

**CONTACT: DavidCampion@ITOPF.ORG**

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**Nurdles – one container, a billion problems.**

Plastics are an integral part of our daily lives; over the last 22 years, plastic production has risen from around 200 million to 380 million tonnes and this figure continues to rise. Due to its global usage, improper disposal and accidental losses to waterways, marine plastic pollution originating from terrestrial and maritime sources is ubiquitous. Plastic pollution from the maritime industry is linked to fishing activities, illicit waste disposal and the loss of containers during shipping incidents.

In 2019, approximately 226 million twenty-foot equivalent units were transported around the world by the global container carrying fleet. According to data collected by the World Shipping Council, on average, 1,382 containers were lost annually between 2008 – 2019 due to severe weather conditions and unforeseen incidents<sup>1</sup>.

To supply the global demand for plastic, significant quantities of pre-production plastic pellets are transported by sea in containers. Plastic pellets, or nurdles, are lentil-sized (typically < 5mm) pre-production raw materials used to fashion almost all day-to-day plastic items. Recent analysis estimates estimated around 230,000 tonnes of nurdles are lost to the environment annually<sup>2</sup>. Given that large quantities of this raw material are transported by containership, and based on recent shipping incidents, some of these losses are likely to originate from the maritime industry.

ITOPF is aware of eight shipping related incidents since 2011 involving nurdles (Table 1). This number may, however, be greater given the absence of a mandatory reporting system for lost containers.

**Table 1 – Known shipping related nurdle spills (2011 – 2022).**

Vessel	Location	Date	Number of Nurdle Containers Lost	ITOPF Involvement
M.V. RENA	New Zealand	2011	4	On-site*
Unknown	Hong Kong	2012	5	None
MSC SUSANNA	South Africa	2017	2	On-site
MSC ZOE	Netherlands	2019	UNKNOWN	Remote*
TRANS CARRIER	North Sea	2020	0 (13.2 MT released)	Remote
Undisclosed	South Africa	2020	6	On-site
CMA CGM BIANCA	USA	2020	4	None
M.V. X-PRESS PEARL	Sri Lanka	2021	UNKNOWN	On-site

\*Involved in case but not specifically in relation to nurdles.

In the last five years, ITOPF has responded to four significant spills of nurdles, each varying in magnitude of spill and extent of contamination, including the largest nurdle spill known to date, the X-PRESS PEARL incident. The estimated quantities lost have ranged from 50 to

<sup>1</sup> World Shipping Council (2020) - <https://www.worldshipping.org/>

<sup>2</sup> Eunomia (2016) - <http://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/>

10,000 MT and affected sites have included pristine remote locations along the Garden Route, South Africa, to chronically polluted shorelines in Sri Lanka. As a result of our involvement in the response to these key incidents, ITOPF has gained critical first-hand experience of the response challenges associated with recovering significant quantities of nurdles from the marine environment.

Whilst responding to the incidents listed in Table 1, ITOPF has observed many inter- and intra-related case issues. Table 2 summarises these issues within key thematic areas. This presentation will elucidate these common issues to help guide future response efforts and ensure the industry can benefit from the lessons learnt and improve its response effectiveness.

**Table 2 – Challenges faced by responders within key thematic areas across recent nurdle incidents.**

#	Thematic Area	RENA, 2011	MSC SUSANNA, 2017	TRANS CARRIER, 2020	South Africa, 2020	X-PRESS PEARL, 2021
1	<b>Carriage &amp; Packaging</b>	Plastic packaging is easily damaged once lost from the container resulting in spilt cargo.	Plastic packaging is easily damaged once lost from the container resulting in spilt cargo.	Cargo carried in a single dry bulk container liner, resulting in the rapid loss of nurdles once punctured.	Plastic packaging is easily damaged once lost from the container resulting in spilt cargo.	422 nurdle containers being carried onboard - 60% stowed above deck.
						Plastic packaging is easily compromised once lost from the container resulting in spilt cargo.
2	<b>Notification &amp; Organisation</b>	Unknown.	Quick to recover nurdles inside port.	Contaminant falls outside definition of acute marine pollutant. Responsible authority not clear under the national pollution control act.	Delayed notification of shoreline contamination following incident. Widespread contamination with limited response initially mobilised.	Quick emergency phase mobilisation but a slower project phase response organisation.
			Slower to mobilise response on beaches outside of port.	Transboundary incident.		Limited flow of information between parties.
3	<b>Modelling</b>	No available data on the behaviour of nurdles once released.	No available data on the behaviour of nurdles once released.	No available data on the behaviour of nurdles once released.	Inaccurate information on container loss location.	No available data on the behaviour of nurdles once released.
					No available data on the behaviour of nurdles once released.	
4	<b>Recovery Methods</b>	Rudimentary recovery tools.	Rudimentary manual recovery tools.	Rudimentary recovery tools.	Rudimentary recovery tools.	Rudimentary manual recovery tools.

#	Thematic Area	RENA, 2011	MSC SUSANNA, 2017	TRANS CARRIER, 2020	South Africa, 2020	X-PRESS PEARL, 2021
			Mechanical trials relatively ineffective.			Mechanical trials relatively ineffective.
5	<i>Endpoints</i>	Novel concept - no standardised clean-up goals defined.	Novel concept - no standardised clean-up goals defined.	Novel concept - no standardised clean-up goals defined.	Novel concept - no standardised clean-up goals defined.	Novel concept; no standardised clean-up goal defined.
					Lost containers remain unlocated.	Toxicity of burnt and unburnt nurdles unknown.
6	<i>Environmental Monitoring</i>	Unknown.	No monitoring.	Investigation into impacts to eider ducks.	No monitoring.	Toxicity and hazardousness of burnt and unburnt nurdles remains unclear.
				Long-term impacts unknown.		Long-term impacts of large single release of plastic unknown.

Over the course of the incidents listed in Table 2, ITOPF has experienced many recurring issues. In the first instance, concerns related to the stowage and packaging of nurdles continue to exist, inherently increasing the risks of plastic pellets being lost to the marine environment. Once lost, challenges related to locating the nurdles, response organisation and nurdle recovery results in this type of incident becoming protracted and expensive.

Notwithstanding, there is growing attention, and subsequent action, from within the industry on the consequential issue of plastic pellet loss, particularly regarding the carriage of nurdles, notification of lost containers and development of new nurdle recovery tools. However, as some challenges are overcome, others become more prevalent. Whilst ITOPF has developed a deeper understanding of the practical challenges involved in nurdle response, the organisation, and the wider industry, remains unclear on the full extent of environmental consequences related to these catastrophic losses of plastic. In the case of the recent X-PRESS PEARL incident, assessing potential environmental damage has become more pertinent due to the involvement of burnt plastics and other hazardous and noxious substances involved in the incident. Highlighting where knowledge gaps remain, as a means to develop a complete understanding of the actual consequences of such losses, is essential to adequately prepare for the risks associated with the future carriage of plastics.