DEMAG

Cranes & Components

High material handling rates in automatic operation 24/7 without a crane operator

Process Cranes in refuse incineration facilities

Amagerforbraending, Denmark

Requirements in automated refuse incineration facilities

Amagerforbraending
The Danish Amagerforbraending company processes refuse to generate electricity and supply district heating. Some 500,000 people live in its catchment area in the south of the capital Copenhagen. Besides recycling stations, Amagerforbraending operates a refuse incineration facility. The crane systems used in the facility, which was built in 1970, were fully automated in 2007.

- Some 430,000 t of refuse are incinerated every year
- Output: more than 1 million MWh of energy and district heating output to supply 140,000 households every year
- Four furnace lines each incinerate 17 t of refuse per hour

Constantly increasing amounts of refuse place higher demands on the Process Cranes employed in the facility

Maximum efficiency for high handling rates
Maximum efficiency was required in the material handling operation to process the constantly increasing amount of refuse and to ensure that the incineration lines are fed continuously. After the crane installations were fully automated, the former crane personnel was to be to utilised at qualified positions in the company.

Increased handling rates
- Both crane installations operate in independent working areas
- High handling rates are required in order to clear the tipping areas and to provide adequate blending of the material
- The crane installations have to achieve high operating speeds in all three motion axes without any sway of the grab

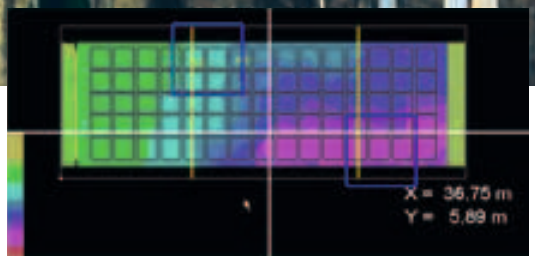
24/7 automatic operation
- Fully automatic control of the crane installations around-the-clock – without a crane operator

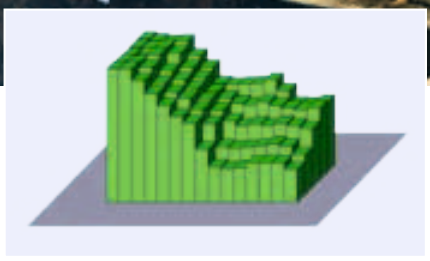
Maximum availability
- All furnace lines can be served by only one crane in an emergency
- Extended maintenance intervals
- Minimised damage to the grabs that may occur in manual operation

24/7 automatic operation makes it possible to employ the crane personnel at qualified positions in the company

Continuous feed to the furnaces
- Maximum blending of the refuse before it is fed to the furnaces to ensure that a constant incineration rate is achieved for the furnace lines
- Furnaces are fed with refuse for incineration to schedule

Fully automatic Demag Process Cranes



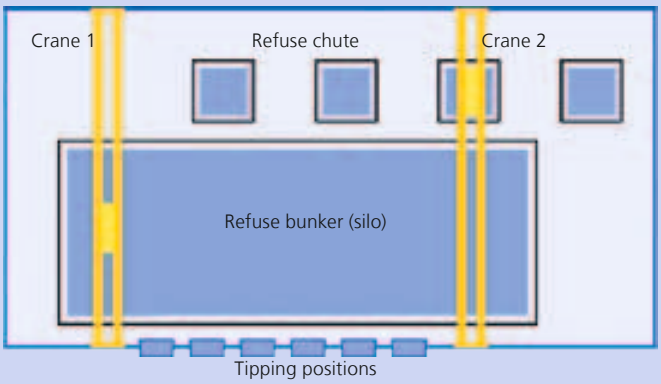


The visualisation system shows the exact fill level in the bunker

The crane installations were initially equipped for automatic operation, which was only used at certain periods of time, however. In a further step, the Process Cranes were converted to fully automatic operation without any crane operators: 24 hours per day, 7 days per week.

- Double-girder crane design
- Powered multiple shell hydraulic grab of low-maintenance design
- Load capacity: 16 t
- Span: 29.5 metres
- Frequency inverter-controlled long and cross-travel motions
- Load-dependent hoist speeds
- Active load sway damping system
- Spiral winding cable drum to supply power to the grab

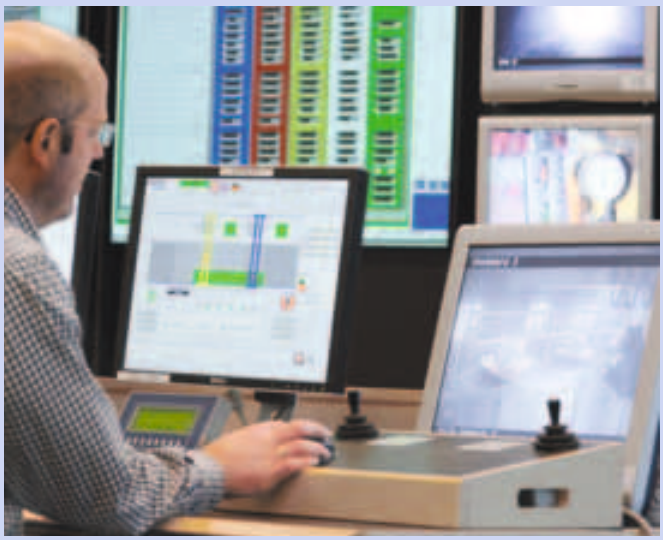
A computer with a visualisation system was additionally installed as an operator interface. This system ensures that the personnel are continuously provided with information on the current position and status of the cranes. The owner can program operation of the installation himself by means of configurable storage and filling strategies and, in this way, optimise management of the bunkers. Capacity was increased by 30% after these modifications had been carried out.



High handling rates
Thanks to the dynamic automatic control system, the cranes do not operate in fixed working zones. This means that their travel paths overlap – the crane installations can operate autonomously in automatic mode and do not block each other. This arrangement enables both cranes to reach any point in the bunker and to serve the four chutes.

Reliable non-stop operation: 24/7 automatic mode without a crane operator
To implement the non-stop automatic control systems, both crane installations were fitted with a scanner height measurement system, which continuously detects the height contours of the heaps of refuse as the cranes pass over them. The grabs no longer have to be raised to the highest possible position in order for the cranes to travel over them. The grab position is adapted according to the profile of the material – even while the crane is travelling.

Since the bunker fill level is known, the hoist unit can precisely approach any height position at maximum possible speed – far more precisely that the crane operator could control the crane from the cab.



Operation to protect the installation: grab failure is avoided
Both Demag crane installations are rated for high handling rates and are fitted with an active load sway damping system. When the sway angle has been measured, control commands are sent to the frequency inverters that are responsible for the long and cross-travel motions to compensate for any possible load sway. The load reaches its destination without any sway. Any possible damage to the grabs – for example caused by collisions with the bunker walls – is therefore avoided.

Feeding operation and strategies

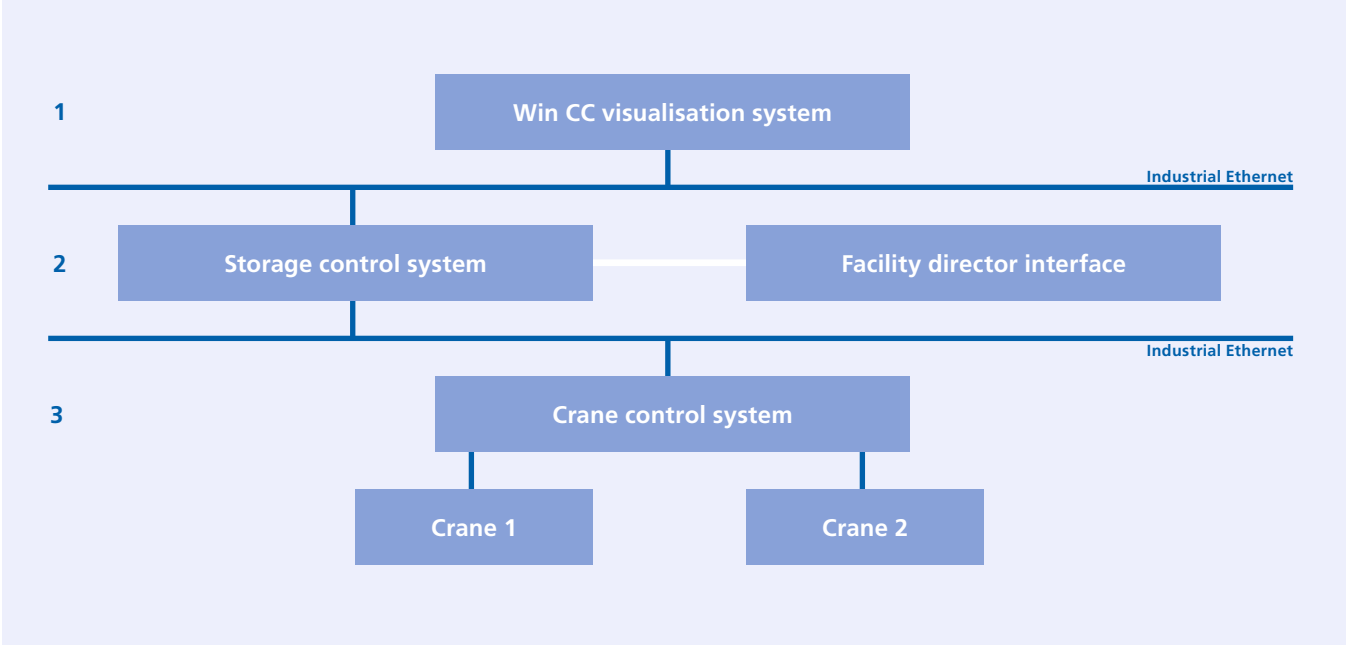
Continuous feed to the furnaces
Delivery of the refuse is controlled by a traffic light and gate system. During the truck unloading operation, this arrangement ensures that the area next to the corresponding gate remains blocked for the cranes so that the grabs are not buried beneath falling refuse. The refuse is delivered by some 450 vehicles every day.

Blending program
The installation features blending programs and storage strategies to achieve uniform incineration and, as a result, the most constant calorific value possible. For example, the cranes create conical heaps of bulk material when the tipping positions have been cleared, which ensures optimum blending of the refuse.

Start-up strategy
After maintenance work has been carried out, the crane control system supports start-up of the incineration line with a strategy that gradually increases the amount of material which is handled.

Serving the bunker chutes
The feed process is controlled by a program and adapted to the various bunker chutes. Since the individual lines are fed independently, bridges of refuse are not created and blockages do not form in the bunker chutes, which optimises the material flow.

Technical data



Control hierarchy diagram

Technical data

Demag crane

- Double-girder open-winch cranes
- Type ZKKW (16 t x 29.5 m)
- MPW open winch crab

Hoist speed:	0 – 80 m/min. (with load) 0 – 95 m/min. (w/o load)
Cross-travel speed:	0 – 90 m/min.
Long-travel speed:	0 – 90 m/min.
Lifting height:	34 m

Handling rates

4 furnaces fed by 2 cranes (without any blending operations):	68 t / hour
Clearing, blending and storage by 2 cranes:	240 t / hour
Combined handling rate of 2 cranes:	308 t / hour

Grab

Type:	Powered multiple shell grab
Capacity:	8 m³
Dimensions:	5.00 m open 3.12 m closed
Opening time:	8 seconds
Closing time:	15 seconds

Demag solutions meet customer needs worldwide

Demag Process Cranes in the refuse incineration facility in Chengdu, China

Demag Process Cranes in the refuse incineration facility in Twence, Netherlands

Demag Process Cranes in the refuse incineration facility in Uddevalla, Sweden

Demag Cranes & Components GmbH
P.O. Box 67 · 58286 Wetter/Germany
Telephone +49(0)2335 92-0
Telefax +49(0)2335 92-7676
E-mail info@demagcranes.com
www.demagcranes.com

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