Process Safety Performance Indicators for Major Accident Hazard Pipelines

UKOPA Meeting - Teddington – 28 February 2008

Jon Carter
HID CI 3G
Chelmsford

UKOPA/08/0022

HSE

Health and Safety
Executive

Developing process safety indicators

A step-by-step guide for chemical and major hazard industries

CHEMICAL INDUSTRIES
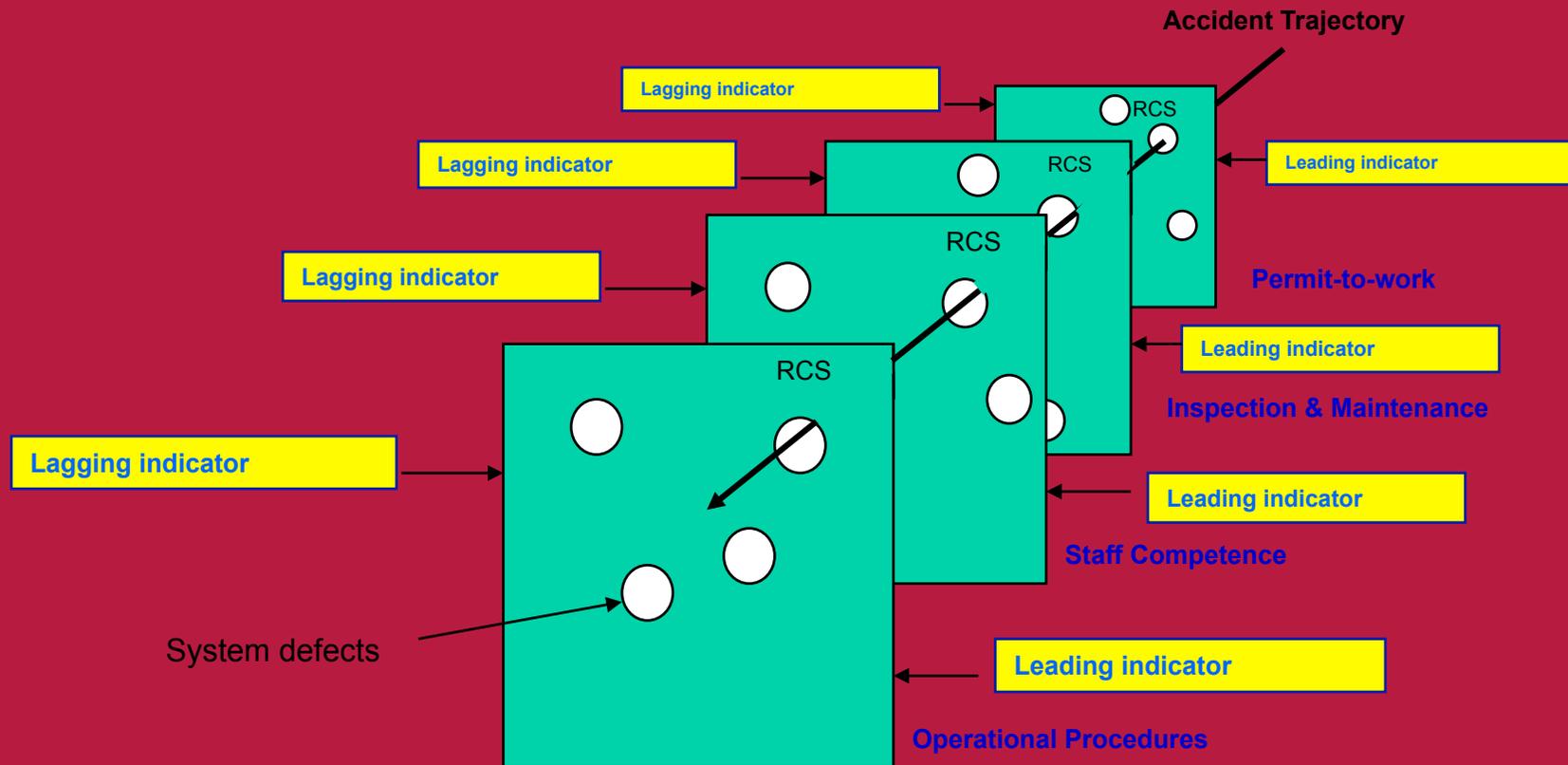ASSOCIATION

Introduction

- The steps to effective performance measurement
  - Establish organisational arrangements
  - Decide on scope
  - Identify risk control systems and outcomes
  - Identify critical elements of RCSs
  - Establish data collection and reporting systems
  - Review

- What do we want to know & why?

- What use will be made of the information?

- What will change as a result – need to demonstrate a positive impact on safety?

- Focus on directly measuring control of risk.

- Information used by those involved in managing the activity to take immediate corrective action.

The HSG 254 Approach

- What can go wrong?

- Where will these challenges to integrity be most critical?

- What systems are in place to manage those challenges?

- What does success look like – measure using a lagging indicator.

- What are the critical activities which must work right to deliver the intended outcome – measure continued operation using a leading indicator.

Indicators set to identify defects in the risk control systems

Accident Trajectory

Lagging indicator

Lagging indicator

Lagging indicator

Lagging indicator

RCS

RCS

RCS

RCS

Leading indicator

Leading indicator

Leading indicator

Leading indicator

Permit-to-work

Inspection & Maintenance

Staff Competence

Operational Procedures

System defects

After J Reason – Accident Trajectory Model

Establish the Organisational Arrangements

- Appoint a steward or champion

- Set up an implementation team

- Involve senior management

Decide on the Scope: Consider what can go wrong and where

Select the organisational level

Identify the scope of the measurement system:

- Identify incident scenario – what can go wrong?

- Identify the immediate cause of hazard scenario

- Review performance and non-conformance

Identify the risk control systems in place. Set a lagging indicator

What risk control systems are in place?

Describe the **outcome**

Set a lagging indicator

Follow up deviations from the outcome

Identify critical elements of each risk control system. Set leading indicators

What are the most important parts of the risk control system?

Describe the **activity**

Set leading indicators

Set tolerances
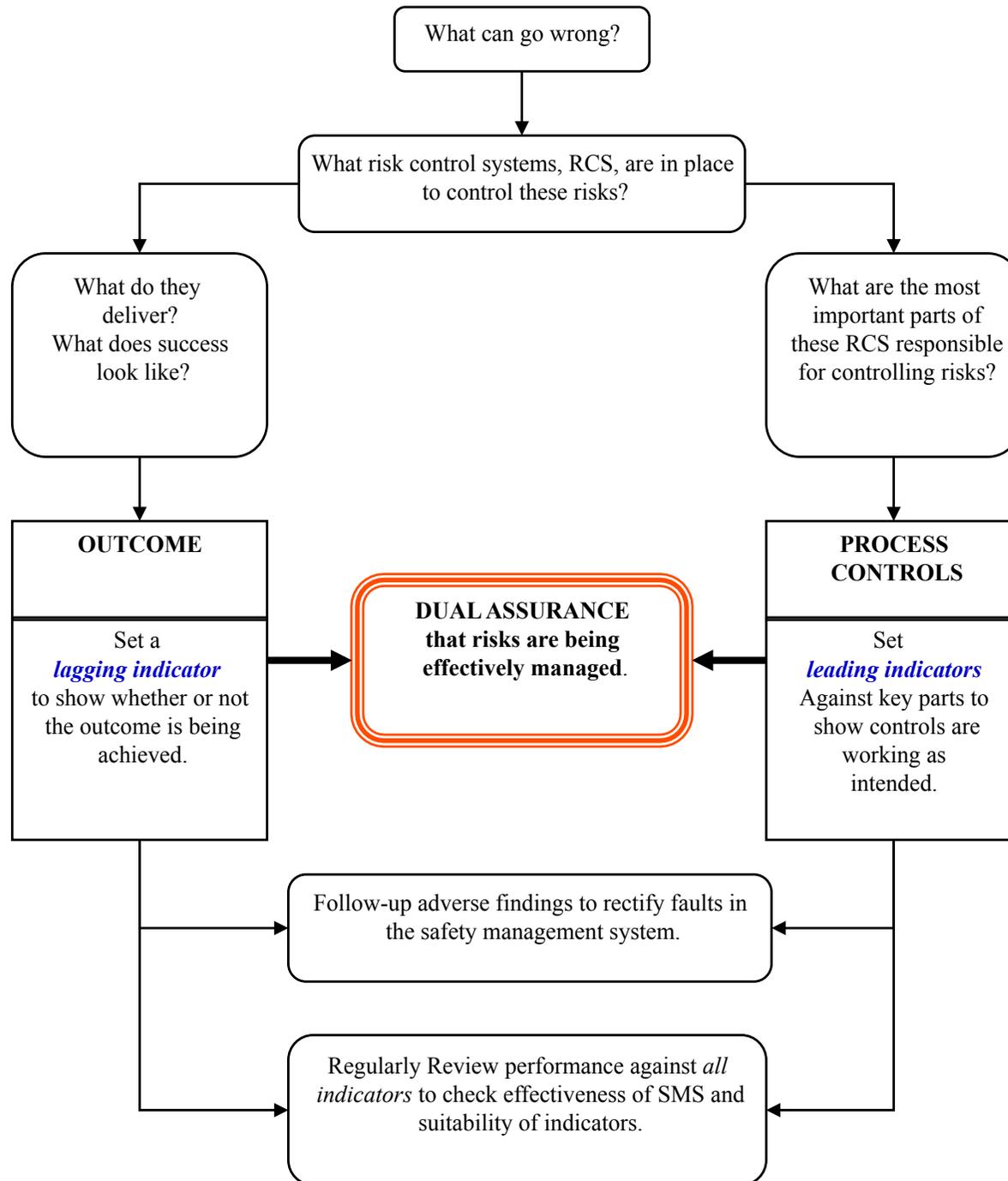
Establish the data collection and reporting system

- Collect information – ensure information / unit of measurement is available or can be established

- Decide on presentation format

Review

- Review performance of process management system

- Review the scope of indicators

- Review the tolerances

What can go wrong?

What risk control systems, RCS, are in place to control these risks?

What do they deliver?
What does success look like?

What are the most important parts of these RCS responsible for controlling risks?

OUTCOME

Set a
lagging indicator
to show whether or not the outcome is being achieved.

DUAL ASSURANCE
that risks are being
effectively managed.

PROCESS CONTROLS

Set
leading indicators
Against key parts to show controls are working as intended.

Follow-up adverse findings to rectify faults in the safety management system.

Regularly Review performance against *all indicators* to check effectiveness of SMS and suitability of indicators.

Identify the immediate cause of hazard scenarios

- Failure of pipelines
  - Corrosion
  - Third-party interference
  - Over-pressurisation

- Accidental release
  - Failure to isolate / de-isolate adequately for maintenance
  - Connections not made correctly

Risk Control Systems

- Control and instrumentation systems
- Inspection and Maintenance
- Cathodic Protection (and CP monitoring)
- Pipeline over-flights and line-walking
- Liaison with land-owners
- Competence and training
- Control of contractors
- Emergency arrangements

For each risk control system:

- What does it deliver?

- What does success look like?

  - Do you know when it has been done?
  - Can you measure it?
  - Is it close to the source of the risk?

  Set a lagging indicator to show whether or not the outcome is being achieved

For each risk control system:

- What are the most important parts of the risk control system responsible for controlling risk?

- What must be done right every time?

- What is most vulnerable and is most likely not to be done (correctly)?

Do you know when it has been done?
- Can you measure it?
- Is it close to the source of the risk?

Set a leading indicator for critical parts of each risk control system to show controls are working as intended

Set tolerances

- Set by management team

- Decide at what point intervention is required, performance has deviated beyond an acceptable level

- Review and revise tolerances with operational experience

Review

- Review performance against all indicators

- Check effectiveness of safety management system

- Check suitability of indicators

Different levels of Indicators

- Unit / Pipeline

- Site / Network

- Company

- Sector

The Way Forward

Any Questions?