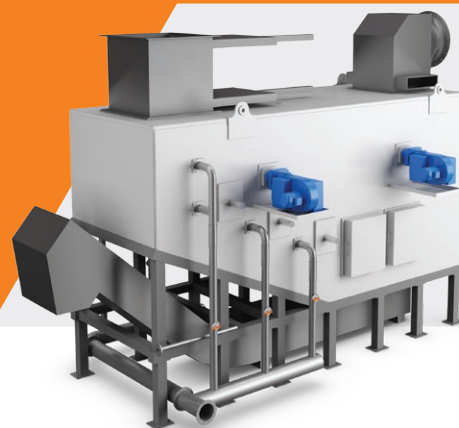


# Complete waste management

## PRODUCT LEAFLET



Waste management is a critical issue for modern cruise vessels, both in terms of cost of disposal and on board management. The Wärtsilä range of products is designed to minimise processing costs and make best use of the limited space available on board. While Wärtsilä are focused on providing cost and space effective solutions to meet current needs, we are continuously looking ahead to the future of waste management, and the future technologies to overcome the challenges that lie ahead.

Vessels can be fitted with Wärtsilä's dry waste disposal system for food waste collection and treatment, bio-sludge dewatering, food waste and bio-sludge drying, recycling equipment, incineration and waste to energy products. Procuring the complete wet & dry solution from a single source streamlines the coordination and integration, making for an easier and efficient project delivery with a single reliable source of after sales.

The cruise market is changing and shipyards now require complete waste treatment packages. In addition to vacuum toilets, collection systems and the advanced waste water treatment plant, Wärtsilä now also offers:

- Food waste collection & treatment
- Solid waste handling
- Drying and incineration



**ENVIRONMENTAL COMPLIANCE**

## FOOD WASTE COLLECTION & TREATMENT

An extensive quantity of food waste is produced on board cruise vessels which needs to be collected, processed, and treated. Wärtsilä Water Systems has designed highly efficient systems to cope with all needs of managing this waste on board.

Feeding hoppers with integrated macerators are designed to be integrated into table tops which are connected to the main vacuum pipes, where food waste will be fed directly into the food waste holding tanks.

### ADVANTAGES OF FOOD WASTE MACERATOR VACUUM SYSTEM

Smaller pipes due to vacuum generation

Decentralized macerating in galleys and pantries at point of origin

Safe operation with no risk of cutlery entering system

Food waste is grinded in small particles – easier thermal food waste drying

Several grinder stations can work simultaneously parallel

Overfilling is not possible

Low water consumption

Food waste



Wet food waste



Dried food waste & bio-sludge



## INTERFACE EQUIPMENT

The food waste collected has several options for being treated. From using food waste digesters that convert particulate matter to treatable waste water, to dewatering where removal of surface water is key. This reduces the volume and increases the concentrations of solids by use of centrifuges or decanters. Solids are then fed into the de-watered bio waste tanks and the liquid directed to food waste reject water tanks and AWP. This solid waste will then be dried and sent to the dried bio waste silo which is then transported via a screw conveyor to the incinerator and wet ash bagged to be taken ashore. During this process the bio sludge taken from the MBR will also be de-watered, dried and fed into the same silo for dried biowaste.

Fig.1 Wärtsilä dryer



## DRYING

The dryer in the Wärtsilä Bio-Sludge Treatment system can process all sludge from the wastewater treatment process and food waste before incineration.

The drying process increases the dryness of the waste to a high level of dry solids, ready for incineration.

Dried sludge is stored in the bio-sludge silo before incineration. In addition, the design of the agitators/ blades within our dryer, crushes “potatoes” during the drying / mixing process, which prevents the sticky phase effect, and the creation of large stones, reducing any unplanned maintenance.

INCINERATION

The Wärtsilä incinerator incorporates a number of unique features. The wet de-ashing system eliminates airborne ash in the dry waste compartments, resulting in a cleaner and healthier working environment for personnel. In addition, it is easy to handle ash bags and reduces maintenance on other equipment installed nearby.

The paddle technology (water cooled paddle system) requires only a short combustion chamber, thanks to the forward and backward movement, which results in an optimal mixing of waste during the incinerating process.

Since the combustion process takes place on the bottom of the incinerator, the air supply is above the burning waste resulting in reduced airborne ash. The paddle system has water cooled shafts and paddles made from Inconel, a material used in extreme environments, and thus, cannot be overheated.

“The water-cooled paddle system made from Inconel cannot be overheated.”

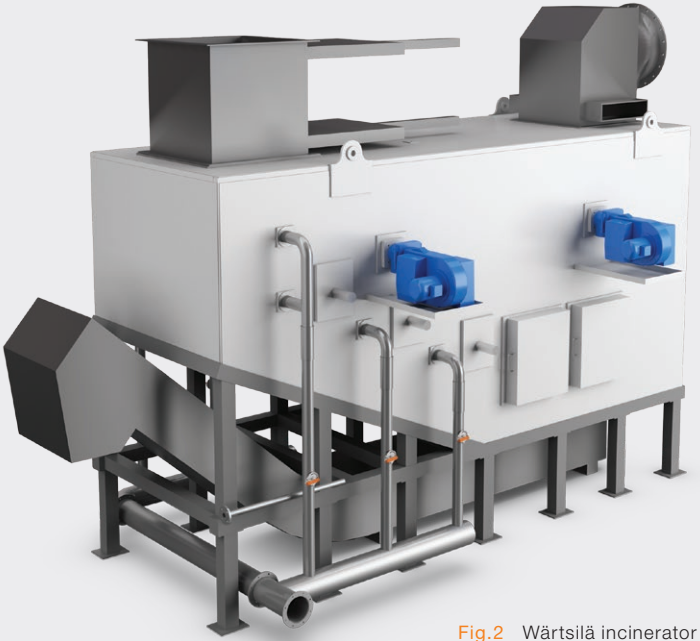


Fig.2 Wärtsilä incinerator

WÄRTSILÄ INCINERATOR VS. CONVENTIONAL

	SYSTEM TECHNOLOGY			
	WÄRTSILÄ INCINERATOR	EFFECT	CONVENTIONAL	EFFECT
Airborne ash reduction	Unique wet deashing system with air supply from above eliminates airborne ash	Cleaner and healthier working environment for personnel	Moving grate with an air supply from below results in a high amount of airborne ash	Working environment with unhealthy ash to breathe
Ash handling	Easy handling of ash bags	Less work for personnel	Challenging handling of dry ash when filling big bags	Unhealthy work for personnel
Side effects of airborne ash	Eliminated airborne ash reduces maintenance need on other equipment installed nearby	Savings in form of reduced maintenance need	High amount of airborne ash requires costly maintenance on nearby equipment	Increased costs for equipment maintenance
Operational reliability	The forward and backward movement of the paddle technology results in an optimal mixing of waste	The optimal mixing of waste during incineration and water-cooled shafts and paddles made from Inconel ensures system cannot get overheated	A moving grate can transport the waste only in one direction, which is not the most efficient process	Will become blocked with solid particles after a very short time resulting in overheating and stoppage
Space requirement on board for same burning capacity	The forward and backward movement of the paddle technology requires only a short combustion chamber for the necessary retention time	The compact and short combustion chamber saves valuable space on board	A moving grate can transport the waste only in one direction, thus requiring a longer design for the necessary retention time	The long combustion chamber results in a much larger footprint taking up much valuable space
Operational reliability	No overheating of the paddle system	Reliable system	Very high risk of overheated grate system	High maintenance costs without any reliability

RECYCLING EQUIPMENT

The accumulation of recyclable wastes on board vessels must be managed correctly on board, our systems take advantage of any storage and working spaces, reducing handling time, as well as maximizing the off-loadable efficiency.

All fork lifts and lifting devices for transport of ash bags and recycling equipment can also be supplied by Wärtsilä.

Wärtsilä recycling equipment consists of:

- Shredders
- Densifiers
- Glass crushers
- Bale compactors
- Briquetting





EXPERIENCE & RECENT SUCCESSES

SAGA



SCOPE OF SUPPLY

Meyer Werft awarded Wärtsilä the contract to supply the complete wet & dry waste treatment package.

Shipowner ..... Saga Cruises

Shipyard.....Meyer Werft, Germany

CRYSTAL ENDEAVOR



SCOPE OF SUPPLY

MV Werften awarded Wärtsilä the contract to supply the complete wet & dry waste treatment package.

Shipowner..... Genting HK/Crystal Cruises

Shipyard..... MV Werften, Germany



SUPPORT THROUGHOUT  
THE ENTIRE LIFECYCLE

AFTERSALES, SERVICE & SUPPORT

Wärtsilä supports its customers throughout the lifecycle of their installations by optimising efficiency and performance. We offer expertise, proximity and responsiveness for all our customers in the most environmentally sound way.

Our Services & Support solutions range from basic support, installation and commissioning, performance optimisation, staff training, upgrades and conversions to service projects and agreements focusing on overall equipment performance and asset management.

We deliver aftersales support through our network of service centres in more than 70 countries worldwide and provide original spare parts for all of our waste management systems, ensuring prompt service and delivery to minimise downtime.