Summary

This literature research assignment will give insight on bulk unloading equipment, the focus has been on equipment above 500 tons/hour. For this equipment it was the goal to gather as much details as possible, this in order to form a basis for a computer program on terminal design. The reason for the details is that the program then can provide options based on real world data.
The structure of the report consists of a chapter for each crane type and three chapters on overall points such as what cranes are currently in operation, what are the strengths and weaknesses of the types and finally some conclusions.
There are roughly two sorts of cranes, continuous unloaders and discontinuous unloaders. Each of these sorts have several sub-types, discontinuous have slewing grab cranes, tower type gantry grab cranes and bridge type gantry grab cranes. Continuous unloaders come in a wide variety but the research focuses on the pneumatic unloaders, screw type unloaders and bucket elevator unloaders.
The gantry grab crane is a common type of bulk unloader and exists since the early days of bulk unloading, currently mostly used for higher throughput capacities and available in two types: tower type and bridge type. The difference between these two types is the rail span, giving the bridge type with the larger rail span the ability to keep unloading in case of hopper failure. Analyses of the details gathered show that an increase in throughput capacity is paired with an increase in outreach, lifting capacity and a slight increase in speed.
The slewing grab crane is unique in its way that it's currently the only unloader being able to unload offshore. With a standard crane there are three mounting choices: rail gantry, rubber tires or on a pontoon. These slewing cranes generally have a lower throughput capacity then the gantry cranes and are therefore used for transshipment or in smaller terminals. But just like the gantry grab cranes an increase in throughput capacity is realized by increasing the lifting capacity and is also paired with an increased outreach as well as an increase in installed power.
The continuous unloading cranes are relatively new on the market, and the type used in a terminal is highly dependent on the goods being unloaded. Bulk such as grain has a low specific weight and can therefore be unloaded with pneumatic unloaders. Coal and iron ore however have a much higher specific weight and have a tendency to form one solid mass inside the ship, meaning pneumatic unloaders will not work. Therefore unloaders with the ability to dig into the material are used, such as screw conveyors or bucket elevators. The disadvantage of these machines is that they require high maintenance due to the number of moving parts, and the danger of eating into the ship's hull. A big advantage is that the keep up their high throughput capacities even when cleaning the hold, and the very low levels of dust pollution because of the completely enclosed process.
Since there is a high level of competition on the crane market manufacturers are not very willing to share detailed information, however after an interview with J. van der Leer at EMO it became clear that most cranes are tailored to the specific demands of the terminals. On the outside cranes may seem alike but in fact it's the details that make them different, and these details are requested by the terminals/customers.
If the computer program is made on the basis of the current data, and the program shows and advantage to terminal operators then the crane manufacturers might be convinced to provide some

crane data. This data can either be historic data or based on what they can offer at the moment. It seems unlikely manufacturers will be contributing without some sort of benefit for them.