

# Preventing plastic pellet loss in supply chains

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Design of a supply chain approach to prevent pollution from plastic pellets.


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## Report for Zero Waste Scotland

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### *Disclaimer*

Eunomia Research & Consulting has taken due care in the preparation of this report to ensure that all facts and analysis presented are as accurate as possible within the scope of the project. However no guarantee is provided in respect of the information presented, and Eunomia Research & Consulting is not responsible for decisions or actions taken on the basis of the content of this report.





# Executive Summary

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This report describes the contents and conclusions of a programme of stakeholder engagement, discussion and development intended to inform the design of a supply-chain management system with the aim of preventing environmental pollution from plastic pellets.

The programme has considered the views and proposals of a wide range of stakeholders, including government, regulators, environmental organisations, standards organisations, industry bodies and businesses. It has included extensive stakeholder dialogue and a series of site visits. In the course of this project, the development of related programmes has been mapped and, where possible assimilated with a view to ultimately informing a single, robust international supply chain management system for pellet pollution prevention.

The resulting system design integrates all these elements and will be taken into consideration for the development of a fast-track standard, in the form of a Publicly Available Specification (PAS): a fast track standardisation process pioneered by BSI. PASs are typically sponsored by industry and government partners. The PAS development project is at the scoping stage: the project will be initiated once all sponsors are in place. The PAS project will be led by a BSI Project Manager; a dedicated Steering Group and Review Panel will be established to inform the content of the PAS through a rigorous consensus-based process which is expected to take between nine and twelve months to complete. It is intended that the PAS will be relevant to an international audience.

The proposed system design:

- is based on the guidance and management principles of Operation Clean Sweep (OCS) and is aligned with recognised standards such as ISO 9001, ISO 14001, BRCGS, etc. but does not require any of these;
- requires a programme of external audits by an accredited auditor but seeks to minimise additional costs and disruption by integrating with existing audit programmes;
- includes a compliance register (some parts of which are publicly accessible) which helps with implementation, transparency and operation, particularly for smaller businesses.

It is recommended that the next steps should be:

- the proposed system design should be considered while developing the PAS and promoted through the PAS Steering Group;
- development work should be undertaken with audit accreditation bodies to establish criteria for auditor accreditation;
- further work should be undertaken into the design and implementation of the compliance register;

- in anticipation of the system's implementation, Scottish businesses handling plastic pellets should be encouraged and supported to demonstrate evidence of improvements to their pellet handling practices;
- further testing of the system developed should be carried out to:
  - inform the PAS development process,
  - iron out any practical issues that may arise and
  - inform further recommendations to support implementation including training and workforce development implications.

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# 1.0 Introduction

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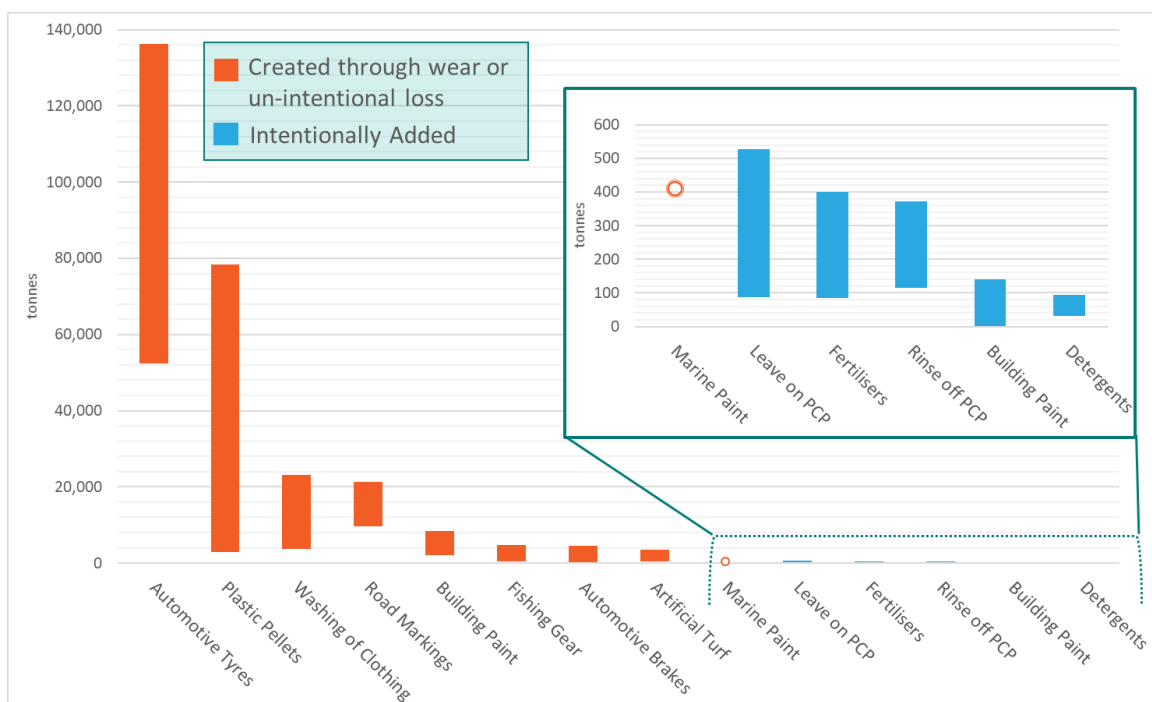
## 1.1 Background

Microplastic pollution is a problem that has been growing exponentially for many years. Its presence in the marine environment has recently come to the fore with programmes such as the BBC's Blue Planet 2 and Sky's Ocean Rescue. This increase in focus in the public arena has been mirrored in regulatory interest, notably at EU level by DG Environment, which commissioned a report last year on "investigating options for reducing releases in the aquatic environment of microplastics emitted by (but not intentionally added in) products<sup>1</sup>."

Figure 1 below shows the estimated range of the relative contribution of various sources of microplastic pollution emitted to the aquatic environment in the EU. (Note: these data concern plastic pollution emitted to the marine environment in that format; they do not include macroplastic pollution which has degraded to a smaller size.

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<sup>1</sup> [https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/microplastics\\_final\\_report\\_v5\\_full.pdf](https://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/microplastics_final_report_v5_full.pdf)



Source: Eunomia and Amec Foster Wheeler modelling

**Figure 1: Estimated Annual Emissions of Microplastics to Surface Water<sup>2</sup>**

This shows that, after automotive tyres, plastic pellets is the most significant source of this type of pollution; the inclusion of powders and flake (see Scope in Section 1.2.1) will increase this.

The report for DG Environment concluded that the most cost-effective approach to minimising future microplastic pollution from plastic pellets would be the introduction of a system that combines accredited third-party auditing with chain-of-custody management to demonstrate that best practices are applied across the supply chain, to ensure compliance with best practice across the industry, and around the world.

The Scottish Government supports the plastic industry's 'Operation Clean Sweep<sup>®</sup>' (OCS) which aims to reduce pellet loss, and in November 2018 convened representatives from industry and NGOs to form a steering group. This group recognised that while progress has been made, further action is needed to fully address this source of pollution and maximise preventative action; and that using agreed standards and/or certifications

<sup>2</sup> Marine paint has no range associated with its estimate as emissions are direct to the marine environment.

Building paint is included twice, once for intentionally added losses and again for losses due to wear during the life of the paint.

across the whole supply chain could be an effective approach. The Scottish Government asked Zero Waste Scotland to lead on a piece of work to develop and trial such an approach with industry that will tackle pellet loss across the full supply chain, and which can demonstrate progress by 2020, avoiding the introduction of further legislation.

This work has been undertaken over the past six months by Eunomia Research & Consulting Limited with further technical expertise provided by Nextek. This document reports on the progress, findings and conclusions of that work.

## 1.2 Aim

The aim of the project is to develop a supply-chain approach to tackling pellet loss. The primary goal is to develop a robust approach that can ensure prevention of pellet loss to the environment at each stage of the plastic supply chain. The intended outcome of the project is a well-designed system which gives assurance to all stakeholders of plastic products (e.g. retailers, brand-owners, governmental, regulators, investors, industry, non-governmental organisations, buyers and the public) that their supply chain is handling pellets responsibly and effectively to prevent their loss to the environment.

### 1.2.1 Scope

The proposed system applies to all forms of pre-production plastic pellets, flakes and powders, including recycled material. Throughout, all forms of plastic in this type of bulk format are referred to as “pellets.”

The proposed scheme applies to:

- industrial businesses that physically handle plastics;
- companies which form part of the supply chain, but which do not physically handle pellets;
- companies which handle but do not at any point own the pellets;

within the following supply chain sectors:

- **Plastics Industry**
  - Resin manufacture, reprocessor;
  - Interim processors (masterbatchers, compounders);
  - Product and packaging manufacture (converters);
  - Recyclers.
- **Logistics Industry**
  - Warehousing;
  - Haulage;
  - Repackagers;
  - Shipping;
  - Port handling;
  - Port authorities.
- **Retail**
  - Any business selling plastic products.

It does not include non-physical industry stakeholders, such as brokers and shipping agents. The system is based on a chain-of-custody approach to maintain responsibility for the safe handling of this material, so organisations which do not physically handle pellets, or the products they are made into, do not need to be included.

The proposed system is designed to avoid duplication and to make use of other systems, whether they are already in use or yet to be developed. For example, if a certification system was subsequently developed that focused specifically on recyclers, it can be integrated into the wider system to connect the supply chain.

### 1.3 Approach

The underlying premise of this project is that pellets in Scotland are known to be escaping into the aquatic environment and that those pellets are thought to be a significant contributor to the problem of marine microplastic pollution.

Estimates suggest that only a tiny proportion of pellets handled are likely to be lost. However, the large-scale use of this material means this is still a source of significant microplastic pollution escaping to the environment. This has been recognised by industry, and stakeholders, as unacceptable.

The foremost solution currently available is Operation Clean Sweep<sup>®3</sup> (OCS). OCS is a toolkit of guidance, procedures and templates developed by the American Chemistry Council and Plastics Industry Association in the 1990s; in the UK it is offered as a voluntary solution to pellet handling companies by the British Plastics Federation (BPF). The BPF's OCS web page describes the commitment of BPF members who have signed up to use the OCS toolkit<sup>4</sup>: "by signing up to Operation Clean Sweep<sup>®</sup>, companies make a commitment to adhere to best practice and implement systems to prevent plastic pellet loss, and that they will play their part in protecting the aquatic environment."

However, OCS is a voluntary initiative which currently has no system of verification or supply-chain obligation. Since 2018, PlasticsEurope has required its member companies to report on their OCS implementation through a questionnaire. Aggregated results are published annually into an OCS report<sup>5</sup>. From 1 January 2020 PlasticsEurope will make OCS sign-up compulsory for its members.

It is of critical importance to the Scottish Government that companies which do comply with operational best practice (e.g. as set out in OCS) are supported, and their efforts recognised. However, it is widely acknowledged that best practice is not in place in all companies handling pellets.

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<sup>3</sup> <https://www.opcleansweep.eu>

<sup>4</sup> [https://www.bpf.co.uk/Sustainability/Operation\\_Clean\\_Sweep.aspx](https://www.bpf.co.uk/Sustainability/Operation_Clean_Sweep.aspx)

<sup>5</sup> Latest edition of the OCS report: <http://www.opcleansweep.eu/operation-clean-sweep-report-2018/>

According to data from the Office of National Statistics, made searchable on the NOMIS website<sup>6</sup>, in 2018 there were 6,115 listed companies registered as a manufacturer of primary plastic or plastic products in the UK (UK, rather than Scottish data, are used to allow comparison with OCS signatories across the UK). BPF lists 134 UK companies as signatories to OCS. As the number of OCS signatories accounts for less than 2% of the listed companies, it seems that there is some way to go before OCS is universally adopted. Although some non-members of BPF (e.g. hauliers) are listed as OCS signatories, the organisation's focus is on their members, so does not include the whole plastics supply chain. All UK signatories can be found on the European website of OCS<sup>7</sup>. No published data are currently available on the actual application of OCS by UK companies signed up to use the toolkit, except for plastics producers (PlasticsEurope members).

During the site visit stage of this project, the team audited several companies which are OCS signatories, and one which was not. Across the board, the companies visited demonstrated a wide range in terms of their implementation of best practice. The OCS programme offers the flexibility for signatories to implement best practice solutions that suit their company best. Among the OCS signatories visited, the quality and effectiveness of implementation was varied. This suggests that simply signing up to a voluntary commitment may not be enough to ensure consistent and effective implementation of best practice. OCS is a good base to build upon, but it is not externally audited or verified, so there is currently no method of ensuring that signatories are applying best practice.

Wider and more consistent adoption of best practice by all actors handling pellets will eventually ensure that all products are supplied through responsible supply chains but the evidence is that currently, this approach is not sufficiently widespread or consistent to be effective.

### 1.3.1 Duplication

The aim of the project is to design a system which gives assurance to stakeholders that their supply chain is handling pellets responsibly, and effectively preventing loss to the environment, but to do this while adding as little additional burden to the industry as possible.

Existing standards will be used wherever possible. In addition to OCS, discussions with stakeholders and the Steering Group indicated that the new international chain-of-custody standard, ISO 22095<sup>8</sup> should be used as the template for the chain-of-custody

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<sup>6</sup> <https://www.nomisweb.co.uk/>

<sup>7</sup> <http://www.opcleansweep.eu/partners/>

<sup>8</sup> <https://www.iso.org/standard/72532.html> (under development)

framework, while existing standards such as ISO9001<sup>9</sup>/14001<sup>10</sup> or BRCGS<sup>11</sup> could be used to embed best practice into site operations, and as a mechanism for auditing. This approach aims to minimise duplication, disruption and cost but does mean that the system must include minimum requirements from these standards. For example, a company which uses its ISO 14001 environmental management system (EMS) to achieve best practice with the pellet management system would need to ensure that EMS procedures covered all the aspects described in Section 2.0 below.

In addition, following submission of the final draft of this report, it emerged that PlasticsEurope is developing with the plastics supply chain an assessment scheme with third party auditing on OCS (see below section 1.4.3).

## 1.4 Progress

As the project has developed, it has become apparent that various other parties are also working on the problem. These include PlasticsEurope, British Plastics Federation, BSI, and a consortium of NGOs including Fidra, Fauna & Flora International and ECOS, all of which are represented on the Steering Group. Given the international nature of the plastics supply chain, discussions with the project Steering Group confirmed that all parties agree that what is required is a common, internationally recognised mechanism for the control of plastic pellets and a common framework to ensure its application across supply chains. To this end, all the above parties have co-operated with this project towards this common goal.

Two standards that are of particular relevance are currently under development:

- the ISO 22095 international standard for chain-of-custody systems, recently issued in draft; and
- the British Standards Institutions (BSI) Publicly Available Specification (PAS), “Management of pre-production plastic pellets across the whole plastic supply chain – Specification”, the development of which is expected to begin soon.

### 1.4.1 ISO 22095

The draft release of ISO 22095 was issued on 27th August 2019, so the consultation process has just started, however the draft itself is the result of many months of work by the technical committee. The standard covers the requirements for a chain-of-custody system, independent of the characteristics being tracked, so it can be applied equally to products (e.g. organic food, or sustainably sourced timber) or processes (e.g. child labour, or OCS compliance). The existence of an international standard, together with agreement among interested parties that a single, international solution is required,

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<sup>9</sup> <https://www.iso.org/iso-9001-quality-management.html>

<sup>10</sup> <https://www.iso.org/iso-14001-environmental-management.html>

<sup>11</sup> <https://www.brcgs.com/>

appears to make adoption of this standard the obvious solution for this element of the pellet management system.

However, it should be noted that ISO22095 is a generic chain-of-custody standard. While it established important principles and requirements for a compliant system, it is not in itself sufficient to cover the requirements of this element of the pellet management system.

## 1.4.2 PAS

The BSI PAS development process is now expected to start in early 2020. The PAS development process relies on sponsorship from and support by interested parties including Industry, Government and Trade Associations, which provide funding for its development.

Through this funding BSI can assign a BSI Project Manager to manage the project, a Technical Author to write the PAS and convene a dedicated Steering Group and Review Panel of key stakeholders from across the industry.

As the UK's National Standards Body, BSI has the responsibility to ensure the Steering Group and Review Panel is a fair and transparent representation of all stakeholders in the industry. Once the project is initiated, the BSI Project Manager will carry out extensive stakeholder research and make the final decision on the composition of the Steering Group and Review Panel.

The Steering Group meets several times during the development of the PAS to raise comments on the PAS in draft form. These comments are discussed and resolved through a consensus-based process and the PAS is then taken through a Public Consultation phase to ensure all comments are considered from a wider list of Review Panel members. Anybody with an interest in the topic area can register their comments on the BSI Standards Development Portal for consideration of the Steering Group members.

The PAS mechanism has been successfully implemented in similar circumstances; the following are a few of the more relevant examples:

- PAS 2060:2014 Specification for the demonstration of carbon neutrality;
- PAS 7000:2014 Supply chain risk management - Supplier prequalification;
- PAS 2080:2016 Carbon management in infrastructure;
- PAS 100:2018 Specification for composted materials.

At the time of writing, the draft scope of the PAS is as follows:

*“Request to develop a specification that sets out the requirements for identifying, managing and reporting the effectiveness of measures to prevent plastic pollution from the leakage of pre-production plastic pellets across the supply chain, to be relevant to an international audience.*

*The standard may also include one or more of the following:*

- *Identification of flows and leakage hotspots of pre-production plastic pellets in the supply chain (establishing a traceability process incorporating all actors making, using or transporting pre-production plastic pellets);*
- *Identification of the mitigation measures by building on the existing Operation Clean Sweep<sup>®</sup>, which is essentially a toolkit of pellet management best practices designed by the industry that can fully prevent or mitigate leakage of pre-production plastic pellets into the environment when it is effectively implemented;*
- *Identifying how different parts of supply chain share information on the flows, management and potential leakage of pre-production plastic pellets;*
  - *Mapping the supply chain and how it transfers information;*
- *Will include all parts of the plastic supply chain, which will be confirmed by the PAS Steering Group and Review Panel.*

*This standard will be for use by pellet handling companies in the supply chain and brands/retailers that have a reputational damage risk from pre-production plastics in their supply chain both in the UK and internationally.*

Although it may not be appropriate for such detail to be included in the draft scope, it is notable that there is no mention of external verification, the possibility of non-compliance, or a commitment to purchase only from compliant suppliers to ensure the integrity of the supply chain approach, all of which are requirements of the NGOs which have been involved in this project. However, BSI have commented that the PAS is being written as a specification setting out requirements, specifically so a certification scheme can be developed once the PAS is published. The steering group will agree the scope for the PAS.

Once the PAS development has been initiated, the BSI Project Manager carries out extensive due diligence into the composition of the PAS Steering Group. Through this research key stakeholders will be identified and approached to become members of the Steering Group. These stakeholders will come from academia, industry (potentially represented by Trade Associations), NGOs, Government and Consumer Groups.

It is our understanding that several members of the Scottish Government steering group may be invited to contribute to the PAS technical committee, although at the time of writing this report, the composition has not been confirmed. The current draft proposed stakeholders' group includes Eunomia, FFI, the Environment Agency and the European Commission but is otherwise made up of industry representatives. The work of the PAS steering group is critical to the success of this project, so it is important that the lessons learned can be fed directly into it. To this end, it is important that the full range of interests is represented on the PAS steering group.

### **1.4.3 Industry led initiative to develop an OCS third party auditable scheme**

During the development of this project, PlasticsEurope committed independently to initiate the development of an OCS certification scheme. To this end, PlasticsEurope developed a set of OCS minimum requirements that should be used as the basis of a future transparent auditable scheme for the management of pellet loss in Europe. The



aim is to develop new standalone modules on pellet loss and OCS implementation that are compatible with existing management system standards. This way, the modules can either be integrated in any appropriate management system worldwide or can function as standalone certification for companies having no management system. PlasticsEurope has been developing the scheme jointly with other European trade associations representing the plastics supply chain.

The development of these modules was not shared with the Steering Group until after the final draft of this report was submitted, so it has not been integrated into the system design development process. However, the proposed system design is entirely compatible with a set of modules to make OCS auditable, either in its own right or when integrated into other management systems, provided of course they are effective in preventing pellet loss.

#### 1.4.4 Summary

These developments provide specific options for building on industry progress to date and, if applied together, they can underpin a solution that can apply across supply chains, and which is externally verifiable and transparent.

This report integrates the findings of the research and site visit programme in the context of these parallel developments. It specifies how a chain-of-custody system compliant with ISO 22095, together with a PAS to implement best practice in pellet management, can be integrated to develop a system which will verify the procedures in place at each link of the supply chain. It also provides justified recommendations for the development of auditable best practice standards for plastics supply chain businesses that can be considered by the PAS Steering Group.

Finally, in Section 2.3.5, the project report identifies strategies and associated procedures to ensure uptake of the proposed system across the supply chain and in relation to workforce planning, to enable the steering group to ensure that workforce changes are successfully embedded. A summary of these deliverables and how they relate to the requirements of the tender is provided in Appendix **Error! Reference source not found.**

## 2.0 System design

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The basic principles upon which the proposed scheme is designed are as follows:

- The proposed scheme is built around all organisations carrying out the procedures laid out in the Operation Clean Sweep® (OCS) code of practice, or equivalents. It contains no additional technical standards of its own.
- Organisations of all sizes can participate in the proposed scheme. No exemptions will be applied to smaller organisations or lower levels of throughput (although assistance may be available from e.g. economic development agencies).

- Voluntary participation – organisations are not obliged to participate in the proposed scheme. However, buyers may include certification as a requirement in their procurement policy. The final scheme should be compatible with a regulatory approach should that be required, and appropriate, to drive uptake.
- Mandatory disclosure – compliant organisations will be listed on a publicly available online database.
- Centralised accreditation body – organisations can be audited by any certified body but compliance is logged with a single central authority.

In discussions with all interested parties, a common definition has arisen whereby the proposed system for preventing plastic pellet pollution is split into a “mechanism” and a “framework:”

- The mechanism refers to that part of the system which ensures that individual sites reduce this source of pollution through compliance with standardised best practice based on the OCS guidance. It includes training, procedures, infrastructure, internal and external auditing, including a process for identifying and remediating non-conformances;
- The framework refers to the chain-of-custody system which ensures that only compliant sites are included in the supply chain of compliant products.

This approach was thought to align with the scopes of the PAS and ISO22095 but in the Steering Group meeting on 4<sup>th</sup> September 2019, it became apparent that the structure of the PAS may include the chain-of-custody requirements, albeit referring to the requirements of ISO22095. The following description of the proposed system design has therefore been amended to align with this approach.

## 2.1 Scope

The first step in OCS is to sign the “Pledge to Prevent Resin Pellet, Flake and Powder Loss.” A system which certifies compliance with standardised best practice based on the OCS guidance must therefore have a goal of zero loss.

However, OCS does not clarify what “loss” means. If pellets are spilled, then recovered in a condition in which they can be used for their original purpose, they are not lost, so OCS best practice does not require the elimination of spills. However, if recovered material is too contaminated to use, or can only be used for another (usually lower value) process, this may be considered a loss. If material is lost altogether (e.g. it escapes into the environment), then it is not only lost to that specific process but is an unmanaged leak from the economy and a contribution to environmental pollution.

The motivation behind this project is the prevention of environmental pollution from plastic pellets, so material lost into the environment is certainly in scope. The system is not primarily concerned with the loss of material resulting in material inefficiencies, only its impact on the environment, so material that is contained is not in scope.

### 2.1.1 Alternatives

Three main alternatives to this scope were considered. One would require only that pellets do not escape from the site; any spills within the site boundary would be considered normal working practice, with physical measures such as netting on fences and drain covers containing them. The other was a zero-tolerance approach to any spillage. The third has been proposed by the American Chemistry Council (ACC), who are proposing that a spill of more than one pound of polymer to ground or water as a release, if not recovered, should be recorded.

It was widely agreed by representatives of sites visited and the Steering Group that a system allowing any amount of spillage within the site boundary was too lax. While it would in principle provide environmental protection, in practice it was agreed that it would not. A strong correlation was observed during the site visit programme between spills and general housekeeping: in essence, it takes the same amount of effort to maintain a site in any condition, but where a site is comprehensively cleaned and then kept clean, there is less likelihood of pollution.

While it has significant advantages in terms of simplicity and environmental protection, feedback and observations during the site visit programme demonstrated that the zero-tolerance approach was not practical. Some of the best-run sites had several layers of containment, excellent training and procedures and a regime of regular inspection and cleaning. This approach was thought very unlikely to allow any significant escape of pellets but there were still several places where they could be seen.

The ACC proposal is thought to be the only attempt so far to apply the same principle to pellet pollution as is applied to other forms, e.g. a certain dilution is acceptable. However, there are difficulties with this approach, in that the principle of an acceptable environmental concentration is based on the environment's ability to degrade pollutants over time, which does not apply in the case of plastic pellets. It does have the advantage of setting a limit, which might be thought preferable to an aspiration, such as zero loss, however we feel that it would represent a dilution of ambition, by implying that a certain amount of pollution was acceptable.

A wide range of options, including those described above, have been discussed with the various consultees, many of which have internal synergies which then have implications for other elements of the system. The system proposed below, and summarised in Section 2.4, represents what we believe to be the optimal approach, taking all these issues into account. Where a decision has been made to favour one approach over another, the alternatives are discussed in each section.

## 2.2 Compliance

As discussed above, the principle of the proposed system is to provide a structure by which consumer pressure can be applied to prevent pellet pollution by encouraging best practice throughout the plastics supply chain. For this to work, there must be an incentive for businesses to demonstrate best practice, and for that to be possible, there must be some way of discerning what best practice is, and what it isn't.

The proposed system builds on the definitions set out above, using a system of external audit, non-conformance and corrective action to drive continual improvement. While the system is designed to give every incentive and every opportunity for businesses to improve, it must include the ability to fail. If a business is causing pellet pollution, is shown that it is doing so and given an opportunity to correct this, yet fails to do so, it must be declared non-compliant. The same applies to a business whose operating procedures present a significant risk of pollution, which is not subject to improvement. In the supply chain model, the percentage of compliant material in finished product can only be increased by procuring preferentially from compliant companies, so ultimately the incentive to comply is to stay in business. Furthermore, this recognises and rewards the businesses that do apply best practice measures effectively.

The purpose of the compliance element is to provide assurance that businesses have prevented pellet loss, however:

- as described above, there are degrees of loss;
- the compliance element must give opportunity and encouragement to improve;
- there must be potential for sites to fail.

To incorporate these influences, and to avoid duplication, it is proposed that the system should use an approach that will already be familiar to anyone operating an ISO management system: non-conformance and corrective action.

The following definitions have been generally agreed amongst consultees:

1. The site boundary is defined as the physical extent of the land owned by the company, including the point at which surface water drains and sewers discharge into the public sewer or controlled waters.
2. During either the regular internal inspections or site audits, or at any other time, any instance where pellets are released across the site boundary, or where there is an identified risk of this happening, will result in a non-conformance. A non-conformance triggers an immediate requirement for a root cause analysis to identify the source and reason for the spill, followed by a detailed plan of corrective and preventive action, including deadline, resources and responsibility.
3. Any instance where pellets are found outside primary containment (e.g. silo, bag) but within the site boundary will result in an observation. Observations are logged and reviewed on a regular basis with reference to the site risk assessment and continual improvement.

This mechanism, and other elements of the overall system design, are summarised in Section 2.4.

### 2.2.1 Auditing

The proposed system will include an external audit by an accredited auditor, at least annually including assessment of:

- Risk assessment;
- Relevant procedures, specifically including:

- transfer of pellets from and to other businesses and intermediaries;
- implementation of best practice to minimise the risk of spills;
- action following spills;
- treatment, handling and disposal of spilled material;
- site inspection, monitoring and records;
- control of contractors, including training and records;
- procurement policy, approved suppliers register and purchasing records;
- communication of compliance issues with suppliers and customers;
- Training records;
- Incident logs, including:
  - Root cause analysis;
  - Record of remedial action;
  - Record of action to prevent recurrence;
- Internal audit records, including:
  - Regular site inspections, including:
    - Site boundary (where appropriate);
    - High risk locations both within and outside site boundary (e.g. outfall pipes, loading bays);
    - Any material outside primary containment.
  - Regular review of incident logs, including near-misses;
  - Review of above procedures.
- Evidence of continual improvement;
- Visual inspection.

This approach will be familiar to anyone already operating an ISO management system, such as ISO9001 (Quality), ISO14001 (Environment) or ISO45001 (Health & Safety). The aim is to minimise the additional burden on businesses where possible, by adding compliance audit requirements to their existing audit programme. While this will extend the requirements of the audit, and therefore the time required and cost, it will minimise disruption.

This approach requires that the system includes a register of accredited, qualified auditors. It is assumed that UKAS-accredited ISO auditors will be capable of delivering this service for sites, and SQAS should be able to do the same for hauliers. BRCGS has not included plastic pellets in the current edition of their Global Standards requirements but a competent BRCGS auditor should be able to audit against the requirements of this system.

Auditors will be able to make use of OCS guidance to inform their site inspection and their assessment of the efficacy of procedures developed by the businesses they are auditing.

Business which are part of the plastics supply chain but which do not directly handle pellets themselves will only need to comply with the chain-of-custody elements of the system.

## 2.2.2 Non-conformance and corrective action

While the system must include the possibility of non-compliance, it must also take every opportunity to assist and support businesses trying to improve. Because the system is intended to be used internationally and right across the entire plastics supply chain, rather than developing a “compliance-ready” version of OCS, compliance is independent of any particular approach: it doesn’t matter how you go about minimising pellet pollution, as long as you do. However, this does not mean that the extensive development work that has gone into OCS should be ignored. It is an excellent toolkit of pellet management best practice which, if robustly implemented, will lead to the minimisation of pellet loss.

When an auditor identifies a non-conformance, this is highlighted in the audit report. The business is then required to identify:

- how the non-conformance has happened,
- what the underlying cause was,
- the estimated scale of the (potential) spill;
- what steps are suggested to remediate,
- what steps are suggested to prevent recurrence,
- the responsibility, resources and timescale to implement these steps.

The process for dealing with non-conformances found during the audit will depend to some extent on the scheme that is being used to audit the system, however the minimum requirements should include:

The business will send the auditor a programme of actions designed to address the non-conformance, including details of responsibility, resources and timescales for corrective action. The auditor then reviews, amends and approves this programme which the business must then implement. Once implemented, evidence is sent to the auditor for review. When the auditor is satisfied that the required remedial actions have been taken, the business is certified as compliant for another year. Failure to satisfy the auditor that the required steps have been taken would result in the business failing the audit and being removed from the public register.

## 2.2.3 Alternatives

The proposed system aims to minimise the additional burden of compliance, and of demonstrating compliance. However, there is such a burden and it is likely to fall disproportionately on smaller businesses and those with poorer performance. Opportunities to address these issues are set out in Section 3.0 below.

Consideration has been given to feedback suggesting the use of incremental methods of introduction, such as a maturity matrix, to facilitate introduction of the system. These are discussed in Section 2.3.4 below.

Earlier versions of the proposed system were perceived to have focussed too much on an annual external inspection of the site and operations, with too little emphasis being

placed on the risk assessment processes and operational procedures which ensure best practice year-round. This misconception has been remedied in this report, which seeks to emphasise the importance of these internal processes in the context of preventing the loss of pellets to the environment.

A system without requirement for compliance with minimum standards is not recommended. While this approach has had some success over the past twenty-five years, it has not achieved the goal of zero pellet loss. This is recognised by many in the industry, resulting in programmes such as this, seeking to build on the progress achieved to develop a practical and effective system.

## 2.3 Chain-of-custody

For the chain-of-custody element, the proposed system once again aims to take the simplest effective route, to minimise the additional burden on participating businesses. Taking account of experience from other chain-of-custody systems and discussion with stakeholders, this is thought to be as follows:

- Establish a public register of compliant businesses;
- Require that a condition of compliance is that businesses purchase raw materials only from compliant businesses;
- Audit the approved suppliers list and purchasing history of businesses during annual audits.

As with any chain-of-custody approach, there are difficulties in the implementation phase, which are discussed in Section 2.3.4 below. In terms of operational practicality, this is thought to be the simplest approach.

The chain-of-custody element of the system must be linked closely to the handover requirements for compliant businesses, as it is essential that it includes parts of the supply chain which may not actually have custody but which do handle pellets, such as hauliers, port authorities, berth operators, logistics and shipping companies.

### 2.3.1 Transfer of custody

In principle, the management of pellet loss at manufacturing premises is straightforward, as demonstrated by the best performing sites. There are various issues that can degrade best practice, such as site infrastructure, management or finance, as demonstrated by the less accomplished sites, but these are rarely insurmountable, and they are expected to become more manageable as pellet control becomes more of a priority.

However, throughout the consultation and site visit programmes, it became apparent that damage in transit was a significant problem, requiring particular attention. In the journey from manufacturer to user, several parties can be involved, each of which must be covered by the chain-of-custody system. For example, a pallet-load of 25kg bags of American pellets was observed in a yard in Scotland, with a hole in one bag. It is unlikely to have left the manufacturer's site in that condition, but it could have been damaged at any point from loading onto the haulier's truck, through US distribution, storage, loading, shipping, unloading, UK distribution, storage, haulage and unloading. If the

damage is not noted until the delivery is accepted, then there is no way to establish where the damage occurred.

The simplest procedure for managing this element of the system is an inspection and signature of acceptance at handover, forming part of the audited procedures of each compliant business. However, a more sophisticated system is recommended to facilitate both initial implementation and subsequent operation.

Implementation of the system requires development of a weighted mass-balance reporting system (discussed in Section 2.3.4 below). This will require recording not only whether a consignment has been delivered by a compliant haulier but also which other businesses it has passed through. Systems of this kind are in use around the world for processes such as package tracking; when ordering online, it is common for a unique tracking code to be issued with the electronic receipt, so that progress with dispatch and delivery can be monitored. It is only practical to do this using an online register, so that an incoming consignment can be checked against the database of compliant companies, and the system can track it through the supply chain.

This level of detail of purchasing information would be considered commercially sensitive, so this element of the register should not be publicly accessible. However, different levels of access would be available to stakeholders as appropriate; for example, retailers would be able to check the history and content of their products.

### 2.3.2 Responsibility

Existing chain of custody systems (e.g. organic food status, Forest Stewardship Council, Marine Stewardship Council) are operated by commercial (albeit non-profit) organisations. There may be several such organisations fulfilling separate roles within the overall process, e.g.:

- Oversight
- Audits
- Accreditation of auditors.

For example, the system of sustainable forest certification has multiple actors:

- The European Commission defines its criteria for certification schemes that should be 'voluntary, credible, transparent and non-discriminatory... an essential point in ensuring credibility is the independent audit of forest management'<sup>12</sup>.
- There are various certification schemes, including FSC, that fulfil these requirements and provide a standard for companies to be certified against.
- FSC (for example) does not run its own audits but has a set of accredited FSC certification companies that can be used by businesses to gain accreditation.

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<sup>12</sup> <https://ec.europa.eu/environment/forests/fcertification.htm>



- FSC is a member of iSEAL, the sustainable standards association, which reflects certain criteria including independent accreditation of the FSC standard by a further body.

While the proposed system will begin in Scotland, it must be designed so that it can be deployed worldwide. The framework described in this report would allow this.

### 2.3.3 Compliance register

A fully competent chain-of-custody system requires that all links in the supply chain are compliant. To ensure that this is the case, compliant companies must ensure that their suppliers are also all compliant. This can be achieved by each compliant company maintaining a register of approved suppliers. This is already a requirement for other standards such as ISO9001). This process can be facilitated by the establishment and maintenance of a compliance register. However, it would be possible for individual companies to check that all their suppliers are certified as compliant, and this process can form part of the audit process.

One issue which still requires resolution is the nature of the entity which would be responsible for the operation of the compliance register. There are parallels in a national context where this function is undertaken by government, such as the Turkish waste register, UK Renewable Heat Incentive and others. Most chain-of-custody systems are operated internationally by NGOs, charities or similar (e.g. Soil Association, Marine Stewardship Council, Forest Stewardship Council). BSI operates the VerifEye supply-chain auditing service, which has some overlap with the proposed system. An international system will likely require an independent scheme operator, rather than a Scottish one.

In discussions with software developers, technical solutions are available whereby a platform could be established, so that national registries can be centrally co-ordinated. This approach might be the best: to develop the underlying structure and a Scottish system built on it, allowing other jurisdictions to build their registers on the same platform, to allow them all to communicate.

A compliance register would assist with the visibility of the scheme and would allow the scheme operator to monitor compliant businesses easily but the same could be achieved by making reporting a condition of licensing for audit bodies or auditor accreditation bodies. A master-list of compliant companies would still have to be maintained in this case. Some consultees have suggested that a public compliance register could include details of audits, non-conformance findings and corrective actions. This level of company-specific information is not necessary to make the system work, and is likely to deliver only marginal benefit at the cost of significant resistance, so it is not recommended.

Analysis of comparable chain-of-custody systems and discussions with stakeholders support a recommendation that a digital compliance register system with some public access should be developed. Such a register would:

- Facilitate operation of the scheme;
- Promote visibility of the scheme;

- Allow uptake to be tracked easily;
- Provide a robust and transparent record of compliance;
- Act as a platform for dissemination of best practice for the full supply chain.

Furthermore, it is likely that a compliance register will prove essential in the initial implementation phase of the system, as well as facilitating ongoing operations and allowing for more sophisticated functionality in future. This is discussed further in Section 2.3.4 below.

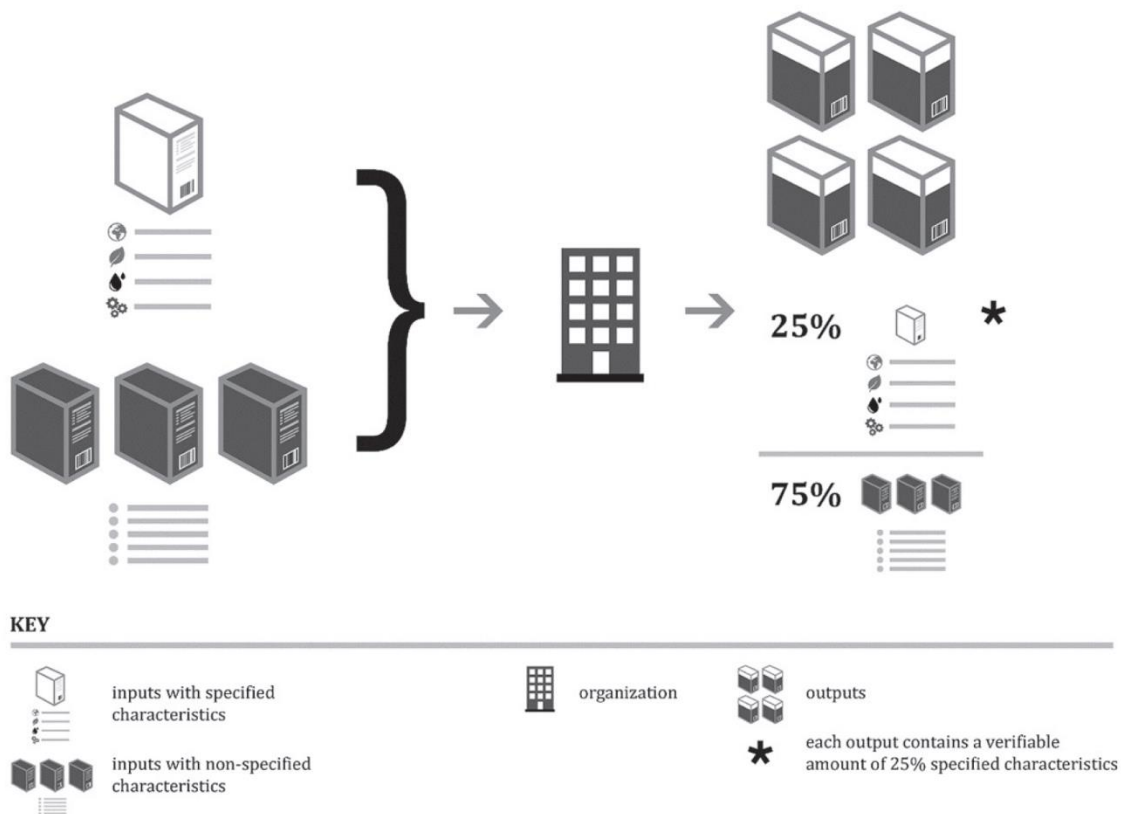
### 2.3.4 Implementation

A process is required for introduction of the proposed system over time, as it will not be possible for brands to require a 100% compliant supply chain from day one. ISO22095 includes different models through which this can be achieved, e.g. segregation of compliant product or declaration of percentage compliant content (the latter is illustrated in Figure 2, below). In the segregation model, only products which are made from 100% compliant material are compliant; however, it will not be possible to achieve this initially. A mass balance model lets the system to get off the ground by allowing declaration of a proportion of compliant material, which can be gradually raised to 100%.

100% compliant is the same as segregated material, but a mass balance model is required to allow the system to get started. In this model, each business records the weight of material bought in and whether it comes from a compliant or a non-compliant business. They then calculate the percentage compliance of their output, and so on. The final product can therefore be attributed an overall percentage compliant content. This logging and calculation process is one aspect of the system which will be greatly facilitated by the development of an electronic register system.

One problem with this model in this context is that a single non-compliant link breaks the chain. This could be a single important but reluctant sector in any part of the supply chain, for example one which does not take ownership, or for which plastics is a relatively small part of their business. If a non-compliant company in the supply chain handled 100% compliant material, the material would not be compliant when it is passed on to the next company. Clearly, a more sophisticated version of the mass balance model will be required. For example, using a compliance register, it would be possible to calculate automatically a weighted percentage, incorporating factors for compliant businesses and the relative risk of each type of business.

In this model, a risk factor is allocated to each link in the supply chain with no compliant companies, based on established models of loss rates from the industry. This risk factor can then be applied to sectors that didn't include any compliant companies and worked into the mass balance calculation for that supply chain.



**Figure 2: Mass balance model (source: ISO22095 draft)**

Consideration has also been given to a “maturity matrix” approach to implementation. This approach encourages businesses to comply but if they fail to do so, they are allowed time to improve. This results in something like a “traffic light” system of non-compliance, partial compliance or compliance, which would be visible on a compliance register. While this approach would allow businesses more time to achieve compliance, equally it would reduce the incentive for them to do so. It is also not clear how the grades of compliance would be compatible with the premise of applying supply chain pressure to improve performance.

For clarity, the maturity matrix approach is distinct from the non-conformance system. In the former, a non-compliant business can claim to be “working towards” compliance for a set period (e.g. a year) during which their compliance status is improved without their necessarily making any changes to their operations. In the latter, a non-compliant business develops and implements the physical and operational changes required for compliance, then requests an external audit. During this process, the business remains non-compliant. If the auditor finds areas requiring improvement, the company has a fixed period within which it must rectify these non-conformances (usually three months). If it fails to do so, it still remains non-compliant; if it does so to the satisfaction of the auditor, it becomes compliant.

### 2.3.5 Stakeholder engagement

The site visit programme backed up feedback from various stakeholders that a significant barrier to implementation of best practice was the ingrained habits of workers on site. In many cases, these are people who have worked in the same factory for decades, who have always worked in the same way, who have grown entirely used to pellets escaping and do not consider them to be significant. Awareness raising is one of the six pillars of the OCS programme.

Although the prices of polymers vary, with some specialised pellets being more expensive than polyolefins for example, in the quantities typically spilled, pellets typically have minimal financial value, so there is little economic incentive to take more care. There is often considerably less concern on the factory floor for the Circular Economy, or even for the environment, than might be hoped, so persuading this cohort of workers to change their ways is problematic.

Through stakeholder responses, observation of best practice and discussions with stakeholder engagement specialists, the consensus is that treating spills as a health and safety issue is the best approach. These days, pretty much everyone is familiar with having to comply with health and safety regardless of what their opinion may be. The risk of injury is too serious to trivialise and failure to comply with health and safety requirements is understood to be a disciplinary offence.

Best practice is already in place in some sites and could be readily disseminated to others. This usually takes the form of the provision of induction and refresher training to all relevant staff.

Another approach which has met with success is the allocation of responsibility for the condition of different areas of the site by shift. At shift change, the incoming responsible person has to inspect the area and sign it off before taking over responsibility. Any spills which occur during their shift are then his responsibility to deal with before handing over to the next responsible person. This approach also generates data on where spills are happening, when and why, which is essential in targeting the programme of continuous improvement.

In similar situations, another successful approach has been to combine competition with a little humour, for example running a competition with a booby prize for the worst offender, to show that management recognise that the situation may seem silly but that it has to be done anyway.

### 2.3.6 Alternatives

Consideration has been given to both simpler and more complicated versions of the chain-of-custody system.

For example, a register is not necessary: it would be possible for each business to check the compliance certificates of their suppliers and to keep a record of these to show the auditor. This approach would perform the function of delivering a chain-of-custody system but it would:

- be far less transparent,
- not allow deployment of a weighted mass balance model to get the scheme off the ground,
- be harder for each business to manage and
- preclude the development of greater sophistication in future.

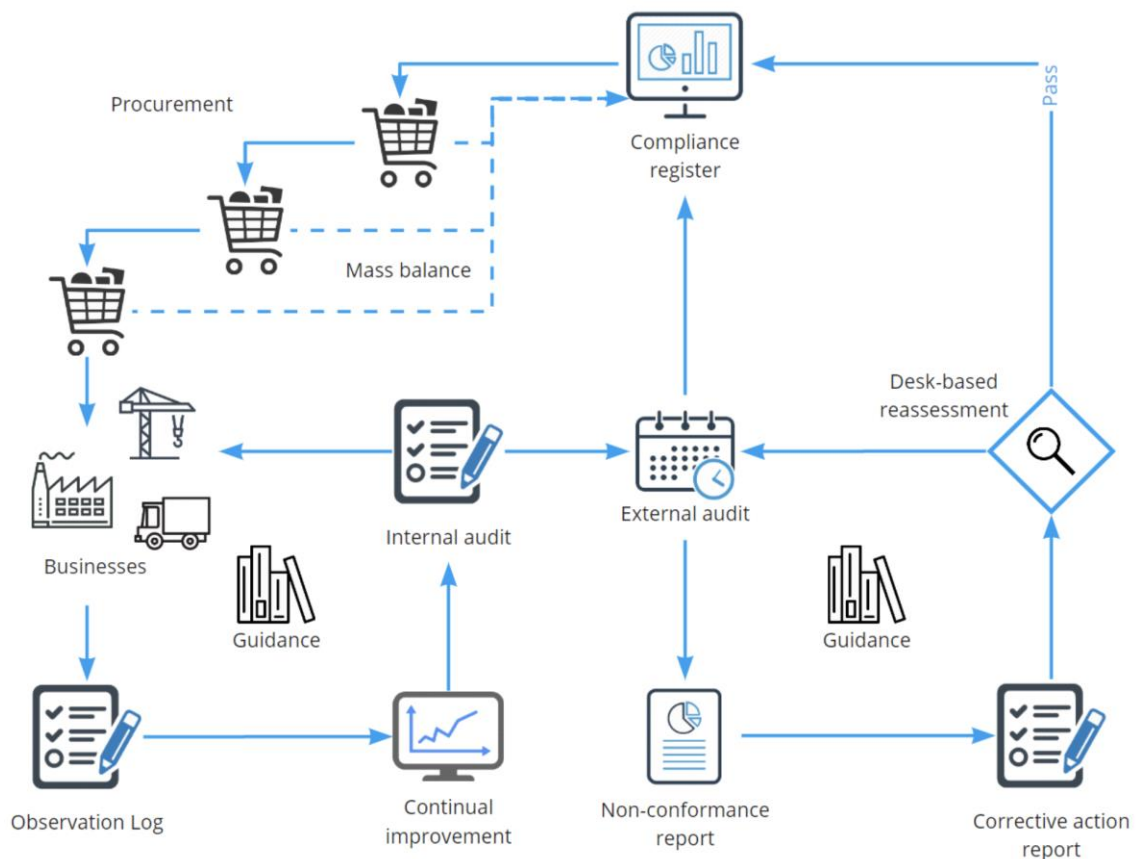
The proposed model allows the development of additional functionality, such as acting as a central repository for Observations, allowing high-risk practices, sectors or businesses to be identified which could in turn be used to improve best practices. It will also greatly facilitate compliance and oversight.

## 2.4 Design Summary

As discussed above, the basic principles upon which the proposed scheme is designed are as follows:

- The proposed scheme is built around all organisations carrying out the procedures laid out in the Operation Clean Sweep (OCS) code of practice, or equivalents. It contains no additional technical standards of its own.
- Organisations of all sizes can participate in the proposed scheme. No exemptions will be applied to smaller organisations or lower levels of throughput (although assistance may be available from e.g. economic development agencies).
- Voluntary participation – organisations are not obliged to participate in the proposed scheme. However, buyers may include certification as a requirement in their procurement policy. The final scheme should be compatible with a regulatory approach should that be required, and appropriate, to drive uptake.
- Mandatory disclosure – compliant organisations will be listed on a publicly available online database.
- Centralised accreditation body – organisations can be audited by any certified body but compliance is logged with a single central authority.

Figure 3 below aims to summarise the structure of the whole system. It builds on OCS as the basis of best practice and makes use of existing standards such as ISO9001, 14001 and 22095; it also makes use of existing independent auditor services to minimise the burden of cost and disruption.



**Figure 3: System overview**

The system is based on supply-chain pressure as the driving force to encourage best practice pellet management across the industry. It has been developed in Scotland with recognition of the fact that supply chains are international. Indeed, our expectation is that this fact will provide the framework through which best practice will be disseminated worldwide.

The core of the system is a compliance register. Although this register has additional functionality which is described below, it is essentially an online database of compliant companies. If a business, such as a retailer or brand owner, wishes to ensure that its plastic products are manufactured in accordance with best practice, it need only select a supplier from this database. This supplier may not handle pellets itself, in which case its registration is quite straightforward, however eventually there will be a supplier which does handle pellets.

To be listed on the compliance register, companies which handle pellets must operate a management system incorporating at least those elements listed in Section 2.2.1; that is:

- Risk assessment;
- Relevant procedures, specifically including:
  - transfer of pellets from and to other businesses and intermediaries;
  - implementation of best practice to minimise the risk of spills;
  - action following spills;

- treatment, handling and disposal of spilled material;
- site inspection, monitoring and records;
- control of contractors, including training and records;
- procurement policy, approved suppliers register and purchasing records;
- communication of compliance issues with suppliers and customers;
- Training records;
- Incident logs, including:
  - Root cause analysis;
  - Record of remedial action;
  - Record of action to prevent recurrence;
- Internal audit records, including:
  - Regular site inspections, including:
    - Site boundary (where appropriate);
    - High risk locations both within and outside site boundary (e.g. outfall pipes, loading bays);
    - Any material outside primary containment.
  - Regular review of incident logs, including near-misses;
  - Review of above procedures.

These elements can either be in a stand-alone system or they can be incorporated into an existing system in use on site, such as BRCGS or ISO14001.

Compliance with these requirements is a continual process, integrated into the everyday operational practices of the site but it is demonstrated through an annual audit by an accredited external auditor. As with the system, this can be a stand-alone process, or it can be integrated into existing audit programmes.

The audit process follows a pattern that will be familiar to anyone with experience of operating a certified management system. The auditor checks the training and operational records, procedures etc. and conducts a visual inspection of the site (or other operation, e.g. haulier). Based on the findings of this process, they will either pass the site as compliant, or issue a report including corrective actions. The site then has a short period (usually two weeks) in which to submit a corrective action plan. Once this has been signed off by the auditor, the site then has to implement it within the agreed timescale (no longer than three months) and provide evidence to the auditor that it has done so. If the auditor is satisfied that the site is now compliant, it will be added to the register (or remain on it, if it is already registered).

One of the requirements for compliance is that businesses must keep records of materials purchased and whether they come from compliant suppliers. A significant advantage of the compliance register system is that it can be used to automate this process. The exact process by which this will be achieved is to be confirmed but a

working example would be the use of QR codes<sup>13</sup> on printed labels. These codes can be printed at negligible cost by any reasonably modern printer, can be read by any mobile device with a camera and can encode enough data to provide a unique identifier for each container effectively indefinitely. Many sites are already using mobile devices as a platform to support operational procedures, internal audits and recording of spills and near misses and these devices are now effectively everywhere. Any device with a camera and an internet connection can be used to log the location, condition and identity of every container of pellets (e.g. sacks, pallets, bulk tanker, shipping container), providing the basis for a chain of custody system which logs the condition of every container at every handover point in the supply chain.

The advantage of having a central compliance register is that it can act as a hub for tracking materials and handover points. This not only makes the whole process streamlined, it also opens up the possibility of analysing the data to identify high-risk activities, locations and even operators. This information would be confidential but it would provide the system operator and subscribers with valuable insights to accelerate improvements in pellet management.

The digital register approach also has the advantage that it allows the automated calculation of percentage compliant material in finished products, which is necessary for the implementation of the scheme. This calculation can also be adapted to patch missing links in the supply chain; for example, there may be instances, particularly in the early stages of implementation, where critical links break an otherwise compliant supply chain. Rather than rendering the product non-compliant, the digital register can be used to provide the flexibility to work around issues such as this, to facilitate implementation.

#### **2.4.1 Use case example**

To clarify how the system operates, the following typical use case example traces how pellets are tracked through a typical supply chain:

As part of its corporate sustainability policy, the head of procurement for a vehicle manufacturer has been asked to manage pellet loss, so she communicates this to all those suppliers from which the company procures products which include plastic. At the same time, she sets up an account on the digital compliance register. Once the company is registered, the system can track all compliant and partially compliant materials supplied to it and report on their percentage of compliant material.

Starting at the other end of the supply chain, a pellet manufacturer has registered on the system. To do this, the site has integrated OCS best practice into its ISO 14001 environmental management system, which is certified by LRQA, which is itself accredited by UKAS. The pellet management system is listed as a “requirement” (Section 3.2.8) in the ISO 14001 system, so the best practice requirements are included in company

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<sup>13</sup> [https://en.wikipedia.org/wiki/QR\\_code](https://en.wikipedia.org/wiki/QR_code)



procedures and they fall within the remit of the external auditor. As the manufacturer has passed its most recent ISO audit, it is deemed to be compliant.

Each batch of pellet which leaves the site is marked with a QR-code generated by the register. This code is a unique identifier which the system uses to track this material. The identifier logs the manufacturer, location, weight (and any other parameters that might be needed in future). The haulier taking the material off-site is also compliant, in this case through SQAS. The load is inspected by the driver, who uses his mobile phone to scan the QR code and certify that the load is accepted in good condition.

He takes his load to another company which makes plastic switch actuators. There the load is inspected on arrival and logged in, again by scanning the QR-code. If any damage is noted, this is photographed and logged. The switch manufacturer complies with the system through their IATF 16949 system. To safeguard business continuity, this system requires that they maintain multiple approved suppliers but not all their pellet suppliers are compliant, so only a proportion of the material coming onto their site is compliant. As part of their compliance requirements, they must declare this and log all incoming loads, so that the system knows the percentage of compliant material in use at the site.

This process can be repeated across any number of steps but for the purposes of this example, the switches are picked up by another compliant haulier and taken to the vehicle manufacturer. The system logs all compliant and partially compliant material coming into the manufacturing process; addition of the weight of any entirely non-compliant material results in a figure for percentage compliance of the finished product.

## 3.0 Next steps

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Based on this programme of stakeholder engagement, site visits, Steering Group meetings and research, the structure of the proposed system represents the optimal balance of functionality, ease of use and cost to achieve the goal of using supply chain pressure to prevent pollution from plastic pellets.

The way the system has been structured maximises the use of other existing systems, such as standards and audit protocols, and builds on best practice guidance such as OCS. This approach means that (with some additional work to build the register) the system could be developed and implemented in a relatively short timescale.

However, the forthcoming development of a PAS for plastic pellet management presents the opportunity of using this system design to inform development of a system with much broader impact. The PAS development process presents an opportunity for this system to be implemented through the established international standards structure, which will make it much easier to disseminate it worldwide. As plastics supply chains and the pollution they cause are both international, this is recognised as a significant opportunity and we would hope that representatives of the Steering Group for this project are also found on the PAS Steering Group.

In parallel with the PAS development programme, it is recommended that the proposed system design should be developed and tested, with feedback from this process being used to inform the PAS Steering Group. Given the likely timescale for development of the PAS, there is a period before its completion in which Scottish businesses could be encouraged, and possibly assisted to implement best practice. Because the system is not a legal requirement, it may be possible for the Scottish Government to facilitate compliance in smaller businesses, perhaps through economic development agencies. During this period, there would also be an opportunity for the system to be promoted with retailers, brand owners etc.

This period could also provide an opportunity to work with auditing bodies to develop the requirements for them to be able to audit compliance with best practice in pellet management, and to establish minimum standards for accreditation of external auditors.

There is also an opportunity within this time-frame to develop the compliance register, which will be of enormous benefit in facilitating deployment of the system, as well as in tracking the progress of its deployment throughout the supply chain. Initial discussions with software developers with experience in developing this type of platform suggest that development in this timescale is feasible, based on the scope described above, namely:

- Maintenance of secure database of compliant businesses;
- Identification of plastic pellet containers by QR code or similar;
- Logging of supplier and customer, tracking of location and condition at handover;
- Calculation of % compliant content of final product;

- Additional functionality could include:
  - Discussion forum for dissemination of best practice;
  - Integration with existing management system platforms.

# A.1.0 Landscape of existing relevant standards

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	Processor					Agent		Storage		Logistics					Retail
	Resin Producers	Masterbatchers (colouring)	Compounders	Converter = Product Manufacturer	Converter = Packaging Manufacturer	Distributors	Brokers	Transport Hubs	Storage Warehousing	Dockside Management	Port Authorities	Shipping	Road Haulage	Rail Transport	Retail
OCS	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification
BRCG	3rd Party V	3rd Party V	3rd Party V	tbc	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V
SQAS	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V										
ISO 14051	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification	Specification
ISO 22095	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc	tbc
PAS 7000	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self	3rd Party V / self
ISO 45001	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V
H&S Regs	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation	Regulation
REACH	Regulation	Regulation	Regulation	Regulation	Regulation										
SIMPL	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary										
ISO 14001	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V
EMAS	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V
PPC	Regulation	Regulation	Regulation	Regulation	Regulation										
ISO 17422	Specification	Specification	Specification	Specification	Specification										
ISO 9001	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V	3rd Party V
Marpol										Regulation	Regulation	Regulation			
CSC												Regulation			
ISO 1496-4												Specification			
ADR													Regulation		

- Supply Chain
- Health and Safety
- Quality
- Environmental Management
- Shipping & Vehicles

The table above sets out the relevant related standards reviewed at the beginning of the project.

## A.2.0 Consultation Process

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The consultation aspect of the programme included various strands

1. Distribution of briefing notes, presentation of interim findings and discussion with the Plastic Pellet Loss Steering Group;
2. Correspondence, calls and conference calls with interested parties;
3. A formal consultation interview process; and
4. Site visit programme.

The first two sections above are discussed throughout this report, and the site visit programme in Appendix A.3.0 below. This section describes the formal consultation process.

The following briefing note was issued to Steering Group members (note: some elements of the proposed system design have changed since this consultation process):

### A.2.1 Briefing note

Thank you for taking the time to read this document. We have tried to keep it as concise as possible. You will be contacted in the next few days for a brief telephone interview where we would like to discuss your views on the proposal and any feedback you can give us on its design, development and implementation.

This document sets out a brief overview of the project and structure of the proposed scheme. It represents a first draft based on our research, every element of which is up for discussion; it will be presented to the Scottish Government Steering Group once your comments have been taken into account.

#### A.2.1.1 Purpose

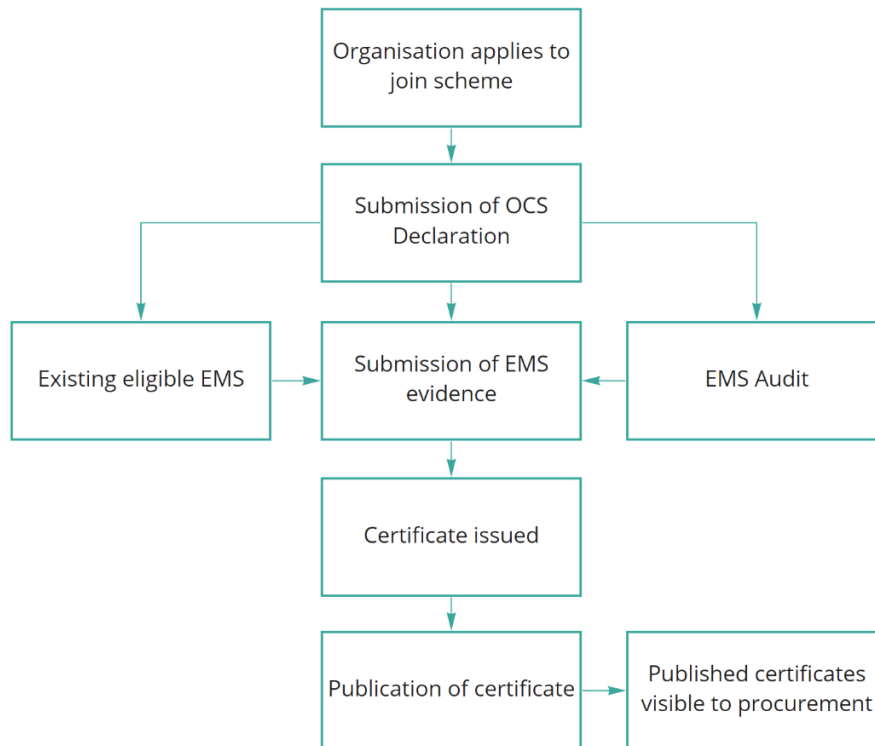
The immediate purpose of the proposed scheme is to allow companies to verify that their supply chain partners are operating management systems that are designed to avoid the leakage of plastics. We believe the most efficient way to achieve this is to use, as far as possible, elements of existing best practice guidance such as Operation Clean Sweep (OCS), management systems (e.g. ISO, SQAS, BRC) and supply chain compliance (e.g. PAS7000).

The ultimate purpose of the proposed scheme is to minimise or eliminate pellet loss through better management practices. The proposed scheme encourages participation by offering reputational and commercial benefits to companies through disclosure of their environmental credentials.

#### A.2.1.2 Basic Design Principles

##### Compliance

The diagram below summarises the scheme compliance process:



The basic principles upon which the proposed scheme is designed are as follows:

- The proposed scheme is built around all organisations carrying out the procedures laid out in the Operation Clean Sweep (OCS) technical code of practice. It contains no additional technical standards of its own.
- Organisations of all sizes can participate in the proposed scheme. No exemptions will be applied to smaller organisations or lower levels of throughput (although assistance may be available from e.g. economic development agencies).
- Voluntary participation – organisations are not obliged to participate in the proposed scheme. However, buyers may include certification as a requirement in their procurement policy.
- Mandatory disclosure – details of all participating organisations and certificates will be available to buyers and the public using an online database.
- Centralised certification body – organisations are audited, certified and their compliance published by a single central authority.
- Organisations can achieve certification by having appropriate third-party verification for an environmental management system ('grandfathering'). If they can't provide such evidence, they will be subject to an audit from the central authority.
  - The audit process may be contracted out on a competitive basis to reduce costs, and may be provided by existing audit bodies, such as BRC.
- Evidence of compliance by existing EMS must include demonstration of a documented commitment to comply with the proposed scheme, which itself refers to OCS.
  - This will ensure that auditors check that the company is compliant with OCS best practice.

## Supply Chain Verification

The principle of the proposed scheme is that retailers and brands can use supply-chain pressure to ensure that their products are compliant throughout their production process. Ultimately, this will require that compliant companies only buy from compliant companies, however imposing this requirement from the outset would mean that the proposed scheme would never get off the ground.

There are various ways around this problem, the simplest of which we believe is for companies to begin by demonstrating only their own compliance. Part of the compliance requirements will be to inform suppliers (and hauliers) of the proposed scheme and suggest the possibility that it may become a requirement of future contracts. Retailers and brands will then be able to set the pace at which they wish to insist on full supply-chain compliance.

## Scope

The proposed scheme applies to plastic pellets, flakes and powders.

The proposed scheme applies to industrial businesses that physically handle plastics, within the following supply chain sectors:

- Plastics Industry
  - Resin manufacture, reprocessor
  - Interim processors (masterbatchers, compounders)
  - Product and packaging manufacture (converters)
- Logistics Industry
  - Warehousing
  - Road haulage
  - Shipping
  - Port handling
- Retail
  - Product Retailers

The proposed scheme does not include non-physical industry stakeholders, such as brokers and shipping agents.



## A.2.2 Consultation Process

Accompanied by an introductory letter, this was sent to consultees on Friday 26<sup>th</sup> April. These consultees are listed below (details redacted for GDPR compliance):

Process	Location
Plastics manufacturers and supplies	Hamilton
Plastics manufacturers and supplies	East Kilbride
Plastics manufacturers and supplies	Lochgelly
Plastics manufacturers and supplies	Bishopbriggs
Plastics manufacturers and supplies	Uddingston
Plastics welding	Glasgow
Plastics manufacturers and supplies	East Kilbride
Recycler	Alva
Plastics manufacturers and supplies	Cumbernauld
Transporter	
Recycler	Glenfarg
Recycler and converter	Ardeer, Stevenston
Converter	Glenrothes
Industrial packaging	Glasgow
Material technology and manufacturing organisation	Glasgow
Plastics manufacturers and supplies	Glasgow
Plastics manufacturers and supplies	Dundee
Plastics manufacturers and supplies	Falkirk
Plastics manufacturers and supplies	Perth
Transport	Grangemouth
Converter (EPS foam products)	Livingston
Plastics manufacturers and supplies	Livingston
Haulier	Grangemouth
Plastics manufacturers and supplies	Cumbernauld
Plastics manufacturers and supplies	East Kilbride
Plastics manufacturers and supplies	Edinburgh
Plastics manufacturers and supplies	Coatbridge
Bottling Machinery	Peebles
Packaging company	East Kilbride
Plastics manufacturers and supplies	Glasgow
Plastics manufacturers and supplies	Glasgow
Plastics manufacturers and supplies	Roxburghshire
Ports & Shipping	Grangemouth
Plastics manufacturers and supplies	Clydebank
Plastics manufacturers and supplies	Bellshill
Converter (pellets - injection moulding)	Glenrothes
Plastics manufacturers and supplies	Clydebank
Intermediate redistribution (does not handle pellets)	Glasgow

Plastics manufacturers and supplies	Leven
Plastics manufacturers and supplies	Glasgow
Plastics manufacturers and supplies	Glasgow
Transporter	
Transporter (haulage and warehousing)	Grangemouth
Plastics manufacturers and supplies	Comrie
Transporter (Haulier)	Grangemouth
Specialist in packaging & machinery	Kirkcaldy
Converter	Dumfries
Plastics manufacturers and supplies	Glasgow
Converter	Glasgow
Converter (pellets - injection moulding)	Edinburgh
Converter	Carlisle
Converter (packaging)	Stirling
Converter (ducts and piping)	Methil, Leven
Converter	Cumbernauld
Converter (injection moulding)	Glenrothes
Distribution company	Larbert
Plastic processor	Dumfries
Plastics manufacturers and supplies	Bearsden Doncaster (facility in Glasgow but don't handle pellets)
Converter	
Masterbatcher	Kirkintilloch, Glasgow
Acrylics	Dumbarton, Glasgow
Converter (powders / pellets)	Livingston
Converter (car parts)	Larkhall
Plastics manufacturers and supplies	Glasgow
Plastics manufacturers and supplies	East Kilbride
Converter (pellets - injection moulding)	
Plastics manufacturers and supplies	East Kilbride
Converter	Bridge of Allan
Converter (plastic sheeting)	Newbridge
Converter (Expanded polystyrene)	Glasgow
Transporter (Haulier)	Falkirk
Container Handling	Cumbernauld

Each consultee on this list was contacted by a team of interviewers from Eunomia and Nextek. As the aim was to get feedback from respondents, the interview process was kept deliberately loose, apart from three topics that were raised in each case that were considered of particular importance. These were:

1. Requirement to **demonstrate** OCS compliance
  - a. OCS is not a compliance scheme, so how do we demonstrate compliance?

2. **Verify** by EMS or audit
  - a. What standards are acceptable?
  - b. How are these tied back to OCS?
  - c. Cost for independent audit.
3. **Commit** to purchasing only from compliant suppliers
  - a. Is this commitment practical?
  - b. How is this commitment monitored and audited?

Responses were received from 10 companies:

A few others were unable to respond immediately but said they were happy to discuss later. Further contacts have also been volunteered by members of the Steering Group, who also contributed some feedback and ideas during a teleconference on 2<sup>nd</sup> May.

As described in the revised methodology, the aim of this initial consultation process was to inform some initial refinement of the proposed system and to inform discussions at the Steering Group meeting. It is not intended at this stage to be a definitive or representative consultation process.

### A.2.3 Initial Findings

The feedback gathered to date is summarised below, categorised according to the three main questions above:

#### Demonstrate

Larger companies with formal management systems were generally complying with the requirements of OCS already, and demonstrating this through these systems, although it was considered important that auditors must be familiar with these specific issues.

In some cases, green procurement policies within e.g. ISO14001 systems effectively deliver the chain of custody requirements by requiring compliance with OCS from suppliers (within the constraints outlined at the beginning of this briefing regarding OCS as a compliance standard).

Smaller companies are more likely to follow the recommendations of OCS on a more informal basis with less emphasis on demonstrating compliance.

#### Verify

Larger companies were not concerned about audit costs, as they already had an audit programme in place which could be adopted for this purpose. Smaller companies were reluctant to take on any additional costs as long as there was no commercial benefit.

The cost burden of an audit programme was considered to be a major impediment by some. An alternative to independent auditing has been proposed whereby participants self-certify but are liable to conformance checks at any point, in the same manner as health and safety or trading standards legislation.

## **Commit**

Committing to chain-of-custody compliance by purchasing only from verified suppliers was in some cases considered problematic (e.g. imports, brokers, distribution channels, single-supplier products), in some an important step and in others to be happening already (e.g. through green procurement procedure). There was a perceived conflict between commercially competitive market and restriction imposed by chain-of-custody compliance requirement.

Companies which did not handle pellets themselves but whose suppliers did find it difficult to comply with OCS, as they have no direct influence on how pellets are handled; in these cases the proposed system would be helpful.

## **General**

Although specific issues were raised by several respondents, there was agreement that something needed to be done across the industry. There was also an appetite for greater transparency and co-operation on non-competitive issues such as environmental improvement.

## A.3.0 Site visits

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### A.3.1 Background to visits

The purpose of the site visits was to identify how practical the chain-of-custody model might be to implement, and to define appropriate limits of pellet spillage and pellet loss that could be reflected in the final strategy to eliminate plastic pellet loss in Scotland. The findings of the visits have contributed to the final design of the proposed strategy.

Sites from across the typical plastic resin supply chain contributed to the insights and provided feedback on the proposed strategy based on practical aspects of controlling pellet loss.

The sites visited included the following organisations within the plastic supply chain:

- Resin Producer;
- Haulage and Warehouse Operator;
- Convertors:
  - Construction products manufacturer;
  - Automotive products manufacturer;
  - Food Packaging products manufacturer;
  - Recycling of post-consumer packaging.

These site visits provided important data and feedback on the implementation of a chain-of-custody process and the effectiveness of pellet containment strategies such as OCS, which have not previously been available. In addition, the visits allowed detailed discussions with real-world supply chain sites on the potential implementation of new initiatives proposed by this report.

Even the best managed sites with regular cleaning and excellent training still had areas of pellet loss. These important observations will be useful not only in Scotland but also across Europe and internationally, and they highlight the key strategies that need to be implemented across the whole supply chain.

#### A.3.1.1 Site visit strategy and selection

Ten of the eleven sites were OCS signatories. Every site visited was very welcoming of the opportunity to review plastic pellet loss and encouraged feedback based on the observations made during the visit. This enthusiasm for sharing of best practice has been incorporated in the system design with a section in the compliance register to act as a repository of best practice resources and a forum for discussion; pellet management is not seen as a matter of competitive advantage but as an issue which threatens the whole sector and requires collaborative action.

The site visit feedback reinforced the view that all parts of the whole supply chain needed to work together to keep pellet loss to a minimum, especially in the key transfer areas which potentially leak pellets to the environment.

### A.3.1.2 Standards and Documentation

The visits provided an opportunity to understand the standards being implemented by the various sites that could be integrated with pellet management processes.

Standards promoting good management practice included Operation Clean Sweep (OCS), quality management systems (e.g. ISO, SQAS, BRC) and supply chain compliance (e.g. PAS7000).

A variety of standards are applicable to the manufacture and application of packaging materials and exposure to the environment; e.g. ISO standards are international, whereas BRC relates primarily to food and non-food packaging. This aspect has been integrated into the proposed design by ensuring that it can accommodate any competent standard, allowing a common framework to be implemented across international supply chains.

The pellet management strategies set out in this study can fit in with current practices in the ISO standards as discussed in earlier sections of this report. The following standards were of particular interest going into the visits:

- ISO 9001:2015 – Quality management for reliable, consistent products and greater efficiency;
- ISO 14001:2015 – Environmental management to demonstrate environmental policy leadership;
- ISO 45001:2018 – Safety management to implement best practices for occupational health and safety.

A key area of focus for every manufacturing site is the maintenance of high standards relating to Health and Safety and there is a clear link between Health and Safety, and minimising the leakage of pellets since slip and tripping is the most frequent type of operator injury. Slipping and tripping in the workplace was the cause of 19% of injuries reported under RIDDOR in plastic manufacturing companies. Slips and trips cost UK employers approximately £512 million per year in lost production and other costs (<http://www.hse.gov.uk/plastics/slips-trips.htm>).

The perception of pellets as a health and safety hazard is also discussed in the section on stakeholder engagement (Section 2.3.5). Economic and environmental reasons are often insufficient incentive for operatives to implement best practice but the culture of compliance with health and safety can be effective.

During initial meetings with the visit participants, the relevant standards were discussed and analysed to see how the elements of the Chain-of-Custody model could be implemented. Some standards used within the businesses are audited once a year. For

example, the ISO14001/EMAS environmental management system is certified by an independent UKAS-accredited external auditor once a year, with the audit usually taking 2 to 3 days, depending on the scale and complexity of the operation. The documentation for formal audits was very accessible and was well managed. For smaller sites this can be expensive, which was brought up by more than half of the sites visited. They commented that new standards should ideally be included with other audits due to expense and time of staff away from their day to day roles within the company. This point has been incorporated into the design of the proposed system.

Documentation of pellet management varied among the sites visited, as did the quality of management of OCS implementation. Some sites recorded OCS issues and non-conformances within existing BRC or ISO standards, whereas others had a separate system and records.

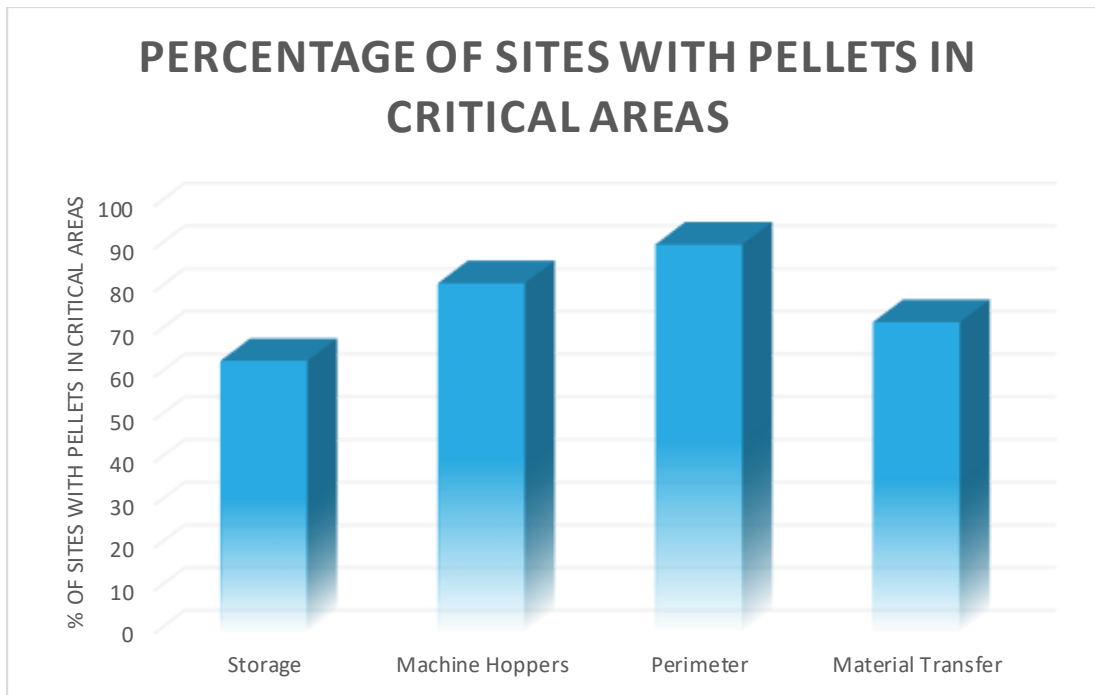
It was clear from the site visits that BRC standards hold extra value to companies within the retail supply chain since failure to comply could lose business contracts that specify compliance to the BRC standards. This observation is fundamental to the success of the proposed approach, as supply chain pressure will mean that non-compliant businesses will not be eligible to bid for work, as is the case with BRC.

Standards based on ISO were harder for companies to completely fail during an audit process and consequently less critical. This illustrates the link between standards that are stringently audited and the pressure to ensure compliance. The proposed system design takes a balanced position between the requirement for stringency and the need to provide businesses with every opportunity to improve, rather than fail.

During the visits, the sites shared their documentation. Some sites used electronic tablets to take photos and keep a live document for the areas around the pellet loss sites that need correcting. In some cases, spreadsheets were also evident which allowed sites to update pellet management techniques, personnel, spillages and incidents. This observation has been incorporated into the proposed system design, which is based on using mobile devices to streamline implementation.

### **A.3.2 Site Inspection**

Site tours were comprehensive, and a wide range of relevant information was collected on the critical areas that would need to be documented in a chain-of-custody system. Critical areas were quickly identified, including those that were external to buildings where pellets could potentially leak to the environment. The key areas identified were spillages identified at the perimeter of the site, at machine hoppers, in material transfer areas and in storage areas.



**Figure A3.1: Critical areas identified where pellets are leaked on site.**

The details of the pellet spillage issues on the sites will be prepared as a separate document as these details are beyond the scope of this report.

Over half of the site visits had staff named as “OCS Champions” to oversee the spillage clean-up procedures and training. Any employees unsure of any clean up procedures would have other trained employees to demonstrate the correct procedures to be followed. Some sites used internal incentives which proved to work very well. Certain zones were judged on their cleanliness which led to employees cleaning up and helping each other. These observations are also discussed in Section 2.3.5

Some sites had only managed to train a fraction of their staff on OCS procedures as production duties typically took the top priority.

### **A.3.3 Conclusions of the site visits**

The site visits showed that virtually every site that handled plastic pellets experienced spillage of pellets, although in most cases these were contained within the site boundary. The key areas of spillage were identified at the perimeter of the site, at machine hoppers, in material transfer areas and in storage areas.

The proposed chain-of-custody strategy would identify the parties and causes responsible for pellet spillage, clean-up however it would be important to ensure that appropriate training standards and clean-up procedures are in place and being effectively implemented. This reinforces the need for an audit process that confirms that effective measures are in place.