

Waste Management Systems & Solutions For Marine & Offshore by:



For : Open to Public
By : Jan van Overloop Delitek Netherlands
Date & Place : Rotterdam, April 2017

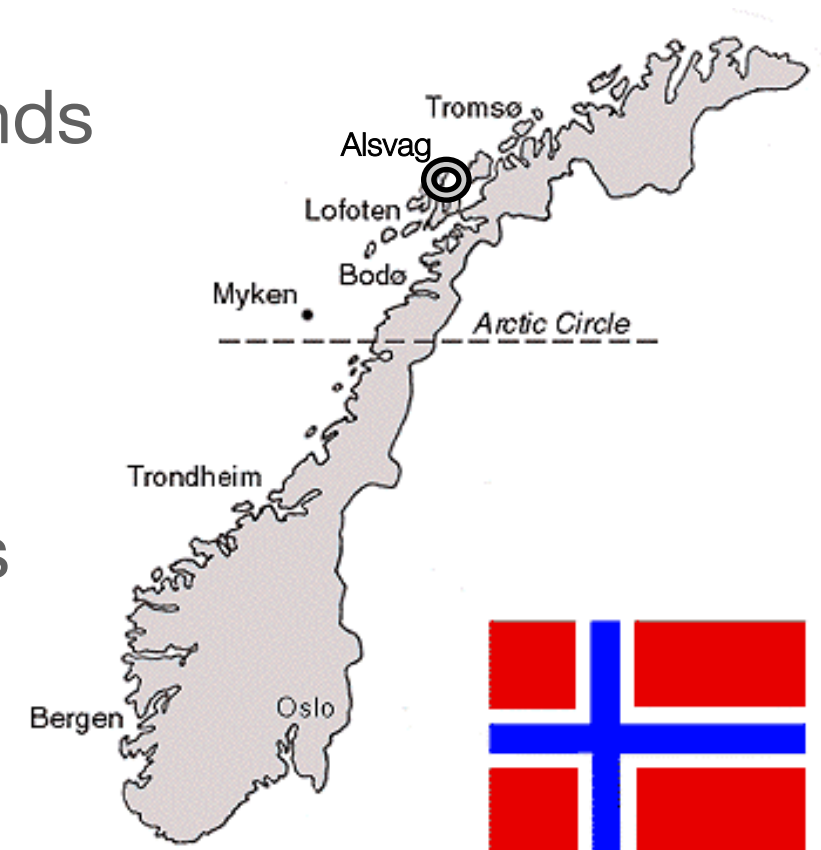
The information contained in this presentation is not confidential and may be used. This presentation and its contents should be copied, distributed or otherwise made available to interested parties.

Agenda:

- About Delitek AS
- Design of systems for Marine & Offshore
- Dry Waste Solutions
- Food Waste Solutions
- Areas for cooperation as Waste Solution Supplier
- 7 reasons to decide for Delitek AS

About Delitek

- Designer & manufacturer of Waste Systems since 1992
- HQ and factory in Alsvag | Myre near Lofoten Islands
- Privately owned Larsen family business
- Specialist in Maritime & Offshore Waste Solutions
- Track record: Fishing Vessels, Offshore, Shipping
- Equipment designed to withstand the harshest conditions



Impression of production & equipment features



Machinery designed to last

Our design principles are:

Simplicity:

- Operable for everybody regardless: language, strength and size
- Operable under all circumstances | harshest conditions
- Low degree of automation (simple push button interfaces)



Durability:

- Quality stainless steel withstand the conditions (and time)
- Fully welded (bolted) structure and main components (no rivet)
- Reliable Electric-hydraulic power unit
- Powerfull motor, couplings and gear
- Protection of components and operator (load & safety)

Flexibility:

- Functionality at the heart of machinery (segregation | big-bags)
- Ergonomic design for operator (wheeled, interchangeable containers)
- A high degree of standardized components (easy maintainance)



Dry Waste Solutions

About dry waste and available technologies

Dry waste:

- Generation rate [mass] close to 0.8 Kg per person / per day
- Volumes vary significantly over fractions :
 1. cardboard & paper, 2 plastics, 3. dunnage, 4. steels, and 5. mixed general waste
- Fractions & material type have varying specific densities and achievable reduction ratio's
- A higher generation rate usually demands a dedicated machinery for practical reasons

Processing solution [technology] is directly related to:

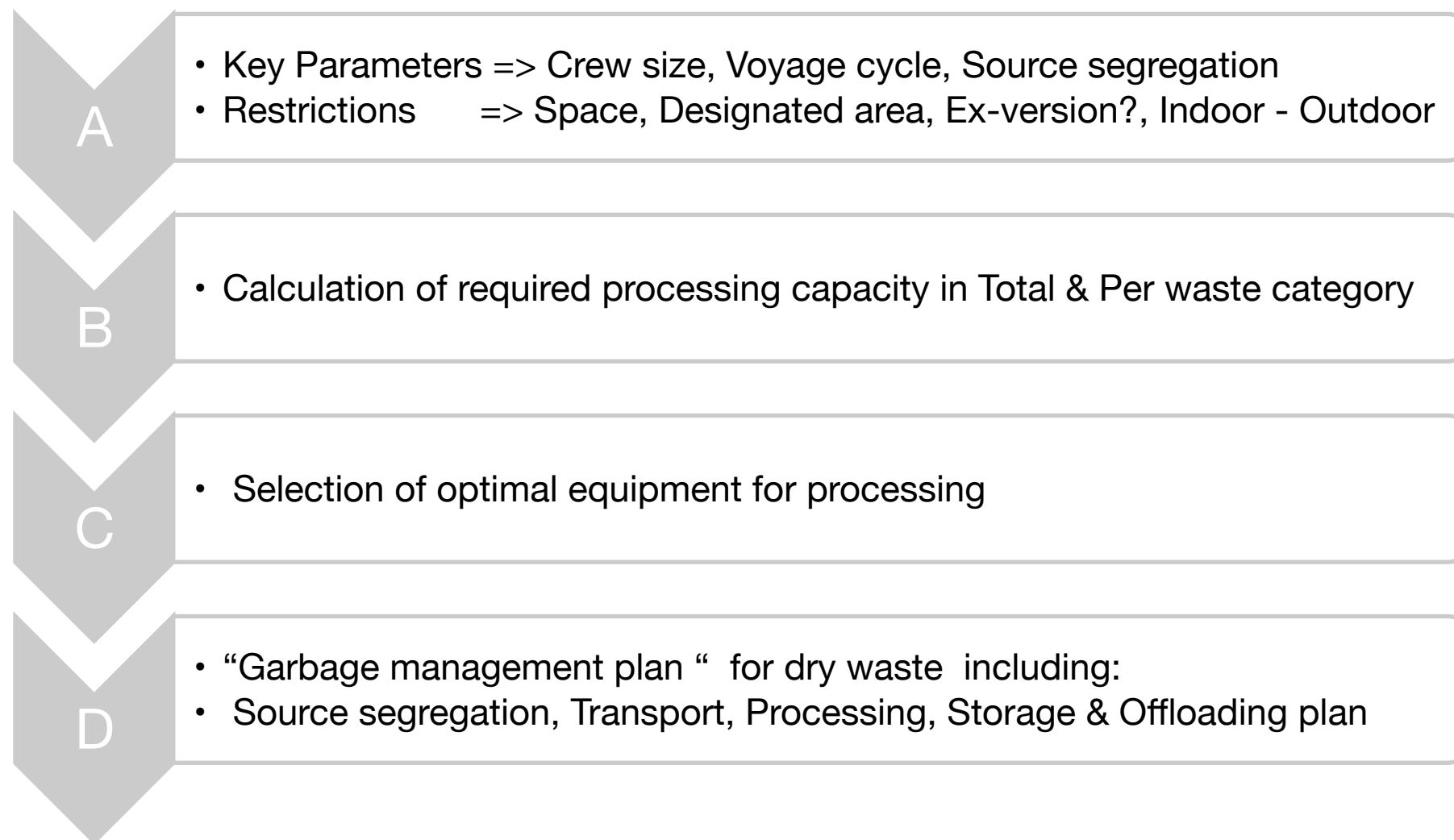
- Persons on board: i.e. Volume & required holding time (trading pattern, area & endurance)
- Sourcing, time-schedule and overall installation cost
- HQSE : Hygiene, safety, energy-efficiency and financial

Table 1 **:	Compaction	Shredder & Compactor	Complete DW Plant	Gasification	Incineration
POB	Low [15 -25]	Medium [25 – 100]	High [100 - 400]	Med-High [100>]	Med-High[100 >]
Endurance	Short (1-7 days)	Medium (14 -30 days)	Daily processed	Daily processed	Daily processed
Waste type segregation	Recycling usually 2 to 3 streams	Recycle – 4 to 5 streams and sorting table	Dedicated machinery Baler Shredder Crush	Contaminated dry	Contaminated dry
CAPEX	[EUR 5K to 10K]	[EUR 10K – 40K]	[up to 100 K]	[up to 200 K]	[up to ? K]
OPEX	Minimal	Minimal	Minimal	Low	High

**Note: to table 1: we provide a brief summary of available solutions on the basis certain parameters and only as indication. Data are based on available information, experience and opinions . Therefore subject to interpretation.

Dry Waste Solutions

Indicative dry waste generation and capacity planning



For technical and contractual specification it is advised to ensure crew will have machines that work for them, we provide custom made advise upon your request

Delitek Dry Waste equipment:

Low maintenance

Reliable and Safe

Reduce handling

Hardware | Mechanical :

Quality steel

Craftmanship

Electric-Hydraulic

Power full drives

Push button interface

Press-plate alignment

Overload protection

Safety-switch [magnetic]



Operator:

Wheeled containers

Interchangeable

Multi-waste fraction

Pre-fitted bags

Double lock doors

Big-Bag offloading

Ramps & mounts

Dry Waste

Our range of capacities ensures correctly sized equipment

Model Type	Vessel type	Crew (POB)	Isolation (in days)
DT 200 Series [DT190 – mini] DT200 MC DT230 SR DT200 GC	Reefer / Feeder / Bulkers / Tankers / Bulkers / PSV / Container lines All Deep Sea Shipping (merchant)	15 - 40	20- 30
DT 500 Series DT500 MC DT575 SR DT500 GC	Offshore supply, Construction/ Dredgers/ CSV / DSV / Cable Pipe Layers	40 – 70	30 days >
DT 1000 series DT 1500 series DT1500 MC DT1575 SR	Offshore structures, Cruise vessels, Accommodation Services	70 >	various



Dry Waste

Technical outline specification for machinery

Shredders: DT230 | DT575 | DT1075 | DT1575

- Technology used: Shear & Tear => highly suitable for multi-fraction feed
 - Drive: direct coupled motor | gear to 2 slow rotating shafts
 - Mechanism: double cutting blade & knife with pick-up hooks
 - Speed (r.p.m.): slow speed 14 r.p.m. [shaft speed of 2:1]
 - Installed power (kW): DT230 = 3 kW and DT575 | 1575 = 7.5 kW
 - Performance indicator: **Torque** 1900 Nm or 4850 Nm
-

Compactors: DT200 | DT500 | DT1000 | DT1500 | DT2000

- Technology : Force exercised to deform materials permanently
 - Drive: Hydraulic unit of motor | pump & hydraulic cylinder
 - Duration cycle: minimum duration of 70 seconds
 - Installed power (kW): 1.8 kW
 - Performance: **Press force** : 9000 kgs | 10.000 Kg : 15.000 Kg
-

Glass Crusher: DT200 | DT500

- Technology: Fast acting double hammering unit
- Drive: electric-motor single shaft coupled cutting knife unit (double edge)
- Installed power (kW): 1.8 kW
- Performance indicator: **R.p.m.:** 1420 r.p.m.

Dry Waste

Additional equipment to the series:

High volume Baler(s) Press: DT1000B | 1500B:

- Carton|Paper|Plastic
- Hydraulic Units of MC's
- Bales onto Euro pallet
- Bale-ejection tool
- Large loading opening



Drum| Filter| Can Densifier- press: DT120 DC | 550C:

- E/R & Galley waste
- Hydraulic unit of MC's
- Captures residual fluid
- Drum up to 200 ltr.
- Internal oil sump



Low-cost Ex-version Air-driven Compactor: DT220-PN:

- Quick connect Air circuit
- Between 7<Barg<9
- 1500 or 3000 Kgs force
- No motor | pump
- No maintenance !



Food [Wet] Waste Solutions

About food waste and available technologies

Food waste:

- Approximately 0.7 Kg per person / per day (cruise ships: min. 3 Kg/pp/day !)
- Varies significantly in composition [patato-mash vs. fish skin vs. bones]
- Water content of 60% to 70%
- Contains relatively high amounts of fats | grease and is acidic by nature
- Decays rapidly under ambient temperature range

Processing solution [technology] is directly related to:

- Persons on board: i.e. volume
- Required holding time (trading pattern, trading area & voyage duration)
- Sourcing, time-schedule and overall installation cost
- HQSE : Hygiene, safety, energy-efficiency

	Maceration (Direct OVB)	Maceration (Holding Tank)	Conventional Incineration	Gasification	Bio-Digester [food only]
POB	Low [15 -25]	Low Medium [25 – 100]	Medium – High [50 >]	Medium – High [50 >]	Medium – High [50 >]
Holding time	Short (1-2 days)	Medium (3-7 days) High (14 days)	Daily processing	Daily processing	Daily processing
CAPEX	Low [EUR 1.500 – 5.000]	Low medium [EUR 10.000 – 40000]	Medium High [with other waste]	Medium High [with other waste]	Medium [EUR 40.000]
OPEX	Low	Low	High	Low	Low

Food [Wet] Waste Solutions

Maceration based solution of Delitek AS :

Delitek food-waste systems are carefully designed for the purpose:

- Quality stainless steel [food grade min. 304 | 316L] surfaces & enclosures
- Powerfull maceration mechanism, motor and pumps
- Robust technology for tough composition of food waste [shredders]
- Functional seperation [discharge pump | conveying pump |transfer pump]

DeliMac: macerator stand-alone or (under-sink) with direct connection overboard

- Simple installation
- Low cost solution
- No temporary holding or storage possible

DeliFri: macerator and temporary bin-storage or refridgerated storage solution :

- For a prolonged holding time of couple of days
- Identical processing system as stand-alone | under-sink or in-table
- in “cold” [chilled] stores or in refrigerated strorage unit

DeliSep: macerator directly followed by de-watering via centrifugal treatment [galley]

- Maceration station followed by de-water unit – centrifugal type
- Water connection directly common grey water drain
- Food waste pulp is temporarily bagged & “cold” stored
- Prolonged holding time without installation of tanks

Food [Wet] Waste Solutions

Maceration based solution of Delitek AS :



A full range of USPH and Marpol Annex V compliant macerators.

All macerators are in:

Stainless steel (AISI-304 minimum), IP55 protection.

Special cast alloy grinding unit and unique seal design.

The 500-series provides you with a choice to select proper machinery:

- Motor power : from 0.75 to 5.5 kW
- Flexibility : Stand-alone, In-tabling welded and in sink versions
- Reversible motor : reduces wear & tear of grinding unit
- Motor overload protection
- Adjustable nozzle type fresh (or sea) water supply-line
- Magnetic cutlery saver & baffle

A DeliSep FW Processing Station consists of a macerator followed by centrifugal treatment of the food waste slurry.

A viable solution for refit and new build projects. The separated water is drained to grey water tank whilst de-watered food waste pulp is collected separately for further processing | storage.

Food [Wet] Waste Solutions

An overview of choices and implications

For a prolonged holding-time:

DeliGrav: Feeding stations connected to integrated holding-tank:

- For galley | scullery (or even a waste processing room)
- Holding tanks size allows for up to 10 days storage
- Tank AISI316, with discharge pump, inspection hole, flush connection , vent, filter.
- Holding tank is agitated by stirring discharge pump (AgitStir recirculation)
- Flexibility: by modular design holding tank can be gravity-fed placed in lower decks [E/room]

DeliVac: Feeding station followed by vacuum conveying to holding tank:

- A complete system without any operational restrictions to holding time and volume
- Multiple feeding stations provide flexibility [optional with top-mounted heavy duty shredder]
- Reliable vacuum conveying technology and pumps [JETS-vacuumator-pump (sewage)]
- Buffer holding tank [AISI316] standard sizes from: 2,0 m³ up to 8,0 m³
- Extended holding time when combined with de-watering connection to DeliSep.
- AgitStir-functionality: integrated timely agitation of the foodwaste slurry prevents unwanted settling
- Functional separation of pumps (discharge|service and vacuum pump)
- Fail-safe push button control panel

Food [Wet] Waste Solutions

System with prolonged holding time

DeliGrav



New

DeliGrav: Our gravitation based solution consists of macerator station followed by a buffer holding tank. This configuration is very compact, solid and flexible whilst you still benefit from:

- Simple push button operation & controls
- Powerful discharge pump with AgitStir function
- Flexible | Modular design allows for installation to meet your needs

DeliVac



New

DeliVac: Our Vacuum-conveying FW-system is a reliable and fit-purpose innovation. Vacuum evacuation of food waste slurry has significant benefits:

- The drain system is less prone to blockage
- 75% less water-usage & slurry produced
- 75% extended holding time
- Hassle-free discharge via separate pump: AgitStir-function and 5 mm particle sizes

Total Waste Treatment Partner

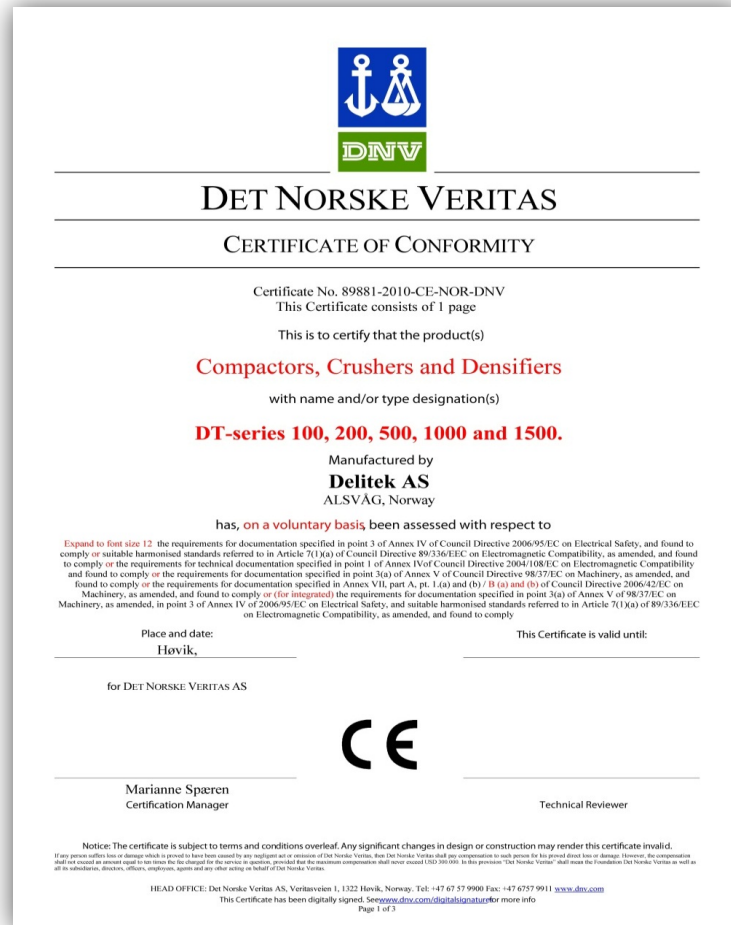
Delitek AS (& marine partners) can support you in projects via:

- Adequately sized recycling equipment [Compactors, Shredders & Crushers]
 - Via capacity-calculation (size, power, reduction ratio's, mass and weight)
 - Handling, storage and offloading plan
 - Technical evaluation of key performance indicators of systems | Technical specification
 - Life cycle costing and cost reduction program
- Source segregation and collection plans
- Food Waste Technology selection and a complete range of solutions
- Containerised Waste station [Reefer | AC]
 - For both standard containers or Offshore Certified requirement
- Assistance in project to reduce or eliminate conventional incineration:
 - Cost – benefit analysis
- Advise on gasification-technology to complete the scope of supply:
 - Contaminated waste streams
 - Sludges & waste oils
 - Hazardous waste

7 reasons to select Delitek AS

- Norwegian craftsmanship
- Design by mariners for marine | offshore
- Single source advantage: from idea, to design, to production and delivery
- Quality: of machinery, steel grade, drives|motor & welding-assembly
- Price and commercial terms: value for your money for at least 15 years
- Experience, know-how, commitment and dedication
- World wide coverage by experienced marine business partners

Industry standard and certification



System performance is verified by DNV-GL. Found fit for purpose for segregated waste processing Marpol V.

Thank you for your attention