

### **About Liebherr Container Cranes**

Liebherr Container Cranes Ltd. Is one of the world's leading manufacturers of ship to shore container cranes, rail mounted gantry cranes and rubber tyre gantry cranes. From its base in Killarney, Liebherr Container Cranes designs, builds and exports container cranes worldwide. Liebherr is the principal Western manufacturer of very large Ship to Shore cranes which at up to 80m in height and well over 100m in length, have been described as the largest objects ever engineered in Ireland. Founded in 1958 as the first Liebherr factory outside of Germany, today, container cranes manufactured by Liebherr in Ireland are renowned for their quality, longevity, and productivity.

### **About the Liebherr Group**

The Liebherr Group is a family-run technology company with a highly diversified product portfolio. The company is one of the largest construction equipment manufacturers in the world. It also provides high-quality and user-oriented products and services in a wide range of other areas. The Liebherr Group includes over 140 companies across all continents. In 2022, it employed over 51,000 staff and achieved combined revenues of over 12.6 billion euros. Liebherr was founded in Kirchdorf an der Iller in Southern Germany in 1949. Since then, the employees have been pursuing the goal of achieving continuous technological innovation and bringing industry-leading solutions to its customers.

### **Liebherr Container Cranes Control and Automation Systems**

Liebherr Container Cranes (LCC) is a project-based business where each crane is designed and manufactured to meet client-specific requirements. In addition to varying load capacity and size, individual cranes vary significantly in terms of the level of automation implemented. Manually operated cranes may be equipped with assistance systems which help the driver control and maintain the load trajectory. Part or fully-automated cranes rely on a range of automation systems to execute crane movements, with the possibility to request assistance from remotely-located drivers for safety critical tasks and exception handling.

Control and automation systems are developed in-house or sourced from third party suppliers for integration by Liebherr engineers and include:

1. programmable logic controllers (PLC),
2. range-finding & profiling technologies for specific applications employing Lidar and related control software,
3. dynamic path-planning and control algorithms, motion tracking systems,
4. digital cameras,
5. remote operating desks and
6. crane and terminal networks and industrial data centres to facilitate low-latency, secure and fault-tolerant communications.

Irrespective of the level of automation, there are numerous other systems including:

7. Crane Management / SCADA System (CMS),
8. conditioning monitoring systems,
9. power electronics,
10. touch screens, driver control consoles, etc.

### **Service Level Agreements for Critical Infrastructure**

Container cranes are considered critical infrastructure and there is a clear market requirement for Service Level Agreements (SLA) in which LCC would be responsible for ensuring that the overall equipment effectiveness is sustained and improved. This would entail both active monitoring and intervention and upgrades and maintenance. For example:

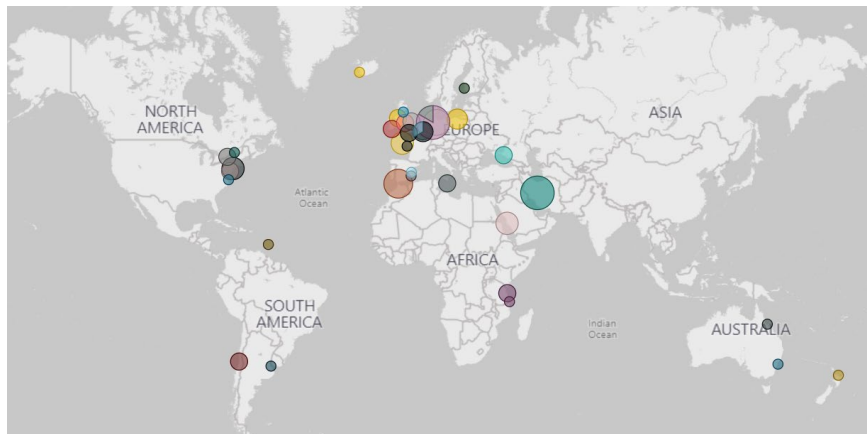
- A. Complex digital systems such as 5 & 6 would be monitored for unknown traffic and devices.
- B. Upgrades / fixes would be managed and deployed for many if not all the digital systems 1 – 10 above.

- C. Potentially, monitoring of electrical and mechanical systems condition and performance data with planned interventions/maintenance.
- D. Potentially, delivering metrics in relation to productivity and sustained collaborative effort, such as containers per hour and cost per move.

While the provision of SLA's is required to support the increasingly sophisticated operational requirements of Clients, the challenge relates to the nature of LCC's market and technology base.

Specialised technologies and roles: LCC maintain the expertise for technologies 1 – 10 (above), primarily in Killarney with support from Liebherr divisions in Europe. These employees are required full-time on platform developments and customisations for Client projects. Any additional responsibilities relating to SLA's needs careful consideration.

Scale and global nature of the business: LCC complete each year approximately 20 – 30 'commercial projects', each including typically 1 – 4 cranes. These cranes are shipped worldwide as illustrated in the figure below. Many cranes are located in the major northern European and middle-eastern hubs and terminals operated by Global companies, but many regional / independent terminal operators may have equally sophisticated operations. While active monitoring may be done remotely, at least some interventions / maintenance will require co-located personnel.



**The challenge overall therefore is how to best formulate Service Level Agreements for a relatively small number of highly complex systems and how to manage and resource these in a way that delivers and is commercially viable for LCC and our Clients.**