

## **CATALOGUE OF BEST PRACTICES AND TECHNOLOGIES FOR HANDLING OF DRY BULK GOODS (ESPECIALLY FERTILIZERS AND PHOSPHATE ROCK)**

**BASED ON THE DISCUSSIONS AND CONCLUSIONS OF THE MEETING ON MAY 7, 2024<sup>1</sup>**

The purpose of this catalogue is to improve the handling of dry bulk goods, particularly fertilizers and phosphate rock, in Baltic Sea seaports. The catalogue aims to indicate how to implement Port Regulations and port environmental protection regulations in the handling of bulk goods to reduce spills and prevent potential emissions of handled materials into port waters. It is estimated that every year, 45 million tons of bulk mineral fertilizers and phosphate are handled in Baltic Sea ports. Polish seaports play a special role in this regard, being important centres for the transport of these goods. The handling and transport of bulk mineral fertilizers is a potential source of emissions of nutrients, such as nitrogen and phosphorus, which can be emitted into the Baltic Sea in excessive amounts. Just a few kilograms of regular NPK fertilizer can cause significant algae growth (20 kg NPK with 5%P = 1000 kg of algae). This catalogue of best practices and technologies is open-ended - it collects, organizes, and structures the most important proposals for actions and technologies aimed at reducing the loss of handled fertilizer and phosphate, thereby reducing emissions and waste. The proposals included in this catalogue are based on the experiences of Race For The Baltic and implemented solutions in cooperation with ports, port terminals, equipment manufacturers for handling dry bulk materials, and fertilizer producers. This document was discussed in depth during the above-mentioned meeting and contains conclusions presented by its participants.

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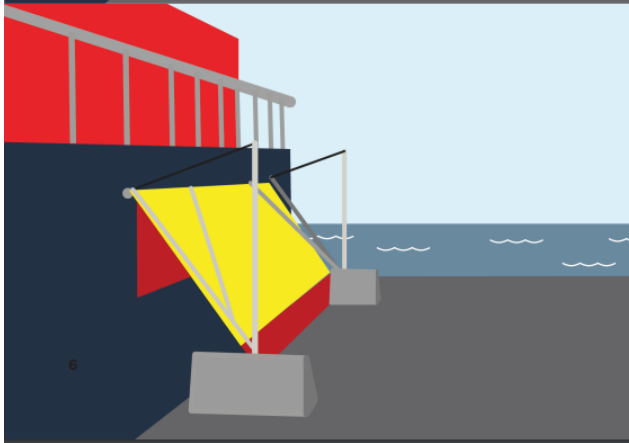
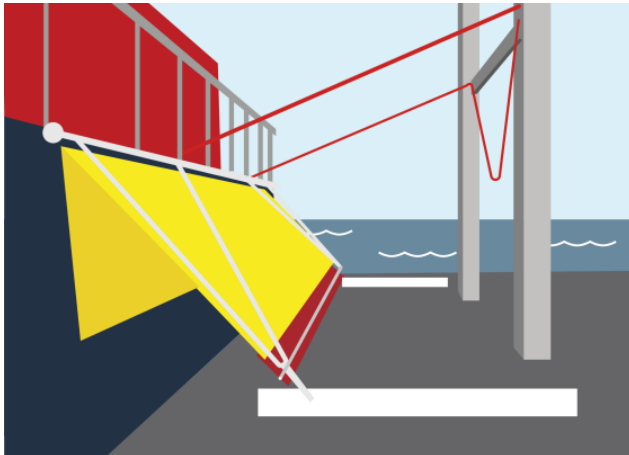
<sup>1</sup> On May 7, 2024, Race For The Baltic organized a round-table meeting in Gdańsk, attended by representatives of the Ministry of Infrastructure, Maritime Offices, port captain's offices, port authorities, port terminals, as well as media related to the maritime industry.

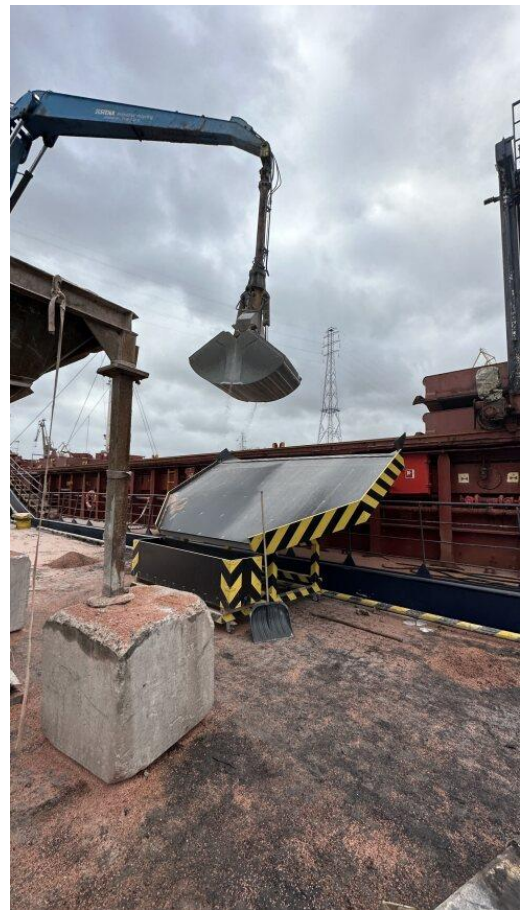
# RECOMMENDATION PROPOSALS

## 1. INSTALLATION OF PREVENTION COVERS OVER THE SPACE BETWEEN THE QUAY AND THE SHIP

The purpose of the prevention cover is to protect the entire area (gap) between the ship and the quay where the grab bucket operates over port waters to prevent potential spills of handled materials into the water in case of grab bucket leakage or emergency opening. Prevention covers fulfil their role and effectively secure the space between the ship's side and the quay, reducing it from 2 meters to 2-3 centimetres. At the same time, in the event of a leaky grab bucket, prevention covers effectively shorten the time needed to clean the quay. The simplest example of such a cover is a tarpaulin, which is a universal cover suitable for less windy ports. A more robust cover can be made of wood and steel, making it more resistant to harsh port weather conditions, such as strong wind. Such covers should have protection against damage to the ship's plating, e.g. a rubber apron. More advanced prevention cover models are equipped with wheels and allow for any positioning on the quay (so-called mobile covers) and may also include a container for collected material (e.g. a self-dumping skip). The use of self-dumping skips or containers for collecting spills from prevention covers allows to save spilled material from disposal, reducing the operating costs. An effective solution to prevent spillage of material on the ship's side may be to extend the cover with a tarpaulin rolled out on the ship's side into the cargo hold.

Sample prevention covers (installed in Baltic terminals in cooperation with Race For The Baltic):





## **2. REGULAR USE OF CLEANING MACHINES AND IMPLEMENTATION OF A CLEANING INSTRUCTION/CHECKLIST FOR THE QUAY**

### **Proposed quay cleaning procedures:**

1. Daily cleaning of the quay during loading or unloading in accordance with safety rules and preferably after each work shift or after completed reloading.
2. In case of larger spillage, cleaning should be done continuously.
3. During unloading/loading operations, ensure that rainwater drains in the port are secured (covered).
4. Use professional cleaning machines suitable for the material being cleaned.
5. The quay surface should be as smooth as possible. All unnecessary unevenness, e.g., unused railway tracks, should be removed.
6. Avoid vehicle movement in the area during loading/unloading to prevent the spread of spilled material beyond the quay area.
7. Cleaning should depend on weather conditions. It is very important to clean the quay before rain or snow.
8. Cooperation and communication between port authorities and individual terminals is important. The role of port authorities is to carry out frequent inspections of quays, which help to keep the quay clean.
9. This checklist/instruction is helpful in case of high employee turnover.

Examples of machines for cleaning fertilizer and phosphate quays



### **3. EFFECTIVE MANAGEMENT OF RAINWATER AND MELTWATER**

1. The basic principle should be to undertake all actions that ensure rainwater and meltwater contain as few contaminants from cargo handling as possible.
2. Particular attention should be paid to managing rainwater and meltwater during ship unloading/loading. A good practice in this case is to cover wells or drains.
3. In winter, it is advisable to clear snow from the quays, preferably before starting the transshipment of fertilizers, which, when in contact with the snow cover, accelerate its dissolution process. This process has a significant impact on spilled material entering port waters or drainage wells together with melting snow.
4. Processes for pre-treatment of outgoing waters, e.g., using phosphorus and nitrogen absorbing filters, can play an important role in reducing contamination. Rainwater can also go to wastewater treatment plants.
5. To manage rainwater and meltwater well and effectively, monitoring of port waters is extremely important i.e. regular sampling, to have up-to-date information on the level and sources of contamination.
6. In the case of publicly accessible quays, the issue of effective division of responsibility for operations carried out is important.

Examples of rainwater outflows in Polish port terminals





#### **4. REGULAR TRAININGS FOR CRANE OPERATORS**

1. Crane operators should be well-trained. It is important to increase crane operators' awareness of the impact of handling on the quality of port waters. Training should lead to the least possible spillage during handling.
2. Accurate work and good environmental practices applied by the crane operators (e.g. closing the grab bucket, lowering the grab bucket low, making a “shaking” movement, not filling up the grab bucket and the hopper too excessively) significantly reduce the amount of spillage from crane grab bucket.
3. Good practices can be introduced and reconciled with the time pressure to which crane operators are subjected, with very good training of crane operators, also due to the fact that reducing dust is also in the interest of the terminal managers and port authorities.
4. Wherever possible, consideration should be given to introducing financial rewards for accurate work for crane operators, financed, for example, by money saved by not having to bear the cost of disposal and clean-up of cargo remains.
5. Reduced working hours and a higher hourly rate for the crane operator can also have a positive impact on the accuracy of crane operations.
6. Crane operators should be regularly trained and made aware of the impact of spillage from grab buckets on the environment - grassroots work with crane operators is important.
7. The introduction of the principles of good environmental practices should be considered in institutions certifying and training crane operators, so that these principles can become an element of the training/certification of crane operators.

## Proposed basic principles for crane operators:

1. No loading or unloading in windy weather - introduce a wind speed limit for operations (10-15 m/s).
2. Do not overfill the hopper (helped by a maximum loading line drawn inside the hopper).
3. Lower the grab bucket as close/low to the hopper as possible before opening it.
4. Use loading sleeves.
5. Do not overfill the grab bucket beyond its maximum capacity.
6. Close the grab bucket before moving it above the hold or quay (hopper).
7. Perform a “shaking” movement with the grab bucket to get rid of excess material that might spill.

Examples of quay operations in Polish port terminals



## 5. HIGH-QUALITY GRAB BUCKETS

1. Leaking crane grab buckets are one of the main sources of dry bulk material spillage in ports. The quality, efficiency and level of impact of port reloading on the natural environment depend on the quality and condition of the grab bucket.
2. It is estimated that, if the grab bucket is in poor condition and does not close tightly, the spillage may be 7 times larger than if the grab bucket is of relatively good quality/good condition. Some estimates indicate that good quality grab bucket reduce spills on port quays by up to 90%.
3. Regular monitoring and maintenance of the crane grab bucket is recommended. The efficiency of the grab bucket should be checked before each reloading, and the grab bucket should be lubricated at least twice during one shift.
4. If it is not possible to repair the grab bucket, special covers or ploughshares should be used to seal the grab bucket jaws.
5. Renovation (surfacing) of the grab bucket should be commissioned to specialist companies to extend the life of the repaired grab bucket.
6. In the case of large spillage from the grab bucket, repair or complete replacement is necessary. If, after starting reloading, a leak is detected in the grab bucket, the operation should be immediately stopped, and the grab bucket should be replaced with a tight one.
7. It is a good practice to dedicate a grab bucket to one specific dry bulk material, especially in universal terminals that handle various goods.
8. Crane operator can reduce the wear of the grab bucket by appropriate work.

Example photos of leaking grab buckets in Polish port terminals



## 6. CLOSED CRANE SYSTEMS

1. Closed reloading systems are the most effective in preventing spillage and dust when reloading dry bulk goods.
2. The use of closed crane systems is generally possible in terminals specializing in reloading of specific materials, e.g. grain or fertilizer terminals.
3. The issue of proper and uniform interpretation of the "tightness" of transshipment by the port management and the operator is important. In this respect, proper cooperation and communication between port management and terminal operator is important.

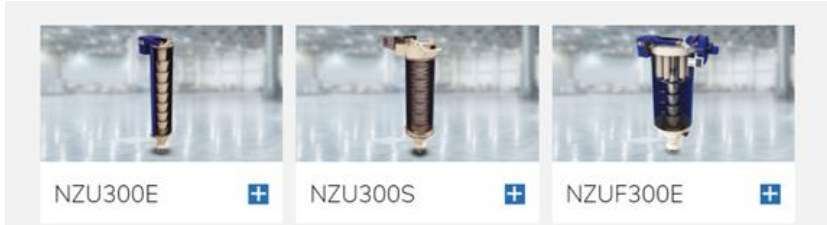
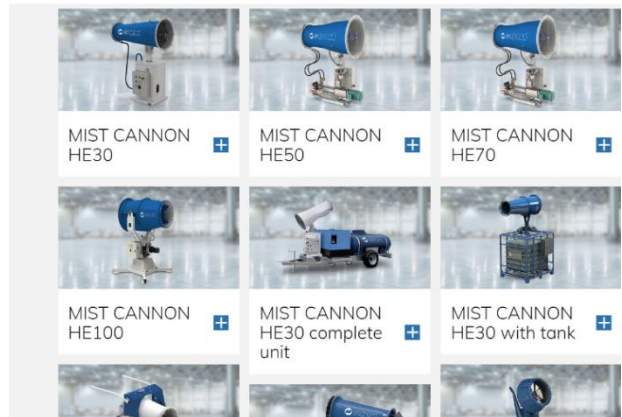
Examples of closed systems for loading and unloading grain



## **7. USE OF DUST CONTROL SYSTEMS AND TECHNIQUES TO REDUCE DUST DURING TRUCK/WAGON LOADING**

1. In dry bulk goods handling, a significant part of the emissions occurs in the form of dust.
2. The use of anti-dust systems (when possible, spraying the stored material with water cannons or silicone preparations) significantly reduces dusting and has a positive impact on the perception of the port among city residents, especially in ports that are located close to residential buildings; in some cases customers receiving dry bulk goods also wish to use anti-dust systems.
3. Various anti-dust systems play a significant role in preventing/reducing pollution: cannons, dust suppression hoppers, sprinklers, dry fog, spray nozzles or dust barriers.
4. Masking nets are beneficial for ports/terminals located close to cities. It is important to develop a model for financing such preventive measures, e.g. cities could co-finance such equipment.
5. Dust hoppers can be effective however they can be quite expensive.
6. It would be advisable to introduce a support program (financial and technical) in the field of environmental protection, which could be addressed to small port terminals that do not have adequate financial and human resources.

# Examples of dust protection systems



TRUCK/RAILCAR LOADING SPOUTS



## **8. CLOSED TRANSPORT SYSTEMS FOR MATERIALS ON THE QUAY – TIGHT CONVEYORS AND SUITABLE HIGH-QUALITY HOPPERS**

1. When there is a need to transport loaded/unloaded material on the quay, it is recommended to use tight/covered conveyors.
2. It is also important to:
  - keep the length of the conveyors on the quay is as short as possible,
  - maintain appropriate slopes on the conveyors,
  - limit the number of transfer points/towers,
  - regularly monitor dust filters.
3. Shortening the length of conveyor belts and removing unnecessary reloading points generates operational savings (maintaining conveyor lines is expensive).
4. Hoppers should be sized to match the grab bucket and properly shaped. The gap between the hopper and the truck/wagon should be minimized, e.g., by using unloading sleeves. The maximum height from which the material should freely fall should not exceed 50 cm.