Key performance indicators (KPIs) focus on the use of leading and lagging indicators that are selected and monitored to target for improvement. Leading indicators are process-focussed metrics that signify the function of operating discipline, processes, or safety barriers/controls. Leading indicators are selected to provide an early signal of potential issues or degradation of safety controls so proactive corrective actions can be conducted. Lagging indicators are outcome-focused metrics that can signify recurring issues and include events that have taken place.

Self-Assessment & Action Plan

Visit Key Performance Indicators on pellet.org for:

* Self-Assessment & Action Plan Worksheets
* Improvement Tools & Resources
* Leading and Lagging Indicators Guidelines



When completing the Self-Assessment & Action Plan below:

* If you identify a gap in any of the questions, develop an action plan.
* When choosing due dates for the action plans, consider the following to determine priority:
  + The anticipated effort required to close the gap and make improvements,
  + The benefits expected from taking action and implementing change, and
  + The urgency (e.g., perceived risk) of the improvements needing to be made.

Key Resources

* [PSM Implementation: How to Use the Self-Assessment Worksheets](https://pellet.org/resources/how-to-use-the-psm-self-assessment-worksheets/)
* [Process Safety Management](https://pellet.org/safety/safety-initiatives/process-safety-management-psm/) on [pellet.org](http://pellet.org/)
* [CSA Z767 Process safety management standard (2nd edition)](https://www.csagroup.org/store/product/CSA_Z767%3A24/)

Materials are being updated all the time - come back to pellet.org often.

Suggested Activities

* Develop leading indicators that measure the performance of work processes, procedures, and equipment that prevent incidents.
* Develop lagging indicators based on process safety incidents that measure weaknesses, defects or failures in processes, procedures, and equipment.
* Communicate process safety metrics to all personnel.

Suggested Deliverables

* Established a process to review and communicate key performance indicators, including target and actual, to management and employees on a routine basis.

References

* Rayner Brown, K., Murray, G., Laturnus, B., Yazdanpanah, F., Cloney, C., Amyotte, P.R. (2024). [*Integrating Process Safety Management into Canadian Wood Pellet Facilities that Generate Combustible Wood Dust.*](https://onlinelibrary.wiley.com/doi/10.1002/cjce.25462) The Canadian Journal of Chemical Engineering. 102, 4085-4103.
* WorkSafeBC. (2022). [*Managing Risks in Manufacturing Workplaces: How to Use the Self-Evaluation Tool*.](https://www.worksafebc.com/en/resources/health-safety/information-sheets/managing-risks-manufacturing-how-to-use-self-evaluation) Last accessed April 2024.
* WorkSafeBC. (2023). [*Enhancing Health & Safety Culture & Performance: Self-Evaluation Tool for Managing Risks in Manufacturing Workplaces*](https://www.worksafebc.com/resources/health-safety/checklist/managing-risks-manufacturing-assessing-mobile-equipment?lang=en&direct). Last accessed April 2024.

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|  |  |  |
| --- | --- | --- |
| 1. **Have you identified leading and lagging key performance indicators (KPIs) for process safety at your facility?**   Yes (formalized and documented)  No  Unsure | | |
| **Action owner** | **Due date (yyyy-mm-dd):** | |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Are unsafe behaviours or inadequate operational discipline measured? Operational discipline is defined as the performance of all tasks correctly every time.**   Yes (formalized and documented)  No  Unsure | | |
| **Action owner** | **Due date (yyyy-mm-dd):** | |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Are process safety near misses tracked? These may include, for example, small fires, system failures or instrumentation failure that could lead to an incident.**   Yes (formalized and documented)  No  Somewhat  Unsure | | |
| **Action owner** | **Due date (yyyy-mm-dd):** | |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Are near misses collected and used for lessons learned, enhancing awareness, and improving process safety culture?**   Yes (formalized and documented)  No  Somewhat  Unsure | | |
| **Action owner** | **Due date (yyyy-mm-dd):** | |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **When selecting key performance indicators, which of the following are considered? Check all that apply.**   Not applicable—process safety key performance indicators have not been selected.  Indicators refer to process safety critical equipment and items that influence system performance.  Indicators advance process safety performance improvement and learning.  Indicators are relatively easy to implement, measure, and understood by stakeholders.  Indicators can be used for benchmarking.  Not applicable. | | |
| **Action owner** | **Due date (yyyy-mm-dd):** | |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Which of the following lagging indicators are tracked? Check all that apply.**   Not applicable—process safety key performance indicators have not been selected.  ID (induced draft) fan fire.  Silo fire.  Pelletizer/extruder fire.  Cooler fire.  Pipe fire.  Dryer fibre silo fire.  Conveyance fire.  Fibre pile fire.  Mobile equipment fire or deflagration.  Hammer mill deflagration.  Belt-dryer deflagration.  Deflagration propagation (multiple equipment impacted).  Others (list): | | |
| **Action owner** | | **Due date (yyyy-mm-dd):** |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Which of the following leading indicators related to electrical upset conditions are tracked? Check all that apply.**   Not applicable - process safety key performance indicators have not been selected.  Loss of power.  Communication error or loss of communication between HMI/PLC (human-machine interface/programmable logic controller).  ID fan failure (loss of air flow) due to electrical loss/power outage.  Deluge system failure due to electrical loss/power outage.  Electric fire pump due to electrical loss/power outage.  Fire or explosion detection systems malfunction due to electrical loss/power outage.  Auto deluge malfunctions.  Motor failure.  Others (list): | | |
| **Action owner** | | **Due date (yyyy-mm-dd):** |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Which of the following leading indicators related to mechanical upset conditions are tracked? Check all that apply.**   Not applicable—process safety key performance indicators have not been selected.  Cyclone plug-ups/clogs.  Conveyor plug-ups and breakdowns.  Dryer infeed conveyor failure.  Dryer outfeed conveyor failure.  Drag chain breakage.  Hammer mill shutdowns.  Belt breakage (dryer or conveyor).  Dryer high temperature shutdowns (due to losing power or due to losing feed).  Motor failure.  Others (list): | | |
| **Action owner** | | **Due date (yyyy-mm-dd):** |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Which of the following leading indicators related to environmental/weather upset conditions are tracked? Check all that apply.**   Not applicable—process safety key performance indicators have not been selected.  Deluge system failure due to freezing.  Dryers having trouble with fluctuating fibre moistures (inconsistent speeds).  Sparks caused by combustion air fluctuating with ambient air.  Freeze up in abort gates.  Freeze up in utilities/compressed air system.  Operational issues with pneumatic sensing/differential pressure lines/flow sensor due to cold temperatures.  Freezing of incline conveyors.  Blower intake screens plugging due to hoar frost.  Building dry valve systems breaking the drain systems due to frost.  Excursions of high-speed bearing temperatures, including hammermills and fans during hot ambient temperatures.  Excursions of high pellet temperatures out of the coolers and into the rail cars during hot ambient temperatures.  Issues with electrical drives, PDCs (power distribution centres), MCCs (motor control centres) during hot ambient temperatures.  Others (list): | | |
| **Action owner** | | **Due date (yyyy-mm-dd):** |
| **Plans and actions needed to address gap or improve existing approach** | | |
| 1. **Which of the following leading indicators related to operational upset conditions are tracked? Check all that apply.**   Magnets filled with metal contaminants (not cleaned).  Rock traps full (not cleaned or emptied).  Worn hammers.  Holes in hammermill screens.  Pelleter roll and dies worn or out of adjustment.  Bridging of material in surge bins.  Failing bin level indicators or bindicators.  Fibre too wet or too dry coming into pelleters.  Decks bridging off or running empty.  Mixing bin bridging.  Cooler bins plugging up.  Manual deluge malfunction.  Burner will not relight.  Others (list): | | |
| **Action owner** | | **Due date (yyyy-mm-dd):** |
| **Plans and actions needed to address gap or improve existing approach** | | |

Review of Action Plan for Key Performance Indicators

Complete the following table after corrective actions have been implemented.

|  |
| --- |
| Improvement actions taken |
| How did you ensure the controls were implemented in a timely fashion? How did you prioritize your actions? |
| How will you ensure the implemented controls will continue to be effective over time? |
| How are workers involved in developing and implementing controls? |
| How do you know that workplace decisions related to safety are effective and sustainable? |
| How do you measure change to establish a new performance expectation? |
| When changes are made, how are interrelated procedures, programs, and policies updated effectively? |
| Is a strategy for continuous improvement in place? How does this process work? |
| If you have multiple locations, are lessons learned and continuous improvements shared with other locations? How does this process work? |
| Is the safety management system self-sufficient, or does it rely on specific individuals to make it function? How do you ensure the system remains self-sufficient? |
| Overall effectiveness of improvement actions. |