



EXTREME MACHINE

High-reach demolition has taken on a new meaning with this latest rig that is capable of working to a height of 90 metres. Steven Vale takes an exclusive look at the record-breaking rig in action at its first job site.

Record breaker

The record-breaking 90m demolition giant, loosely based on a Cat 5110B, is currently on its first job at a site in the Port of Rotterdam.

Who would have thought it a few years ago; a high-reach excavator that is capable of carrying a five-tonne attachment at 90 meters, or a 12t tool to 80m, and able to cut 1m-thick steel beams at 76m. Previewed in **EARTHMOVERS** in September 2007, the giant machine was due to be delivered to its owner Euro Demolition in February. However, a series of delays meant that this was extended until August. Although still not quite finished even now, the new rig is ready for action and currently tackling its first job – the demolition of a number of aluminium silos in the Port of Rotterdam.

It was hired in by Dutch demolition company Mueva to cut up 600 to 700 tonnes of aluminium. Getting access to the machine is also a tall order, as it is working in a vast refinery belonging to a well-known petroleum concern, in an area that is normally out of bounds to prying eyes. However, with all the necessary access and photography permits in place, we were able to gain access to the site for an exclusive look at this high-reach giant.

There really is nothing that can prepare you when you see it for the first time – it is huge. The demolition monster that is dubbed the TUHD (Telescopic Ultra High Demolition) 90-5 took a year to complete and is the result of 17,000 hours of work. Although the finished operating weight is estimated to be around 220 tonnes, the exact figure is not known as there are still a number of bits to add. What we do know is that the complete boom assembly alone weighs 69 tonnes, and the modified track units weigh 30 tonnes each.

To give you an idea of its size, no fewer than seven trailers were needed to transport the various components to its first job site. One is needed for each of the two tracks, one for the boom, one for the 50 tonnes of rear ballast, one for the upper-structure and a further two for the attachments and tools.

While much of the technology is unfamiliar, the base unit – a Caterpillar 5110B excavator – is no stranger to Euro Demolition. One of the three machines owned by the company, in its former life this one used to operate as a backhoe version. That is until it was decided to use it as a 150-tonne power source for the 90m rig.

The conversion was carried out by Rusch Special Products, a company that has plenty of experience in working with new high-quality steels in building and repairing telescopic crane booms. Operating from a factory to the north of Amsterdam, the company first hit the demolition headlines in 2006 when it developed a 62m telescopic rig for Dutch company Beelen Demolition.

Reworked

Although the 696hp V12 engine and hydraulic pumps of the Cat 5110B were retained, a number of major changes were needed. One of the first big jobs was to remove the upper carriage and tracks and then rotate the undercarriage by 45 degrees. This helped to extend the width of the machine to provide the necessary stability. Although the original slew ring and base plate were retained, new track beams had to be welded to the undercarriage. Fitted with 1m-wide track pads, the length of the original track frames were then extended by 2.5m to a total length of 9.5m.

There is no hydraulic side-shift mechanism. Instead, engineers designed a couple of mechanical adaptors. Not only do they increase the operating width of the machine by 1m at each side, but also allow the track units to be quickly fitted and removed. They also help to boost the weight of the lower structure, as the steel alone used to make them weighs 15 tonnes, and this is without the additional ballast.

The boom on most mobile cranes is located as close to the rear of the machine as possible and ideally this is the best place for high-reach demolition work. The use of a hydraulic excavator as the power source is a bit of a compromise and Rusch had to do a lot of work to move the original boom base almost 1.5m back from its original position.

The biggest job was to move the hydraulic valve block, which is now located further to the rear. Although the hydraulic pumps can be found in the same spot, the capacity of the hydraulic system was also boosted by adding an extra 1000-litre reservoir to increase the total volume of oil in the machine to 3300-litres.

Even the original Cat 5110B cab was not spared from modification. Not only has it been given the tilting treatment, and extra protection from falling debris, but it has also been lowered by 40cm. This ensures that the overall height of the structure is kept to 4.2m when secured to a low-bed trailer for road transport.

Top Right & Centre: Although the machine carries six CCTV cameras, operator Dirk Bos prefers to use the tilting cab and visually monitor the attachment.

Right: Each of the tracks needed to be lengthened by 2.5m to almost 9.5m and now weighs in at 30 tonnes a side.



The main feature of the demolition giant is, of course, its three-stage telescopic boom, which reportedly cost its new owner in excess of €1.5 million. Attached to the excavator with a 12-tonne boom foot, the main boom section has a length of 25m. Inside this are two telescopic sections, each of which has a length of 21m. However, the need for a 3m overlap means that each of the second and third telescopic sections extend to a maximum length of 18m. At the end is a 3m extension, to which is coupled a main dipper stick of 11m and an auxiliary stick of 9m. Given that the height of the boom foot is almost 4m above ground level then the maximum height of the fully extended rig is 90m.

Although it all sounds fairly straightforward, the development of the boom was no easy task. Most mobile cranes have a boom section length of 12m, and for good reason as steel plates are supplied in 12m lengths.

The boom section on the 5110B has a length of 18m. This meant that it could not be made from one piece. Different plates needed to be welded together. There are only a handful of companies in the world that can do this, one of which is Rusch.

It was the steel and the difficulty in getting hold of it that is blamed for holding up the project. In the end it arrived three months late and the specially-designed new main lift cylinders did not arrive until May. Made in Dubai, each one weighs 4.5 tonnes and, when fully extended, are almost 12m long.

“Just a slight movement of the joystick can result in a lot of movement at the top of the rig.”

One of the most difficult tasks concerns the telescoping function. The use of a single cylinder in each section would have been prohibitively expensive and have a delivery time of at least 18 months. Similarly, it could take up to one and a half years to replace a damaged one.

In the end, the company opted for a series of smaller identical hydraulic cylinders inside each of the telescoping sections. Connected together, these cylinders are covered with a two-piece reinforced telescoping casing. Each pushes out in turn, with the cylinder at the top pushing out first. Although the operator currently has to carry out a series of operations to get the boom to full height, the plan is to automate the functions into a single joystick operation. When finished, it will take less than three minutes for the boom to reach full height.

Although engineers dreamt up a new locking system for the boom sections, access to the internal workings is not good. Although the lower main section of the boom has a 1.8m-square internal spacing once the boom is fully retracted, this space is almost completely filled by the upper sections. This means that the boom needs to be extended to service the locking mechanisms. The company has learnt from this and says that future telescopic versions will feature greater access for routine maintenance.

The machine is operated by Dirk Bos, who in addition to operating the Cat 5110B as a backhoe version, has acquired plenty of experience with the company's 50m Hitachi ZX870. He confirms that operating at heights in excess of 75m takes a bit of getting used to. “Just a slight movement of the joystick can result in a lot of movement at the top of the rig,” he says. “I am very much on a learning curve.”



Above: Made in Dubai, each of the main lift cylinders weighs 4.5 tonnes. When fully extended they have a length of 12m.

Below: The giant demo rig still needs some work done on it, including a new paint job, before it goes out on its second job.



He is also on a learning curve with the newly-developed electro-hydraulic system. Developed jointly by Rusch and Euro Demolition, and replacing the former Cat system, the new version allows for precise control of the boom and tool movements.

The new design also limits the number of hydraulic pipes required on the main boom. The Rusch design uses just four pipes inside the length of the boom (two for pressure and two for return). The upper boom and tool movements are activated via a hydraulic actuator control system located at the top of the main boom.

The machine is fitted with six cameras, of which two are at the rear of the machine. Then there are two inside the telescopic boom for boom extension positions and to highlight potential leaks. The two at the top of the rig provide visibility of the tool, although the operator says there is no problem using the tilting cab to visually monitor the 3.5-tonne tool when working at the top of the silos.

The operator is astonished by the huge working range of the machine. Even with the two telescopic boom sections retracted, he can use the rig at an angle of 66 degrees. This angle increases to 81 degrees at full height.

It is not only the operator that is on a learning curve because the complete machine is new. Although the basic machine is well known, there is no blueprint for the computer system and programming of the software was still being carried out at the time of my visit. So too was work to try and locate a niggling hydraulic cylinder fault, which has dogged the machine for a number of weeks.

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Although it is still early days, it appears that the critics have been proved wrong because Rusch has succeeded in making a machine that can work at a height of 90m. Looking to the future, there is no shortage of work for the new machine, and Dirk Bos reckons that it will be kept fully employed. “Higher-reach rigs mean that one man and one machine can take down a building. This is more cost-effective. Also, there is the safety aspect as it is no longer necessary to manually take down the top floors of a high-storey building.”

Once this first job has been completed, the machine will be shipped back to Rusch for final checks. Part of the process will include adding four hydraulic legs underneath the main frame. Currently, although the machine can be driven over a low-bed trailer, the drive unit has to be removed. With the boom and rear weights removed, the addition of the hydraulic legs will allow the machine to be raised, after which a low-bed trailer can then be reversed underneath it. With the track units removed, the base unit can then be lowered on to the trailer.

Aside from a new paint job, before the machine goes out to its second job – the demolition of a number of 90m buildings in Belgium – it will be fitted with access steps and a safety rail around the top of the upper-structure. Additional engine sound damping on top of the upper-structure will also be added to reduce external noise emissions to a very acceptable 80dBA. “This will make it suitable for working in residential areas,” adds Dirk Bos.

With three major European jobs already lined up for the demolition giant, work is already at

an advanced stage with another new high-reach demolition rig for Euro Demolition. This time it concerns the same base unit – an 860hp Cat 5110B – but with a shorter 33m triple boom with a 12-tonne shear. This machine should be ready for action by the end of this year.

However, increasing demand for even higher-reaching rigs means that another monster is already on the drawing board – this time a rig with a 34m reach fitted with a massive 28-tonne Genesis GXP 2500 scrap steel shear. As far as we are aware this is the first time that a 180-tonne Cat 5130 will be used as the power source.

Future

Finally, high-reach demolition could very well take on an even more extreme format in the future as Euro Demolition is considering a machine that, when finished, will have an operating weight of 600 tonnes. Capable of carrying a 27-tonne shear to a height of 53m, each of the two tracks will have a length of 12m. Although the power source still has to be decided, the company confirms that it is currently looking at something like a Komatsu PC3000 or Hitachi EX3600. This really will rate as the daddy of the demolition giants!

However, there is another possible route as the current 5110B has been changed to such an extent that there is not much left of the original version. As a result, Rusch is currently toying with the idea of making complete machines in-house, using OEM-sourced main components,

such as engines and transmissions. Although further Cat 5110/5130s are available for the machines currently on order, the company is currently developing its own build concept and designs so that by 2010 it could very well be in a position to stop using second-hand machines and concentrate on its own brand new design.

Rusch has never made a secret of the fact that hydraulic excavators are not the best base units for high-reach demolition machines. The company is better known for its work in the crane sector, and it is quite likely that the result could be a bit of a cross between a hydraulic excavator and a mobile crane.



Below: The 90m rig is currently fitted with a 3.5-tonne Dehaco steel shear. Here it munches through the aluminium, which varies in thickness from 1cm to 4cm.

Above & Below: Quick-release track frame couplers on the side of the undercarriage boost the operating width of the machine out to 7m.

Right: Though currently fitted with a 3.5t tool, the rig is capable of carrying a five-tonne tool at full height and a 12t attachment to 80m.

