

COMAH Competent Authority Workstream 2e

Process Safety Performance Indicators

(Operational Delivery Guide)

the Competent Authority



1. Purpose

- 1.1 The COMAH Competent Authority's strategic aim for process safety performance measurement:
 - By the end of 2015 all major hazard establishments and duty holders will measure their performance on the control of major hazard risks by way of key leading and lagging performance indicators.
- 1.2 The strategic inspection topic covered by this guide is designed to continue the promotion of the use of site level process safety performance indicators (PSPIs) as part of the monitoring arrangements for an effective process safety management system at major hazard sites.

2. Justification

- 2.1 Recent major accidents in both the UK and abroad highlighted a serious weakness in how major hazard plants were operated. Namely, that executive decisions made in the board room were often made without those in charge understanding the risks of their plant or the implications of business decisions on the continued safe operation of the plant.
- 2.2 The BP Grangemouth major incident investigation report concluded that one of the key lessons for major hazards sites was: "Companies should develop key performance indicators for major hazards and ensure process safety performance is monitored and reported against these parameters".
- 2.3 There is now a need for strong process safety leadership, from board level down throughout the organisation in order to achieve the right culture and enable key decision makers to understand all the dimensions of process safety risk when making business and operational decisions. Good management decisions can only be made on the basis of sound information.
- 2.4 Operators therefore need to focus on the important risk control systems, adopt and utilise appropriate process safety performance indicators (PSPIs) to identify where there are deviations from expected safety outcomes.

3. Topic Scope

- 3.1 All COMAH site operators need to adopt and develop PSPIs for their process safety management systems for major hazard operations.
- 3.2 PSPIs should be the subject of planned interventions at major hazard establishments in the context of COMAH Schedule 2, paragraph 4(f) 'Monitoring performance', one of the key elements of a safety management system. Guidance on what can be covered as part of the intervention can be found in [Annex 1](#).

4. Resources

- 4.1 Interventions should generally be undertaken by regulatory inspectors, with involvement of PSPI Champions as necessary. It is anticipated that regulatory resource will be 1.5 – 2 days per intervention.
- 4.2 Input may be required from process safety specialists, especially for sites yet to start the PSPI process. Involvement should be arranged and discussed locally.

5. Main actions

- 5.1 Wherever possible, site interventions should include discussions with senior management within an organisation to gauge the degree to which they utilise process safety performance information to set priorities and monitor progress. For companies within the Lead Unit System, the lead inspector should coordinate the intervention.
- 5.2 During site interventions Inspectors should review the indicators in place (if any) to assess whether they are adequate to demonstrate that the process risks are being adequately controlled.
- 5.3 The development of process safety performance indicators on a site involves four stages:
 - **Stage 1** – Introduction to the topic and assimilation – general understanding of need for, nature of, and methods for developing PSPIs, usually informed by HSG254 and/or visit or workshop by HSE inspector, may take up to three months.
 - **Stage 2** – Development phase – should follow as soon as possible from Stage 1. Involves creation of suitable team to develop an initial set of indicators, (probably for one area or process) along with data collection and reporting systems, can take around six months.
 - **Stage 3** – Trial period – normally need to run with the initial set of indicators for 6–12 months to generate sufficient data to judge suitability and quality. Further indicator development for other areas/processes can also be taking place.
 - **Stage 4** – Roll out and operation – implementation of full suite of developed and tested indicators across the site, could take a further 6-9 months.
- 5.4 From this it follows that the full implementation of a site PSPI programme could take between 18 months and 2 years 6 months from when the initial introduction takes place.
- 5.5 The actual time taken will depend on the size and nature of the site along with the level of commitment and resources that are applied.

6. Links to sector performance indicators

- 6.1 To support the development of PSPIs, HSE is working with trade associations to establish sector-based indicators and guidance will be produced for their member/sector companies.
- 6.2 Primarily, sector indicators should be viewed as the means by which a trade association demonstrates the performance of the sector as a whole. Sector indicators can also, where the member companies undertake similar activities that present similar risks, form a common set of indicators that provide individual operators with the range of information needed to monitor process safety on site. When operators rely on sector indicators in this way to monitor performance inspectors should check that the indicators used are appropriate for the activities undertaken on site (see what we look for in PSPIs at [Annex 1](#)) and also that operators have the necessary understanding to be able to use the information effectively.

7. Core intervention issues

- 7.1 A guide to the core intervention issues is provided in [Annex 1](#) of this DG. This sets out the core essentials of what you need to look at for each issue, and has been drawn from HSG 254. This DG links closely with other inspection DGs, as it underpins the monitoring aspect of the inspection of risk control systems.

8. Help and Support

- 8.1 Each HID CI Unit has nominated PSPI champions to support this work, and in addition there is central Process Safety Specialist resource (currently Peter Dawson, CI3G) to coordinate it and assist with progress. It is expected that the majority of the interventions will be carried out by the CI inspection teams as part of the normal COMAH intervention plan. The intention is that the champions will facilitate the growth of PSPI expertise within these teams, over time reducing the need for their involvement.

9. Supporting information (available on HSE Intranet)

- a) Texas City report.
- b) BP Grangemouth major incident investigation report.
- c) Section 11 of the safety report assessment manual (Major accident prevention policy and safety management systems aspects) includes criteria for measuring performance and arrangements for their review: Criteria 11.23, 11.23, 11.25 and 11.27 (P59-61) make explicit reference to setting carefully selected and targeted leading and lagging performance indicators.
- d) HSG254 Developing process safety performance indicators: a Step-by-step guide for chemical and major hazard industries.
This publication sets out:
 - the difference between leading and lagging (performance) indicators;
 - a six-step process to implementing a process safety measurement system;
 - a case study (chemical bulk storage facility) with examples of indicators across a range of relevant risk control systems.
- e) OECD Guidelines on safety performance indicators. This publication shows how companies can select indicators against the key elements of a process safety management system. The methodology described mirrors HSG254 but includes useful additional guidance and examples.
- f) Buncefield Standards Task Group (BSTG) final report. Safety and Environmental Standards for fuel storage sites.

10. Success criteria

10.1 By End March 2011:

- Verified that 'Buncefield' type sites have effective monitoring of process safety performance in place and that site-specific leading and lagging performance indicators have been developed as required by Buncefield Standards Task Group recommendations. (Stage 4);
- All COMAH top tier and lower tier establishments ranked Band A by the COMAH site prioritisation process to have completed Stage 4 - implementation of full suite of developed and tested indicators across the site;
- All COMAH top tier and lower tier establishments ranked Band B by the COMAH site prioritisation process, to have completed Stage 3 – have developed and tested at least an initial set of indicators for a selected area or process on the site;
- All COMAH top tier and lower tier establishments ranked Band C (with a score ≥ 8) and establishments newly allocated to Band B as a result of a local performance criteria, to have completed Stage 2 – have developed an initial set of indicators for testing.

Note: Bands are based on the CA site rating and operator performance measures.

10.2 Inspectors should determine progress against the four stages. If further progress is required, refer the operator to the available guidance and revisit after a suitable period of time.

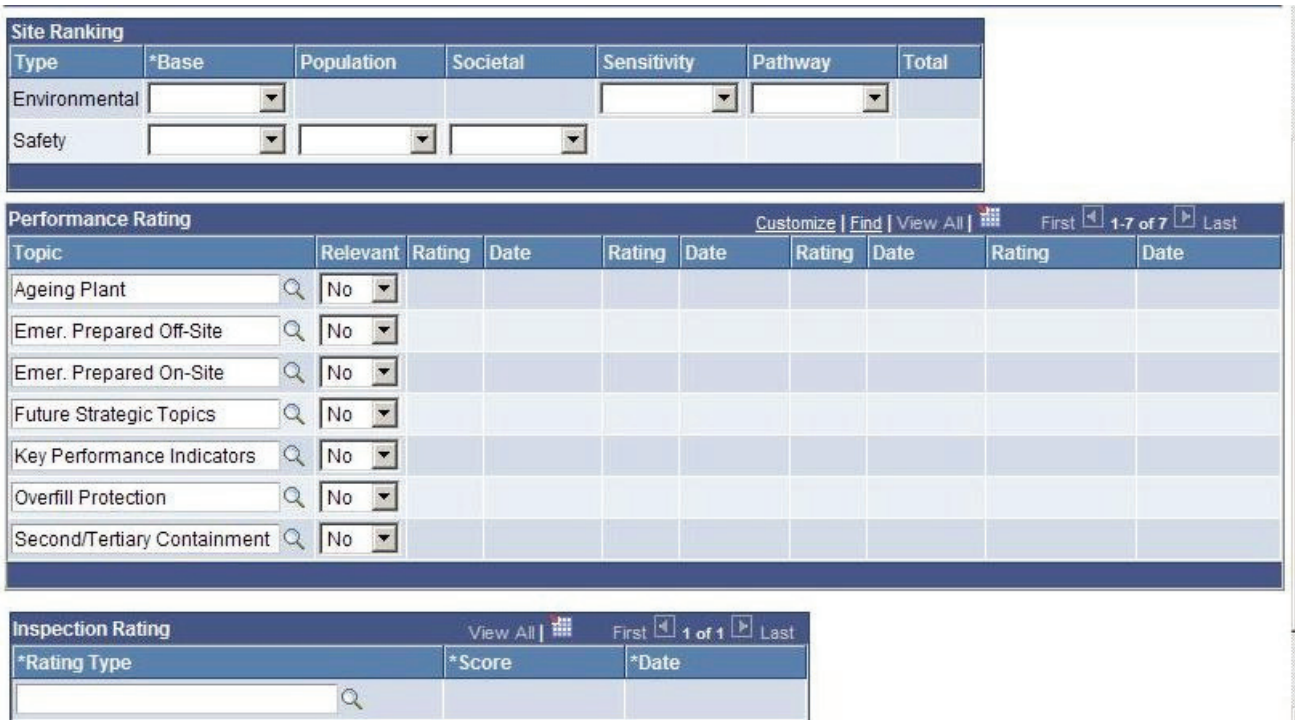
11. Judging success & moving on

11.1 The COIN Inspection Rating (IRF) system is used measure a site's progress with this strategic topic

11.2 This is not an absolute measure of site 'performance' for this topic but will be used by the CA to monitor the progress made by COMAH sites in establishing PSPIs, and auditing their effectiveness

12. COIN IRF Scoring

12.1 The COIN Inspection Rating Form (IRF) tab on the COMAH Intervention Plan Service Order should be used to record the operator's progress on PSPIs in the 'Key Performance Indicators' line.



The screenshot displays three main sections of the COIN IRF Scoring interface:

- Site Ranking:** A table with columns: Type, *Base, Population, Societal, Sensitivity, Pathway, Total. It includes dropdown menus for Environmental and Safety types.
- Performance Rating:** A table with columns: Topic, Relevant, Rating, Date, Rating, Date, Rating, Date, Rating, Date. Topics listed include Ageing Plant, Emer. Prepared Off-Site, Emer. Prepared On-Site, Future Strategic Topics, Key Performance Indicators, Overfill Protection, and Second/Tertiary Containment. All 'Relevant' values are set to 'No'.
- Inspection Rating:** A table with columns: *Rating Type, *Score, *Date. It includes a search icon and navigation controls.

12.2 Progress should be recorded following each PSPI intervention on the following basis:

Progress Rating	Description	CA action required	Score
Stage 4	A site has had indicators in place for over 12 months and are content they are providing them with assurance their process safety risks are controlled	No action required.	10
Stage 3	A site has recently developed a suite of indicators and are trialling them	Monitor progress	20
Stage 2	A site is in the process of developing a suite of indicators	Agree timetable for move to Stage 3	30
Stage 1	A site has just had their introductory visit and is considering the use of indicators	Agree timetable to at least Stage 3	40
N/A	N/A	N/A	(50)
Not Started	A site has not had an introductory visit and is not known to use PSPIs	Ensure topic covered on site asap	60

- 12.3 The data will be used by the CA to monitor the progress made by COMAH sites in establishing PSPIs and auditing their effectiveness.
- 12.4 On behalf of the CA HSE HID CI4 intend to pre-populate the site scores for the beginning of the 2010 work year to give a baseline for progress.
- 12.5 Comments about progress or the intervention should also be made in the Notes field of the service order as normal, with the Summary line to include the Key-Word somewhere in the field: **PSPI1, PSPI2, PSPI3 or PSPI4 (no spaces)**.

Enforcement

- 12.6 The development of PSPIs is being taken forward by way of promotion and education of good practice by working in partnership with trade associations rather than by an enforcement initiative.
- 12.7 As this programme moves forward those who are yet to adopt PSPIs will be increasingly out of step with good practice. They will therefore be more vulnerable to enforcement action in terms of monitoring the effectiveness of the process safety management system within the requirements of Regulation 4 of COMAH. **(See also Annex 1 Absence of PSPIs)**.

13. COIN Time Recording

- 13.1 In order that the Competent Authority can demonstrate the deployment of resources to strategic topics, there has been a slight alteration to the way we record time spent on these inspections on COIN:
 - for strategic topics there should be an entry made in the 'Category' box of the Time Line via a drop down menu;
 - the category selection will be restricted to the strategic topics and the relevant one should be selected when completing the timeline;
 - all other time line instructions are as before.

Business unit	(BU)	Work Desc	Activity	Category	Work
COMAH	Company	INSP_COMAH	StratTop emer onsite StratTop emer off-site StratTop PSPI KPI StratTop Ageing Plant StratTop Buncefield PSLG StratTop Containment	ELSE/ OFFCO/ OFFNC/ OSITE	Case/Service Order

14. Further Information

- 14.1 This guidance was reviewed and revised in January 2010. Any comments or queries on content should be addressed to Peter Dawson (VPN 515 4360).

Process safety performance indicators (Operational)

Annex 1: Core intervention issues

HSE expectations

COMAH operators should monitor the effectiveness of their process safety management system and demonstrate its effectiveness by setting process safety performance indicators.

Key actions for inspectors

- During interventions at COMAH sites assess the 'measurement' aspect of the process safety management system.
- For those companies who require it, provide advice/guidance on creating a suite of process safety performance indicators (PSPIs) in line with 'Developing process safety indicators: A step-by-step guide for chemical and major hazard industries HSG254'.

Depending where an organisation is with PSPI progress, inspectors should consider the following:

1. Introduce the subject of performance indicators by emphasising the importance HSE has placed upon them. Use the **Justification** section of this DG.
2. As this is a fairly new concept, it will be useful to give an overview of our expectations with some supporting questions about the questions asked.
3. It is likely that the company will have some performance indicators against process safety risks, however, they will probably be mostly lagging with maybe a few leading indicators. Many will be measuring the progress with programmes such as completing audit action points, progress with reviews of written instructions etc. Whilst important, it should be remembered that this is not a direct measurement of the operation of their Risk Control System (RCS). To achieve this it is important to explain the concept of 'dual assurance', i.e. having supporting leading and lagging indicators in support of the critical elements of a risk control system (see HSG254 page 2, Figure 1).
4. HSG 254 provides a framework and a language for operators to move beyond believing that their process safety management system is delivering the desired outcomes to knowing that they are. HSE cannot insist that operators use HSG 254 to set process safety measures as there are other systems and approaches available to achieve the same aim. However, we can now expect operators to be monitoring and measuring the effectiveness of their process safety management system based on an appraisal of the process safety outcomes delivered by them. It is worth stressing that performance indicators, no matter how good, only provide information on the status of the RCS. **It is the action taken as a result of that information that will make a difference to the control of risks.**

Approach & scope

We expect

Operators of COMAH establishments (and other complex plants) to develop, communicate, monitor and review performance indicators as part of their safety management system in line with the criterion set down for the assessment of COMAH safety reports (SRAM Criteria 11.23 –27). (HSG254 Part 1).

Questions

Has the organisation set process safety-related performance indicators?
(If the answer is no, go 11).

Commitment /leadership

We expect

Directors and senior managers to actively be involved in the control of business risks (corporate governance). (HSG 254 page 7 Step 1.3).

Senior managers should understand fully the business benefits of performance measurement and clearly see how managing process safety contributes to the success and sustainability of their company.

Performance indicators should be used to show the status of the process safety management system.

Direct and tangible action should be taken to make improvements where necessary based on the information gained from performance indicators.
(HSG 254 page 14, Step 3.4 & page 17, Step 4.4).

Typical Questions

Do the most senior managers within the organisation routinely receive information on process safety performance?

How is the information used?

What impact does it have on the management of process safety risks?

Are you confident this information provides you with the assurance that process safety risks are under control?

What changes have been made within the organisation as a result of the information provided?

The indicators should be chosen to provide the management team with the right scope and level of information they need to be satisfied that process safety risks are under control.

Are the process safety indicators set at:

- plant/installation;
- site;
- organisational level; or
- a combination of the above.

The management should:

- actively participate in the development of indicators and the setting of tolerances;
- routinely see and act upon the information provided from the process safety measurement system. (HSG 254 page 7 Step 1.3).

Both leading and lagging indicators should be used to monitor specific process safety risks.(HSG 254 page 2 Figure1: Dual Assurance).

Information from the measurement system should have a clear and tangible impact on the management of process safety risks.

How was the scope of the indicators set?

For example, are they based on:

- process safety and major hazard risk profile?
- where greater business assurance is needed?
- improvement programmes?

Selecting indicators

We expect

The process safety risks at a site to be reflected in the performance indicators that have been set. (HSG254 page 11, Step 2.2).

The company to have considered the main incident scenarios to help themselves focus on the most important activities and controls against which the indicators should be set. This involves identifying:

- what can go wrong (the incident scenarios);
- the immediate causes of the scenario; and
- what risk control systems are in place to control them.

Defining the outcome

Key Questions

Have the most critical activities been identified at this site?

Have risk control systems been put in place against these activities?

We expect

The 'desired safety outcome' to have been defined, in terms of success, for the important RCSs. Without this it will be impossible to monitor the success of RCSs, to show the outcome is being achieved. (HSG 254 page 13, Step 3.2).

The safety outcome of a RCS to have been considered by asking the following questions:

- why do we have this RCS?
- what does it deliver in terms of safety?
- what would the consequences be if the RCS wasn't in place?

That **lagging indicators** have been set to monitor whether or not the organisation has been successful at achieving the desired outcomes of these RCS.
(HSG254 page 13, Step 3.2).

Questions

Have the critical RCS been discussed and a 'safety outcome' decided upon against each one?

Have lagging indicators been set to monitor whether or not the desired outcomes of the RCS are being achieved?

Defining the critical elements of the risk control system(s)

We expect

Those elements that are critical in a RCS to deliver the outcome that has been defined. It is not necessary to monitor every part of a RCS. (HSG254 page 15, Step 4).

That **leading indicators** are set to monitor whether the RCSs in place are operating as intended.
(HSG254 page 16, Step 4.2).

Questions

In determining what aspects of a RCS are monitored, were the following considered:

- *which activities must be undertaken correctly on each and every occasion?*
- *which aspects of the system are liable to deteriorate over time?*
- *which activities are undertaken most frequently?*

Have leading indicators been set to monitor the critical elements of each important risk control system are operating as intended?

Periodic review

We expect

The performance against each risk control to be routinely reviewed by senior managers to ensure the whole process safety management system is delivering the intended outcomes and to provide assurance that critical systems continue to operate as intended. (HSG254 page 19, Step 6).

Questions

Are reviews carried out to demonstrate that:

- *the indicators still reflect the main risks?*
- *the data collected shows that the risk controls are actually working?*

Absence of PSPIs

Monitoring performance of the management system aimed at preventing and mitigating a major accident could be considered as a 'necessary measure' under COMAH Regulation 4. (Schedule 2, paragraph 4(f) sets this as an explicit expectation). HSG 254 is new guidance and represents good practice in this area, supplementing the guidance in paragraphs 373 –379 of L111.

Operators should be allowed time to assimilate this updated guidance. Over time, we would expect that all COMAH operators improve and amend their monitoring systems to meet the approach outlined in HSG254, or an alternative equivalent.

The critical test should be whether the measurement system gives direct information on the outcomes of the process safety management system, detects system deterioration and promotes improvements in time to prevent a major accident. Revised Safety Reports, when submitted, will require this demonstration.

For COMAH establishments inspectors should consider the following steps:

- ask how the company knows (rather than believes) that the RCSs are operating as intended;
- let the company know that HSG254 is available in the internet or to purchase;
- take the company through an overview of the process of developing PSPIs using the standard presentation and guidance material available on the **PSPM website**;
- suggest that they register to join the **PSPM website**;
- arrange to meet with the company again after a suitable timescale.