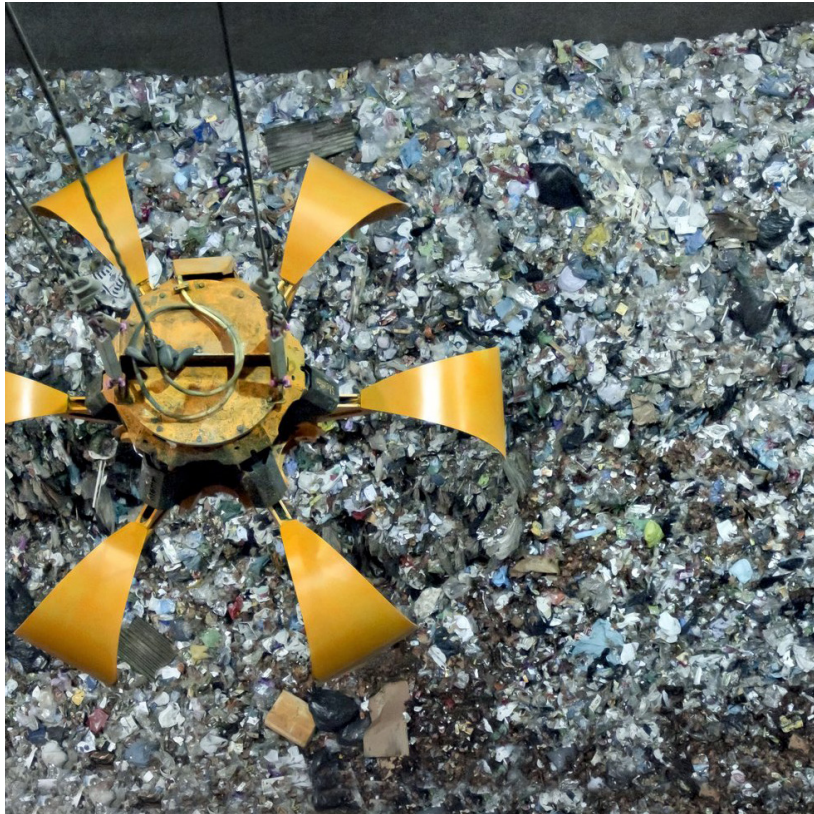


**FIVE QUESTIONS TO ASK
WHEN SELECTING CRANES FOR
WASTE-TO-ENERGY FACILITIES**

6.23.2015



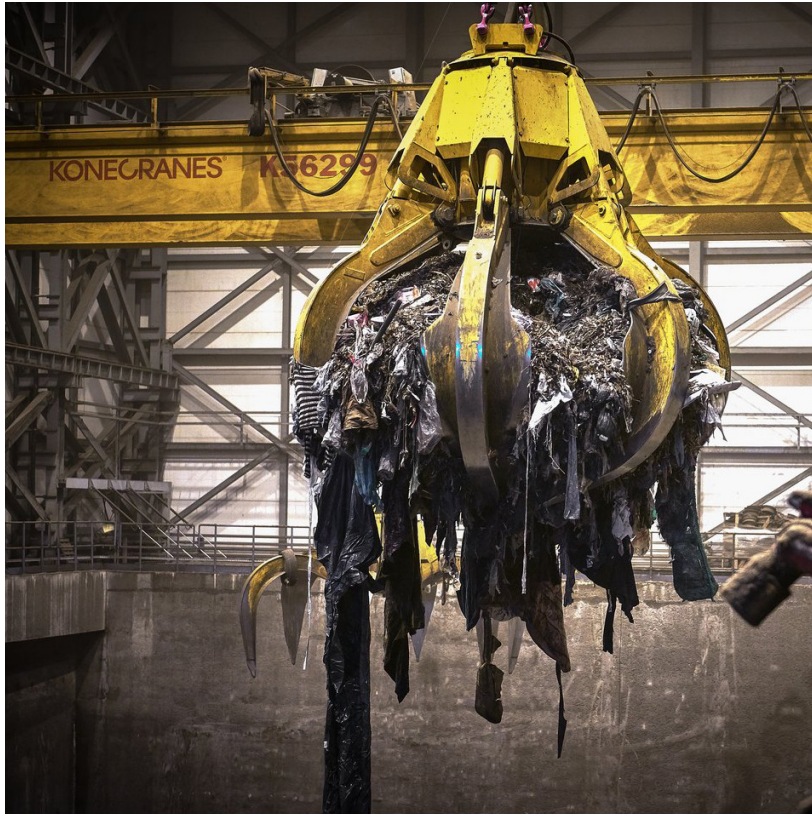
CHOOSING THE RIGHT CRANE FOR YOUR FACILITY

Overhead cranes play a crucial role in the incineration process of a modern Waste-to-Energy (WtE) facility. Cranes must meet continuous demands of safety, uptime, reliability and performance required for waste processing, from the arrival of waste to the stacking, mixing and feeding of the hoppers.

Waste-to-energy facilities offer one of the harshest and most punishing environments for overhead cranes: intense productivity thresholds, continuous operation, filth and high temperatures. If the cranes are not up to the challenge, the entire process is at risk, and the lights may go out.

This white paper draws on experience gleaned from thousands of industrial process applications over several decades and discusses five key decision criteria vital to achieving optimum safety and reliability levels with overhead cranes:

1. What is the total feeding requirement of my hoppers?
2. What is the layout of my handling area?
3. What is the application of my crane?
4. Are my cranes specifically designed for WtE processes?
5. Do I have an effective preventive maintenance program and parts supply?



1. WHAT IS THE TOTAL FEEDING REQUIREMENT OF MY HOPPERS?

The primary function of WtE cranes is to move loads of waste to the hoppers that lead to the incinerators. Many WtE companies strive for 95 to 99 percent boiler uptime. This means the cranes must be able to move sufficient tonnage per hour to feed the incinerators at a certain burn rate. It is important to verify cycle times and determine how much tonnage of material will be processed per hour and for how many hours per day.

The overall cycle times are based on crane capacity, speed and grapple size, as well as the density of the material being moved. Designed cycle times should be based on peak crane usage (i.e. peak receiving hours for waste collection trucks). In a two-crane system, either crane on its own should be capable of handling receiving and feeding throughputs.

For a WtE plant operation, it is vitally important that initial crane dimensioning is done correctly and that cycle times are carefully determined. If the cranes are under dimensioned, they will effectively prevent the incinerators from running at full capacity, either due to lack of feeding capacity or inadequate mixing of the waste, resulting in low burning efficiency. Improperly dimensioned cranes may be forced to run at or beyond the limits of their design, hampering their performance, driving up maintenance and production costs and shortening the lifespan of the initial investment.

A failure in the original cycle-time calculation may ultimately result in premature and costly performance upgrades of the cranes. It is best that these things are done correctly from the start.

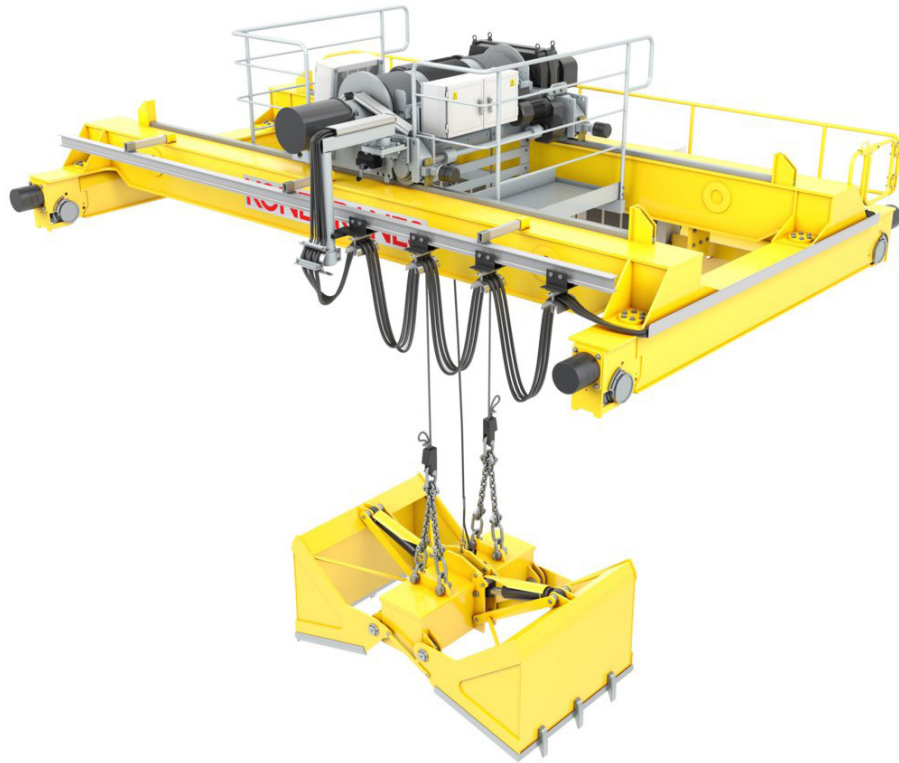


2. WHAT IS THE LAYOUT OF MY HANDLING AREA?

Another important factor influencing the type of cranes and the performance of those cranes is the layout of the handling area of your WtE facility. The spaces in which WtE cranes operate are typically tight horizontally with long vertical lifts. The bucket must be able to move in three dimensions through this tight space while avoiding conflict with incoming waste being dumped into the pit.

Layout planning of the waste handling area influences the safety and productivity of the whole plant. It is important that the receiving area is designed so that there is enough space for trucks and received waste during peak hours, without the cranes having to operate in the space above the trucks and personnel while delivering and dumping their loads. Also, the mixing area should be designed so that efficient automatic mixing is possible for one or both cranes. The location of your hoppers and traveling distances of your cranes play a vital role in cycle-time calculations.

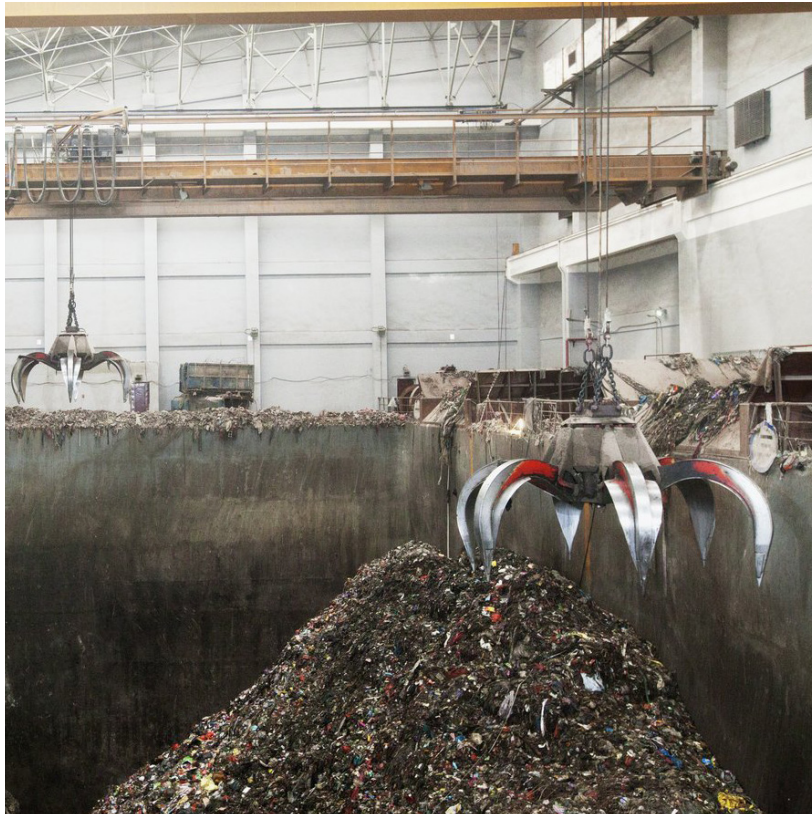
Konecranes is willing to work closely with facility designers to maximize safety in the layout design and the safety and efficiency of waste handling in the plant.



3. WHAT IS THE APPLICATION OF MY CRANE?

There are numerous tasks performed in a WtE facility. Each application requires a specific type of crane designed to the level of performance needed.

- **Biomass-handling** cranes are often used instead of front-end loaders or conveyors to move biomass to hoppers. The use of these cranes can reduce energy costs, maximize available floor space and eliminate diesel fumes inside the facility.
- **Slag-handling** cranes are used to distribute slag under the conveyor line to other areas in the slag bunker, and are specifically designed to withstand the dusty, humid environment.
- **Sludge-handling** cranes are designed to transfer semi-fluid sludge from storage bunkers into storage areas, and then feed it to the process line. The sludge material is very sticky, which is taken into consideration in the dimensioning of crane structures and machineries. One continuously-operated, fully-automated crane is typically used in this application.
- **Waste-handling** cranes play a crucial role in modern incineration plants. They are tasked with mixing the waste and keeping it moving toward the incinerator. If a waste-handling crane stops, the entire continuous material handling system and process is at risk. There are often two waste-handling cranes above the pit, one of which is a backup.



4. ARE MY CRANES SPECIFICALLY DESIGNED FOR WTE PROCESSES?

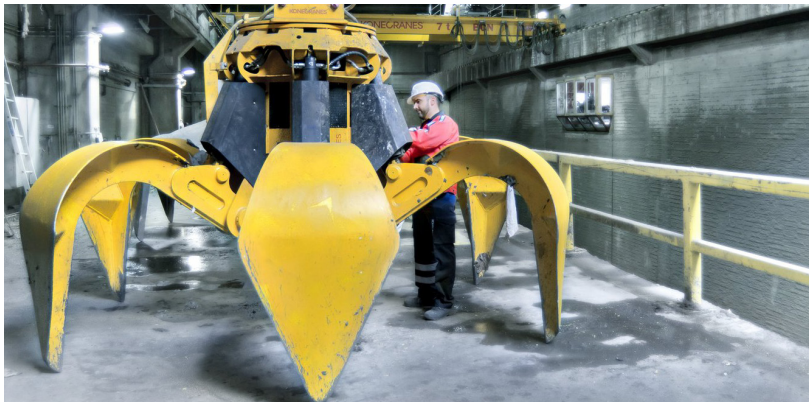
This is perhaps the most important question to ask. Does my crane supplier have a history of proven performance in this industry and with these engineered process applications? It's tough to argue against a track record and proven technologies.

For instance, **integrated sway control systems** allow for faster, more precise movement of the grab, while helping avoid costly equipment damage. Sway is caused during acceleration and deceleration of the load and can happen even with experienced operators at the controls. Once sway begins, operators must wait for it to diminish or they risk having the swinging grapple collide with the pulpit and pit walls. A sway control system allows the load to move at speed while dramatically minimizing sway, helping with load control and positioning, enabling reduced cycle times, and resulting in better efficiency.

For waste processing cranes, a common design leaves the vertical **power cable** hanging freely from the crane. This can lead to the power cable becoming snagged, caught or torn, resulting in downtime and increased maintenance costs. Options are available that significantly reduce this point of failure. For instance, a design patented by Konecranes has the vertical power cable for the grab wound onto the middle of the rope drum and driven by the same hoisting machinery that lifts the bucket. This innovative design is intended to synchronize movement of the grab, or bucket, with the power cable, and to avoid the cable tension that is always present on more common and traditional designs.

A third feature important for your WtE crane is a **proven automation system**, ideally with a mechanism to select full- or semi-automation. Automation in waste handling cranes helps with load positioning and collision avoidance. It also reduces operator fatigue and can contribute to decreased risk of crane failure. Automation features often come with monitoring systems that allow the process to be controlled either from the operator's pulpit or from a central control room remote from the waste pit.

There are a variety of automation modes available to best suit the needs of your operation, such as semi-automation, feeding automation, mixing automation and unmanned full automation. The benefits and objectives of automation are clear: improved safety for equipment and personnel, increased throughput and a more reliable and predictable process.



5. DO I HAVE AN EFFECTIVE PREVENTIVE MAINTENANCE PROGRAM AND PARTS SUPPLY?

One of the biggest challenges WtE facilities face on a regular basis is equipment maintenance and the potential issues that can arise when a piece of vital equipment goes down. An effective preventive maintenance and parts program can significantly address potential maintenance and safety issues before they become critical and threaten employee safety, productivity and revenue. It also can have a positive impact on the performance and reliability of the cranes.

The size and scope of a preventive maintenance program can vary. Effective programs can contain the following:

- Trained and, where applicable, certified inspectors and technicians who understand the equipment
- Preventive maintenance inspections that follow manufacturers' recommendations
- Reliable parts supply and inventory management
- Periodic compliance inspections based on applicable regulations
- Routine maintenance at regularly scheduled intervals
- Risk assessments that document component conditions, assess risks and provide recommendations for improvements
- Remote monitoring that can provide real-time visibility and analytics
- Thorough annual review of all maintenance activities, along with action plans and recommendations designed to optimize maintenance spending
- Online records that enable visibility of maintenance records, service history and safety information
- Expert consultation to identify and communicate improvement opportunities

For more information on crane preventive maintenance, visit [konecranes.com/service](https://www.konecranes.com/service).



THE RIGHT CRANES AND THE RIGHT SERVICE

The WtE industry presents a very harsh environment that can take a toll on the performance, safety and reliability of your crane. Given that most of these facilities and their incinerators operate in a nearly continuous cycle, downtime and low performance levels are not an option. Having the right crane, supported by a capable maintenance provider, can mean the difference between managing unplanned, costly downtime and having an efficient, safe operation in which time and energy can be applied to improving performance levels and return on investment.



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