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Industrial paraffin-wax strandings on the Eastern coast of the Channel. Contexts and stakes.



Since August 2016, the association has launched four alerts concerning beach strandings of "fresh" industrial paraffins on the French eastern coast of the Channel. In just over a year, dozens of tons of these products have washed up on our region: the famous Côte d'Opale. This synthesis document is intended for a better understanding of the economic and industrial frameworks of this phenomenon and it offers thoughts for a better consideration of this recurrent pollution regarding the new regulations which are being drafted.

> Industrial paraffin-wax strandings on the Eastern coast of the Channel. <u>Author</u> : Sea-Mer Asso - October 27, 2017. http://sea-mer.org contact@sea-mer.org

Reference document

Pollution of the North and Baltic Seas with Paraffin Independent Environmental Group of Experts "Consequences of Pollution Incidents" (UEG) - July 2014.

Economic datas and carriage

<u>Paraffin wax market analysis by application, by</u> <u>region, by country, and segment forecasts</u> On the website grandviewresearch.com - February 2017.

Paraffin Wax Market To 2022- Industry Trends On the websitee linkedin.com - October 2015.

<u>Paraffin wax on chemical tankers</u> On the blog of the indian Captain Ajit Vadakayil.

<u>Preparing Chemical Tankers for Cargo Operations</u> On the website of the insurance society Skuld.

<u>Oil Spill Environmental Forensics Case Studies</u> (book on google books) Paragraph on the paraffinwax pollutions.

<u>Consideration and analysis of reports on alleged</u> <u>inadequacy of port reception facilities</u> On the website of the classification society Veristar.

Informations on the products

Les chloroalcanes sur le site Wikipédia (fr)

Les paraffines sur le site Wikipédia (fr)

<u>Analyse des chloroalcanes</u> Sur le site de l'INERIS (fr)

<u>What are chlorinated alkanes?</u> On the website of the association Eurochlor.

Le perchloroéthylène sur le site de <u>l'INERIS</u> et sur <u>Wikipédia</u> (fr)

Le trichloroéthylène sur le site de <u>l'INERIS</u> et sur <u>Wikipédia</u>. (fr)

Regulations and rules

Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk The Marpol convention on the website of the Marpol Training Institute.

Adoption de l'annexe II révisée de MARPOL 73/78 French law regulations on the Official Journal (fr)

<u>The reports of the GESAMP</u> On the website of the GESAMP.

<u>Port reception facilities</u> On the website of the IMO.

<u>The International Bulk Chemical code</u> On the website of the Netherlands Ministry of Infrastructure and the Environment.

<u>The supplement of the IBC code (substances)</u> On the website of the Netherlands Ministry of Infrastructure and the Environment.

<u>The 2017 annual report of the KIMO</u> Sur le site de la KIMO.

<u>Sub-Committee on Pollution Prevention and</u> <u>Response (PPR)</u> On the website of the IMO.

<u>Report of the PPR 4 - 16/20 january 2017</u> On the website of the classification society Veristar.

Ecological impact

Hong Kong's Palm Oil Spill Is Wreaking Havoc on Marine Life

On the website Ecowatch- August 2017.

Toxic waste killing dogs on beaches: Poisoned pets left writhing in agony by palm oil dumped at sea

On the website of the Dailymail - March 2014.

<u>Rescue for birds covered in 'wax' in the south west</u> On the website of the BBC - February 2013.

<u>Plastic and paraffin wax in the stomach of a Fulmar</u> <u>Boréal</u>

Video from Professor Franeker of the IMARES, Netherlands - on the Youtube chain of the association SOS Mal de Seine.

GENERAL MATTERS ON PARAFFINS

The paraffins in question are some by-products from the crude oil refining process. They are used in many products: candles, food, cosmetics, drugs, industrial coatings, adhesives, electrical insulators, high-pressure lubricating oils. They are also used as a fire retardant or plasticizer for PVC. They are also usefull in plastic and rubber manufacturing processes, foundry and metal cutting [link]. The quantity of paraffin used worldwide was more than 3 million tonnes in 2014 with an expected increase of nearly 4% between 2015 and 2022. This market represented a total volume of \$ 4.9 billion in 2015 [link].



The kinds of paraffins are numerous and depend on the length of their carbon chain, their degree of purity and the additives they may contain. Paraffins are

alkanes, ie linear or branched hydrocarbon molecules and their chemical formula is CnH2n+2. The length of the carbon chain may vary with a number of carbon atoms ranging from n = 8 to n = 40. The longer the chain, the more the paraffin has a high melting temperature (up to 60 ° for waxes). Paraffins are commonly arranged in three families according to their viscosity: liquid paraffins, oily or pasty paraffins and solid paraffins or waxes.



Some examples of packaging and some samples of paraffin. Source: any web-search engine.

Among the applications mentioned above, some use chlorinated paraffins, in particular for their flame retardant and plasticizing properties. These chloroalkanes are paraffins of which several hydrogen atoms have been industrially replaced by chlorine atoms. Chloroalkanes are classified into three groups whose properties depend on the length of their carbon chain:

- Chloroalkanes C10-C13 / Short Chain Chlorinated Paraffins
- Chloroalkanes C14-C17 / Medium Chain Chlorinated Paraffins
- Chloroalkanes C18-C30 / Long Chain Chlorinated Paraffins

The chloroalkanes sold on the market can contain between 30% and 70% of chlorine. The viscosity and the density of the paraffins obtained increase with the concentration of chlorine. Their chemical and physical properties are very different from one group to another. According to the Eurochlor association, the European production of chloroalkanes is around 45 000 tons per year [link].



CARRIAGE OF PARAFFIN PRODUCTS AT SEA



A 15 000 t product tanker at Lorient. Source : Wikipédia

Carriage particularities :

Paraffins are carried by ships specialy built for the carriage of chemicals or oil products. These ships are made up of several tanks allowing to carry several different products at the same time. As they have to be loaded or unloaded in liquid form, certain products such as paraffins must be heated to a temperature above their melting temperature. To maintain the products in liquid form, the tanks of these vessels are fitted with heating coils allowing a circulation of saturated steam or hot thermal oil.



Heating coils in a ship tank. Source: <u>www.ajitvadakayil.fr</u>

Loading and unloading :

The tanks are loaded by the pumps of the loading port and they are unloaded by the pumps of the ship. To prevent the products from solidifying in the transfer pipes, these ones are heated by an external piping system working on the same principle as the tank coils. In case of clogging, the pipes can be opened manually.

After unloading, the residual quantities can be significant because the paraffins remain fixed against the cold walls of the tanks and to the various cold internal equipments and fittings. The tanks are usually cleaned by an automatic or semi-automatic rotating jet cleaning system using hot water or solvents such as <u>perchlorethylene</u> or <u>trichlorethylene</u> which are two carcinogen products. The tanks cleaning residues can then be treated by the port of unloading in dedicated installations or can be discharged at sea under certain conditions. In practice the residues have a higher melting temperature because of selective crystallization of the long chains. They must therefore be cleaned directly using live steam or manually using for example wooden hammers.



Tank cleaning onboard a product tanker. Source: <u>www.skuld.com</u>

RULES FOR THE DISCHARGES AT SEA: THE MARPOL

The discharges at sea of praffin-like products are ruled by the international <u>MARPOL</u> Convention and its Annex 2: "Rules for the prevention of pollution by noxious liquid substances carried in bulk." It defines the three categories of harmful substances, certain standards and principles of construction for the ships that will be allowed to discharge the residues at sea, and the standards for controlling such discharges. The most interesting rules have been summarized here to simplify reading and comprehension. The full french official texts are available on the <u>Official website</u> of the French Republic. The full international texts are available on the <u>Marpol Training Institute</u>.

Rule 6: Categorization and list of noxious liquid substances and other substances.

This rule defines the three categories of harmful substances according to the risk or damage that the substance may pose if released to the sea during tank cleaning or deballasting operations. The risks are those identified for marine resources and for human health. The damage is that what could cause harm to amenities or other legitimate uses of the sea.

Category X - Substances presenting a serious risk to marine resources or to human health justifying the prohibition of discharges into the marine environment.

Category Y - Substances presenting a risk to marine resources or human health or causing damages justifying a limitation of the quality and quantity of discards in the marine environment.

Category Z - Substances presenting a low risk for marine resources or for human health justifying less stringent restrictions on the quality and quantity of discharges into the marine environment.

Rule 12: Pumping, piping and unloading facilities.

The pumping of all the products in the tanks of the ships is almost impossible, either because of the shape of the tank or because of the performance of the pumping equipments. This Rule 12 indicates the maximum amount of residues that each tank and its associated piping can maintain after pumping based on the classes of substances that they are permitted to carry. A gradual reduction of the quantities has been put in place according to the year of construction of the ships, making it possible to keep in service the old less efficient vessels. It is unlikely that ships of this type built before 1986 are still in operation. The quantities indicated are relatively small but concern only one tank while some ships may have several dozens.

	Category X or Y	Category Z
Ship built before 1986	300 liters per tank	900 liters per tank
Ship built between 1986 - 2007	100 liters per tank	300 liters per tank
Ship built after 2007	75 liters per tank	

Rule 13: Control of releases of residues of noxious liquid substances.

Conditions to be met by vessels when rejecting any X, Y or Z substance:

- The ship must proceed at a speed of at least 7 knots.
- The discharge is carried out without exceeding the maximum flow rate for which the discharge pipe have been designed.
- The ship is at least 12 nautical miles from the nearest land.
- The ship is in waters where the charts indicate a depth of at least 25 meters.

Use of cleaning agents or additives.

When a washing agent other than water, such as a mineral oil or a chlorinated solvent, is used instead of water to wash a tank, the release of this agent shall be subject to the provisions that would apply if this agent was transported as cargo.

Release of Category X residues

A tank from which a Category X substance has been unloaded must be pre-washed before the vessel leaves the port of unloading. The residues resulting from the cleaning shall be discharged into a reception facility until the concentration of the substance released is equal to or less than 0,1% by weight. When the required concentration is reached, the remainder of the washings must continue to be discharged into the receiving facility until the tank is empty.

For some products and depending on the product that is planned to be loaded later, the cleaning of the tanks can continue at sea and be completed by hand with sponges and rags.

Release of residues of categories Y and Z

Prewashing at and discharge of the residues at berth are not planned for these categories of products. This means that the cleaning of tanks that have transported a product of these categories can be carried out after leaving the port of unloading and that the residues resulting from these cleanings can be discharged at sea in a manner according to the rules.

• If the unloading procedure goes badly and if there are still too many quantities in the tanks, the vessel must carry out a prewash at berth and discharge the residues in the unloading port or in another port with an appropriate receiving facility.

• For Category Y products, if the substance discharged is insufficiently heated and is at a temperature too close to its melting temperature, a prewash with discharge of residues at berth must be carried out.

Regulation of discards in the English Channel and the North Sea.



There is no specific regional regulation for discharges resulting from the tank cleaning operations in the Channel. Vessels using the Traffic Separation Schemes between France and the United Kingdom are authorized to carry out such discharges. In fact, this sea route is at a sufficient distance from the coast under international regulations. More than a hundred ships use this route every day. Each ship is monitored by Radar and is in radio connection

with the Maritime Rescue Coordination Centre. Air checks are also carried out regularly. Traffic intensity makes it almost impossible to identify a specific ship once paraffin strandings are found on the shoreline.

CLASSIFICATION OF THE PRODUCTS: THE IBC CODE AND THE GESAMP

Noxious liquid substances carried by ships in bulk are studied by the <u>GESAMP</u> (Group of Experts on the Scientific Aspects of Marine Environmental Protection) working for the UN and the International Maritime Organization (<u>IMO</u>). Their advice and studies are included in the <u>IBC</u> Code (International Code for the Construction and Equipment of Ships Carrying Dangerous Goods in Bulk). In this IBC code, we find for each product: their category Marpol X, Y or Z, the types of ships that can transport them and the specific measures to be taken during their loading, transport and unloading [<u>link</u>].

So we find our substances that can solidify in seawater in two categories:

- Category Y : paraffins and palm oil (but also carcinogenic solvents: perchlorethylene and trichlorethylene). After having properly discharged its cargo, the vessel may discharge at sea the residues resulting from the prewashing of its tanks.

- Category X : C10-C13 chlorinated paraffins and C14-C17 chlorinated paraffins containing 50% chlorine or more, and less than 1% chains lower than C13. After having properly unloaded the cargo, the ship must carry out a pre-wash with the unloading of the residues in a reception facility.

Today, there is still the greatest blur on the commercial names of paraffins and the technical data provided by manufacturers are not always consistent with the classification made. GESAMP reports this problem on page 9 of the report of its session of 17 November 2016 [link].

HARMFUL LIQUID SUBSTANCES SOLIDIFYING AT SEA

This specificity is not taken into account in the regulations. At the moment, IMO and GESAMP are working on the problem linked these kind of strandings. Amendments to the Marpol Convention and the IBC Code are being drafted. The most recent information on these works date from January 2017 and are available on the website of the classification society Veristar [link]. The products or groups of products involved in strandings and the most impacted areas such as the North Sea, the Baltic Sea and the North Atlantic should apparently be particularly taken into account. The biggest obstacle to the reduction of these discharges could be the establishment of reception facilities for residues resulting from the cleaning of the tanks for these products, especially as their deployment is <u>already insufficient</u>. The completion of the preparation of these new regulations is scheduled for the current of the year 2018 and no details appear on a possible timetable for their implementation.

At the European scale, the KIMO, an important international association of local authorities for the environment, which brings together 70 members from 7 countries in Northern Europe, is actively working on the subject. It submitted a report to the OSPAR Commission in April 2017 [link] on the economic impacts of these pollutions. This report will be forwarded to IMO by one of the OSPAR member countries to influence future regulations being drafted. KIMO calls for a classification of paraffins in category X whose discharges at sea are prohibited without prewash.

The IBC Code also lays down the standards for the construction of vessels capable of carrying harmful liquid substances in bulk, in particular with regard to double-hulls acting as protection in the event of a collision, and double-bottoms playing a protective role in the event of stranding. Today the work seems to focus on discharge standards but not on the types of vessels that may be allowed to transport these products.

TOXICITY EVALUATION OF PARAFFINS

It is very difficult to know the level of toxicity of raw paraffins when they run aground on beaches because these products are transported in forms with varying degrees of purity. If monocrystalline paraffin is edible, it is probably never transported in bulk. The waxes used for candles are reputed to be of low toxicity. Chlorinated paraffins are toxic for some of them. The smell of these products and their color could perhaps give quick information on toxicity but they are not today identified as reliable indicators.

Toxicity of chlorinated paraffins:

- Short-chain chlorinated paraffins (SCCPs) are becoming less and less common in the industry because of their environmental effects and carcinogenicity. They are classified in category X.
- Medium Chain Chlorinated Paraffins (MCCPs) are used in industry to replace SCCPs. They are considered less toxic than SCCPs and are categorized as Y.
- Long chain chlorinated paraffins (LCCP) are considered non-toxic.

Difficulties for the analyzes:

The french chemistry institute INERIS indicates in this regard in <u>a study</u> on chloroalkanes that "Whatever the analytical technique used, the characterization of the sample to be assayed (chlorination rate and distribution in carbon chains) is not easily achievable, making the choice of the reference sample difficult or even impossible." It is therefore impossible to know the chlorine content or the carbon chain lengths of the products falling on the beaches in reasonable time.

ENVIRONNEMENTAL IMPACT

While the environmental impact of plastic particles in the marine environment draws the general attention, almost no study addresses the ecological impact of paraffin discharges at sea. The analysis of the <u>Fulmars</u> <u>Boreal stomachs</u> on the German coast shows the presence of paraffins in <u>20% of cases</u>. Paraffin may also be confused with food by fish. The first consequences are a reduction of satiety and therefore a depletion of these marine animals. Finely fragmented, it may also be ingested by filtering organisms. Following the spill of 9000 tonnes of palm oil in Hong Kong in August 2017, an increase in fish mortality <u>has been reported</u>. In the United Kingdom, <u>domestic dogs died</u> in 2014 after ingesting palm oil washed up on beaches and in February 2013 more than <u>2,400 birds died</u> as a result of discarding polyisobutylene at sea (now classified in the Marpol X category). Once stranded, paraffins accumulate at the top of the beach and in the strand lines. This strand line have a major ecological role in the coastal ecosystem: they shelter and feed many scavengers that represent an important pantry for other species, including birds. The impact on these scavengers and the other species that depend on them is unknown.

ECONOMICAL IMPACT

In its report submitted to the OSPAR Commission in April 2017, the KIMO states that the cleaning costs generated by the various strandings in the OSPAR area were in each case up to several tens of thousands of euros. 91 accidents were recorded between 2012 and 2016 in 5 countries in the zone, affecting 37 communes over more than 300 kilometers of coastline. The costs that would be related to cleaning operations in France are unknown. The indirect impact on the tourism business is unknown.

CONSEQUENCES IN THE EASTERN CHANNEL

Strandings of paraffins and other substances that can solidify at sea are regularly observed or observed on the coast. The different forms taken by these products found on beaches testify to the practices in force on board ships in this area. Among all the waste that can be clearly identified, these are among those that show that the jet of waste overboard is still commonly practiced by members of some crews.



Block and plate from manual tank cleaning.



Block from clogged transfer pipes.



Stranding of "fresh" patties.



Stranding of various pieces.



Paraffins and other substances are also permanently present in the seashores as fragments. For example, in the Slack Estuary in January 2016, 11 pieces of paraffin and solidified grease were counted over the four meters of studied shoreline. Larger quantities have often been observed but not quantified.

MAIN STRANDINGS ON THE FRENCH EASTERN CHANNEL COAST

Since August 2016, four strandings of paraffin patties freshly discharged at sea have been observed on the Côte d'Opale.



Several dozen kilos of a pink paraffin washed up on 10 km between Wimereux and Ambleteuse. <u>Read the report</u>



About 3 tons of a white paraffin washed up on 30 km between Berck-sur-mer and Equihen. <u>Read the report</u>

July 2017



About 30 tons of a yellow paraffin washed up on 40 km between Quend and Le Portel. <u>Read</u> <u>the report</u>

October 2017



More than one ton of a white paraffin washed up on 50 km between Quend and Ambleteuse. <u>Read the report</u>

TOUGHTS ABOUT THE PROBLEM

1. Since one year, paraffin strandings have become recurrent on the Côte d'Opale.

This means that a new maritime traffic has been introduced for this product near the Dover Strait or that an existing traffic has intensified. This modification of the transport flows or their intensification may be explainable. A study of the North European production, import-export, storage and distribution activities of this product could provide some answers, especially if some changes have occurred recently in the region. The adoption of new international regulations is now well under way, but in the meantime, it seems obvious that the actors of this traffic



Vue aérienne d'une raffinerie locale. Source: <u>meretmarine.com</u>

must be quickly identified and solutions must be found with them to avoid new pollution events.

2. The "authorized" quantities discharged at sea have been exceeded three times.

The "authorized" release quantity thresholds were apparently largely exceeded in November 2016, July 2017 and October 2017. This could mean that the vessels were allowed to leave their port of discharge with incorrectly emptied tanks. It is also possible that the vessels had a too short travel time to discharge the residues of tanks cleanings in due form. If a regular traffic has been established or has intensified recently, it seems that it is not in line with international regulations. Knowingly, this new traffic should have been implemented with taking into account the constraints of time and distance from the coast. The economic pres-

sures on the Captains must therefore be identified and solutions must be found to enable them to conduct their maritime shipments under normal commercial operating conditions.

3. Biodiversity and local economic activities are in danger.

The Channel is characterized by a regular and important renewal of the water volume, but most of the time the prevailing winds push the surface waters towards the coast. Any discharge of paraffins is likely to strand on beaches. These strandings have an unequaled impact on the landscape heritage of our coastline, while this heritage plays a key role in the regional tourism economy. We are also sorely lacking in knowledge about the potential impact of these products on biological diversity when such quantities are present and accumulate in coastal

natural environments. Beyond the toxic or non-toxic aspect of the paraffins, while discharges are beein multiplied in the Channel, the local emergence of this practice should therefore be reconsidered in view of the consequences that it is likely to engender. At time, reassuring communications will certainly not be enough to convince tourists, beachgoers, seafood consumers, or the seafood products themselves.



Plagistes à Equihen.



Un capitaine de navire. Source: <u>gcaptain.com</u>

4. The affected beaches must be cleaned.

Several dozen tons of industrial paraffins have been stranded on the Opal Coast in just over a year and a large part is still present on the coast. A quantitative study should be carried out to evaluate and demonstrate the persistence of the product and to forecast the financial and technical means necessary for a targeted cleaning. Too few beaches have been seriously cleaned next to the strandings. This complicates the detection of new strandings when they are discrete and this can be catastrophic in the case of a stranding of a similar substance but whose toxicity would be high. Targeted systematic cleaning should therefore be carried out to protect against possible ecological risks, to preserve the landscape heritage, the tourist economy and to be able to detect any new arrivals.

5. Local actors have to be warned and more informed about the problem.

While "beach users" are numerous, some strandings were reported correctly to the competent authorities only one to three days after their arrival. During this time the paraffin patties can be remobilized by the tides or silted by the wind and the initial stranding area is then impossible to determine without too much uncertainty. All of this complicates or makes impossible to identify the vessel in question. Municipal technical service personnel, lifeguards, coastal natural area technicians, members of coastal sports clubs and even sea-side traders and restaurateurs could be made aware of this type of pollution and informed on the reporting actions to be taken when a stranding is witnessed. There are structures formed under the national Pollution Response Plans that could act as relays to inform the public and that could help collecting informations.

Very few cleaning operations have been carried out by the municipalities following the various strandings. In Germany, a group of independent experts working for the State, however, stipulated in its 2014 report that in case of paraffin stranding the beaches must be closed until they are cleaned. This is usually done in other European countries. In addition, some beaches have been cleaned with machines such as screeners or agricultural harrows with deposition of waste at the end of the beach. The results are catastrophic and this practice should be banned.



Passage of the sieving machine



machine

Used arrows

Results with the arrows

During strandings, the information received by the competent authorities is sometimes inconsistent or imprecise. No quantification protocol exists. This makes it impossible to compare different strandings in different countries. A protocol for evaluating stranded quantities could be written. It may include counting or weighing techniques depending on the quantities and size of the pieces encountered: use of quadrats of different sizes, use of different references of lengths of sea-shore: 1 meter, 2 meters, 10 meters ... This would allow quick and effective assessments of the pollution events.

6. The IMO and the concerned States must react as quick as possible.

The International Maritime Organization states that "maritime transport is a very positive force, whose contribution to the world's prosperity is considerable while its negative impact on the planet's environment is relatively low." Maritime transport wants to be virtuous by limiting its ecological and economic impact, but today in the

Channel, these two dogmas are undermined: economic prosperity of the region and environmental impact on the coast.

The International Maritime Organization drafts its regulations a posteriori of the incidents, accidents and pollutions. This is how it works since its creation, its reactions are slow, and it certainly still will be. Restrictions and discharge bans must be put in place urgently in the Channel and North Sea and they must be accompanied by heavy penalties for infringement : this is also how the IMO and its member States operate and usually ensure proper enforcement of regulations.

7. No improvement is expected with the planed new regulations.



In IMO works, it is planned to define the "substances that can solidify in seawater". This will normally make the prewashing with unloading of residues at berth mandatory for paraffins and other products. The actual methods used on board for cleaning the tanks show that conventional prewash is not efficient enough. We do not know if the residues from steam cleaning and manual cleaning will be included in the residues that will have to be unloaded at a receiving facility or if they can still be discharged at sea.

The three recent large-scale coastal discharges show that the residual quantities after

unloading can be very large. If these quantities were greater than the limits already foreseen by the Marpol, then the new rules will not change anything. Indeed, concerning our three major strandings, the Marpol already provides that such quantities of residues are unloaded either in a reception facility before departure, or in another port, but not at sea.

Several scenarios can explain these abusive discharges at sea:

1) No control is carried out by the State of the Port during unloading. In this case the master of the vessel is free to pre-wash his tanks at sea and to discharge the "residues" at sea.

(2) The Port State Inspector does not report the non-conformity of the unloading operations and authorizes the departure of the vessel without prewashing the tanks. In this case, the master of the vessel is authorized to pre-wash his tanks at sea and to discharge the "residues" at sea.

(3) The Port State Inspector reports the unauthorized discharge and authorizes the departure of the vessel without unloading the prewash residues. In this case, the ship's captain is responsible for pre-washing his tanks at sea and for discharging the "residues" at sea.

If these discharges were indeed illicit, the absence of a port reception facility for residues can not justify them and the presence of an appropriate installation constitutes an aggravating circumstance. Without surveys conducted at least to enforce the polluter-payer principle and fund cleaning operations, no improvement is possible and strandings will continue. The grounding of August 2016 which could be considered "normal" shows the impact of the legislation currently in force.

CONCLUSIONS

1. In the immediate future, the unloading ports from which the polluting ships come must be identified and technical and / or administrative solutions must be implemented as soon as possible to put an end to these polluting practices.

2. Once these malfunctions have been identified, the best cargo unloading practices and prewashing procedures must be re-evaluated with regard to the adhesion of these products to the tank walls in order so that the quantities discharged into the sea comply with the quantities authorized for liquid products and the Marpol Convention must be amended accordingly.

3. As soon as possible and whatever the method used, discharges of substances that can solidify at sea should be considered in the same way as substances of category X in Annex II of the Marpol in order to avoid any possibility of wrong interpretation of the rules and to put an end to discards at sea of "small quantities".

4. The collision between two ships in China in July 2017 caused the spill of 9000 tons of solidified palm oil. This event highlights the fact that these substances that solidify in seawater are currently transported on board IBC type 2 ships whose construction standards do not respond to potential risks. The standards imposed by the IBC code for these products should be revised upward with Type 1 ships.



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