Summary

Between the year 2000 and 2010 more than 1119 tower crane accidents are reported that caused over 780 deaths and countless injuries. By studying the most common accident causes (e.g. unsuitable underground, poor installation or installation of damaged components, weld failures etc.) it is seen that many of these accidents could have been prevented by improving the inspection process before tower cranes are put into operation after reinstallation.

In this report an up-to-date checklist with all important inspection points is be composed that is advised to be used before tower cranes are put into operation after reinstallation. The timeframe in which this checklist has to be completed is 2-3 hours. Formulating this checklist is done by making a Fault Tree Analysis (FTA) and studying the European Standard and Directives the tower crane has to comply with [EN 14439 (Safety Tower Cranes), Directives 2006/42/EC (Machine), 2000/14/EC (Sound Emission) and 2004/108/EC (Electromagnetic Compatibility)]. The safety requirements and/or protective measures mentioned in these documents that are relevant for the inspection process of tower cranes are combined and sorted so that a practical checklist is formed.
The checklist can be used for all types of tower cranes, except mobile tower cranes. For components purchased from other manufactures it should be kept in mind that possibly other inspection points are defined by the company than those specified in this checklist.

The inspection process of tower cranes starts by assessing the handbook to verify if all required documents are included. After that, the present environmental conditions (e.g. wind loads, electromagnetic radiation and sound pressure level) on the job site have to be checked to see if they match the design specifications. Installation of components falling under the electromagnetic compatibility directive has to meet strict regulations to prevent electromagnetic disturbances.

Stability and support of the tower cane has to be guaranteed by checking if underground of the crane has sufficient bearing capacity and does not contain irregularities. Also applying the correct amount of central and counter ballast and their securing is essential for crane stability. The condition of the foundation and the anchoring of the foundation to the tower are as critical well. For the metal structure of the tower crane a check has to be performed to judge if the correct tower and jib sections are installed and if they are in good condition. Also proper installation and the condition of fasteners (e.g. pins, bolts, safety pins, etc.) have to be checked.

Well-functioning rail travelling of the tower crane and trolley have to be guaranteed by checking if the rail is clean, free from obstructions, in good condition, properly secured, leveled and aligned correctly. The wheels of the trolley have to be in good condition and run smoothly. All drives, brakes, gears and bearings installed on the tower crane need to be properly lubricated, functioning and in good condition. This is essential for controlled movement of components and a safe working environment. The slewing system's ring and teeth have to be in good condition and properly aligned.

The trolley traveling and hoisting system consists of ropes, rope anchorages, sheaves, (safe) guards, drums, etc. These components have to be functioning and aligned correctly to ensure smooth load lifting and trolley traveling. To ensure the load is properly secured, the hook and the safety latch (if required) have to be properly secured and in good condition.

Movements (e.g. hoisting, lowering, traveling, luffing, trolleying, etc.) of the tower crane have to be stopped by limiters (e.g. buffers, electrical switches, etc.). Buffers at the end of the trolley and crane rails shall not be dried out or damaged and the electrical switches have to be functioning to ensure movements are stopped in time. Capacity limiters have to guarantee that load (moment) limits are not exceeded. To ensure that the crane does not collide with equipment or constructions on the job site, an anti-collision device may be required to restrict the crane movements. Also restricting the working space of the tower crane could be required to avoid entering forbidden areas. To limit the loads acting on the tower crane it should be possible to enable the free slewing position. Lights or acoustic devices have to be functioning so that personnel working with the crane, or people in the vicinity of the crane, can be alerted for hazardous situations or informing them that the crane is in a certain mode.

Protective measures for mechanical, electrical and thermal hazards have to be present and in a good condition to guarantee protection and safety distances. Warning notices have to be visible and readable when these protective measures cannot be taken. Because most of the crane's components are placed at large height, fall of these components shall be prevented by hinges or other means. Safety measures on the crane and climbing system (ladders, footholds, life lines, anti-slip measures, etc.) have to be present and in good condition.

Of the electrical installation the earthing system shall be properly connected, the fuse box has to function and notices warning for residual voltage/discharge time have to be present if required. At the control stations all controls have to function properly and emergency stops have to be provided where required. Also the climatic conditions in the cabin and the view of the operator have to be guaranteed.

Specific tower crane types use a climbing system to increase or decrease the tower height by inserting or removing tower sections. The climbing system is placed on the in- or outside of the tower and is guided by wheels traveling on the tower's corners. The alignment and smooth running of the wheels has to be checked because this is essential for the load transfer and stability. Measures preventing the jib from slewing or luffing during climbing shall be functioning. Also functioning of the hydraulic system and for presence of leakages, or sharp bends of hoses has to be checked. To prevent the climbing system from lowering after power is lost, check valves have to be present and functioning.

Once all points of this checklist meet the demands, the tower crane can be put into operation. Completing this checklist successfully will decrease the risks related to reinstallation of the tower crane and also it is likely that poor maintenance will be unveiled. Also a safe and proper functioning of the system will be ensured and possible mistakes made during reinstallation will be revealed.