in some of these incidents and whilst moving a fully rigged lattice crane in perfect conditions is acceptable some element of risk remains.



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A 5MW nacelle



Loading wind turbine blades

The safest solution is to allocate an hour to remove half the lattice sections and some counterweight - crane stability is dramatically increased. Most accidents are caused by two things - making too many assumptions and inexperience. We hold regular toolbox talks with our frontline staff to reinforce the critical safety issues," says Corrigan.

Advantages of the telescopic crawler

One of the main advantages of the telescopic crawler is that it can be moved fully rigged. Because of this there are fewer work at height issues - particularly low level (three to four metres) working - which is now a major consideration for contractors. Over the past four years the dynamics of the UK wind industry have changed with Health & Safety standards raised to a very high level, far ahead of any other country.

"This has surprised many European contractors entering the UK over the past two years including those who exited the market a few years ago and have decided to return," says Corrigan. "In simple terms a continental contractor will arrive with a crane and walk on top of the boom and think nothing of it - UK operators would not consider doing this. It is only a small example but it illustrates the difference in national standards. When the LTM 11200 was first demonstrated to us about four years ago there were three technicians on the same step-ladder to complete the assembly works - that doesn't happen here. We have long campaigned for additional hand rails and decking to be placed lattice crane boom sections and it took a long time for this message to filter through to the manufacturers.

Another advantage of the crawler telescopic is its rapid relocation, remobilising the crane in two hours whereas an equivalent lattice boom maybe anywhere between eight and 12 hours. And finally the crawler needs a lot less site infrastructure.

Equivalent lattice boom crane e.g. 84 metre boom plus 10 - 12 metre fly-jib requires more substantial site infrastructure.

Turbines

The wind industry has been a key driver for the major crane manufacturers - particularly Liebherr and Terex - over the past five years. Most wind farm work takes place at steep boom angles, with larger capacity requirements at significant heights. Most turbine manufacturers liaise with the crane industry during the development phase of new turbine models to ensure adequate capacity exists within existing crane models.

As mentioned earlier, the quality of the wind farm sites in the UK means that the 'typical' turbine is now about 3MW capacity, weighing 70 to 80 tonnes and positioned at 80 metre hub heights. Hub heights on the continent are higher at more than 100 metres with larger blade diameters to capitalise lower wind yields. This size of turbine is not needed in the UK at the moment but will come in time when the more favourable sites are used up.

The table below identifies the largest onshore and offshore (planned) turbines. However smaller capacity

Current largest capacity turbines

	Make	Model	Capacity	Rotor diameter	
Onshore	Enercon	E126/7500	7.5 MW	127 metres	Available
Offshore	Windtec	SeaTitan	10MW	190 metres	Under development

units can still be difficult to lift.

Windhoist currently has two, Liebherr LTM 112000 and one LTR 112000 crane in its fleet. It also has a 103 metre Wumag truck mounted platform which is currently on long term hire to Siemens carrying out blade inspections.

Supplying and managing cranes for wind farm contracts is relatively straight-forward," he says. "Projects become more complex when crane and installation are required in a single package. There are a few exceptions where some turbine manufacturers hire crane-only but most, including Vestas, Siemens, Repower and Nordex, consider only the full package. This sector is very specialised with relatively few competent contractors possessing the equipment, experience and manpower to carry out the work."

Given this fact, it is surprising to hear that contract prices have fallen significantly and very quickly over the past 12 months although the knock-on effect on quality has not yet been seen. "The global recession is the prime reason for the contraction within the industry.

There is sustained activity in the UK wind industry but with the petrochemical, oil and civil



Declan Corrigan of Windhoist

engineering sectors all depressed anyone with a large crane is looking at the wind sector for work."

"Rates over the last 12-18 months are down more than 15 percent and everyone is in survival mode. Contract prices have been driven down to the minimum - almost to the point where key interfaces are beginning to be affected - it's hard to see contract prices going down much lower with any certainty of quality not being compromised. The larger utility companies now hold immense buying power and are controlling prices across the supply chain from turbine manufacturers down to contractors."

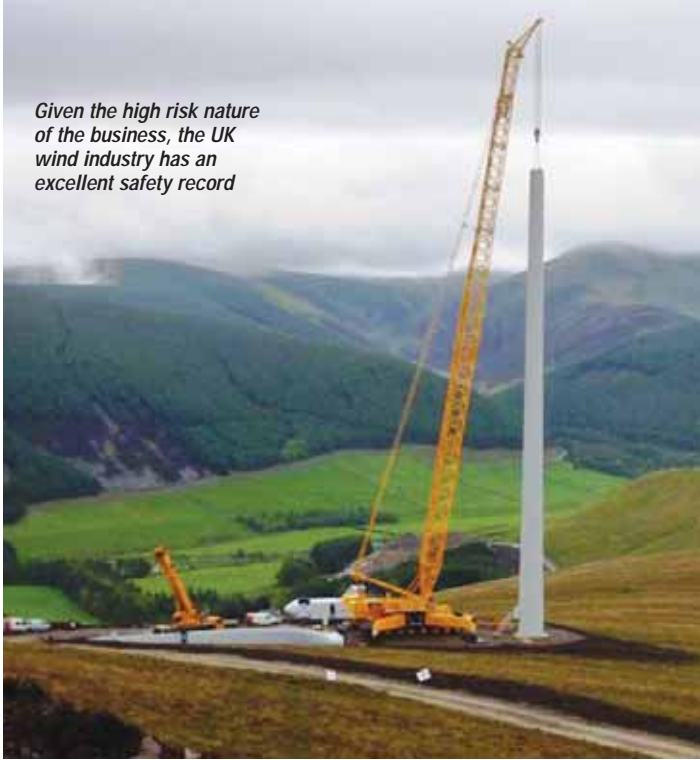


maintenance work on a RePower turbine



A Manitowoc 16000 fitted with the new wind attachment erecting 204 turbine towers at La Ventosa, Mexico

Given the high risk nature of the business, the UK wind industry has an excellent safety record



“UK and Irish sites the most challenging in the world”

“The sites in the UK and Ireland are the most challenging in the world with deep peat levels and floating roads,” says Corrigan. “You generally don’t find this elsewhere in Europe. These challenges have helped build up our experience and a core competency over the past 10 years. Given the high risk nature of the business, the UK wind industry has an excellent safety record. Lifting is not the problem, often it is something much simpler such as driving – jeeps, vans trucks and cranes – on the site roads with steep gradients up to 18 percent. Most turbine manufacturers prefer to set gradient limits at 15 percent but these are now being revised as more challenging sites are developed. Road failures such as cranes going off the roads, adverse cambers and poor road surfaces mean that

advanced planning is absolutely vital. Whilst we have robust legislation to cover lifting operations - LOLER/PUWER defining the roles and responsibilities of each party - there is very little documentation for controlling and monitoring road transit on site.

Windhoist has developed its own policy over the past 10 years.

“For example where floating roads experience high water table levels it is impossible to reverse an eight or nine axle crane carrier so, in most cases, we would insist that turning heads be provided or the hard standing area be sufficient to allow the crane to turn around. Many designers confuse road gradeability issues with crane performance.

A Terex-Demag AC120 has a gradability factor of 70 percent so if the crane fails to surmount an 18 percent gradient then it is not the fault of the crane. You have to limit



McNally's Liebherr LG1750

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the wheel slip even if this means laying a top layer of asphalt. It all comes down to the quality of the civil works provided on site. Turbine manufacturers send a list of site specific requirements - road width, road bearing capacity, hard stand dimensions and hard stand bearing capacity - to their client and the client gives those to the civil contractor."

Industry trends

"With the more efficient sites in the UK already being developed, hub heights look set to increase from 80 metres to 100 metres which has a big impact on the cranes. The Terex CC2800 or Liebherr LG1750 - popular cranes for the work - can cope with that hub height so the crane industry can already deal with that development."

"At the smaller end of scale there is very little happening in the 130-500 tonne cranes in the UK and Ireland. Civil engineering projects have just evaporated."

Over the last 18 months Windhoist says it has looked very closely at its crane utilisation with limited utilisation for 200-250 tonners beyond that of assist cranes for tandem lifts of blades up to 80 metres. Its crane of choice is the 250 tonne Liebherr but this may be sold due to poor utilisation. "If we see a number of projects coming up we will buy another one," says Corrigan. "We are always looking at

cranes but it really depends on the workload. We did look at the Grove GTK1100 but its main problem as we see it is that it has very little utilisation outside of wind sector. We specialise in wind but we have to look at other sectors. We have a construction and civil engineering client base so the cranes have fit with these sectors as well. The heavy cranes are accompanied on site usually with a 130 tonner and possibly a 90 or 55 tonner as well."

"I am confident that activity levels within the sector will increase but will take another 18 months or two years for the industry to fully recover. The wind industry has an excellent future in the medium term and a significant secondary market in maintenance and repowering. In next 10 years wind farms will be decommissioned and new farms erected in their place. The older 8-900 kW nacelles will be replaced with larger megawatt machines and this will further sustain the market." "Wind isn't the answer but part of a solution. Workloads may have



Grove GTK1100



A Kobelco SL6000 with HD wind turbine fly jib



A Terex CC6800-1



levelled off for the moment but there is still moderate activity levels. The depressed rates mean companies need to think very carefully about reinvestment. A few years ago when companies were looking to get into this market the main problem was building up expertise not attracting finance - the situation has now reversed.

New crane design?

"Most manufacturers are concentrating on improving lifting efficiency and making them more transport friendly. What drives us in the UK is having a safe system of working. Manufacturers are now realising it is up to them to provide a safe system of work. Our recent LG1750 purchase has a double wire system on the boom and a lot of catwalks so it shows manufacturers are listening."



German-based Hartinger with its LTR11200

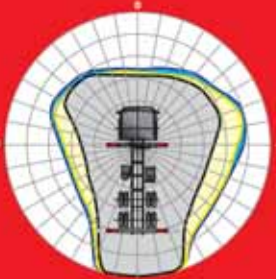
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