

Significant Event Elimination Program Overview

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Abstract

This paper presents an overview of the Significant Event Elimination (SEE) Program. The objective of the SEE Program is to eliminate the reoccurrence of events which have had the most significant impact, or potential for impact, on the safe operation of the plant. With some additional considerations, the SEE program can address reliability and quality issues as well. As such, the SEE program is an important part of a Continuous Improvement Program.

SEE includes a method to prioritize plant events, including “near misses,” based upon their actual or potential safety, health, and environmental impact. The prioritization includes both one-time events and repetitive events. The highest priority events are then analyzed using root cause failure analysis (RCFA), reliability-centered maintenance (RCM), or other appropriate analysis tools. The analysis provides recommendations that can be used to prevent, inhibit, predict, or find future problems, thereby improving the plant.

The SEE process consists of two major steps: Event Prioritization (including ongoing data collection and analysis), and Event Analysis. Each of these steps is described in the following paragraphs:

Event Prioritization

Event Prioritization includes several substeps. The substeps first identify failure effects by considering the overall requirements and goals, and then prioritize events by reviewing them against actual and/or potential failure effects.

The substeps required for Event Prioritization are as follows:

- Identify Failure Effects and Weight Values (one time program development task)
- Ongoing Event Data Collection
- Periodic Pareto Analysis of Event Data

Each of these substeps is briefly described in the following paragraphs.

Identify Failure Effects and Weight Value

The first step in establishing the SEE Program is to identify the failure effects of concern to the plant and to associate a weight value to each effect. This subtask is performed only once, during the initial implementation of the SEE Program. The effects should address all areas of concern to the plant (e.g., safety, health, environmental, and any other regulatory issues). In addition, it is also possible to include production and quality issues in the analysis. Possible effects are shown in Table 1.

Once the effects are determined, weight values should be assigned to them based upon the relative impact of each effect. Typically, weights are assigned on a scale from 1-10, with 10 being the worst effect.

Code	Effect	Weight
A	Plant personnel hazard significantly greater than that of normally working in the area	10
B	Plant personnel hazard moderately greater than that of normally working in the area	5
C	Plant personnel hazard slightly greater than that of normally working in the area	8
D	Significant hazard to general public	4
E	Environmental/other regulatory event - written notification	4
F	Environmental/other regulatory event - non-written notification	7
G	Potentially reportable environmental/other regulatory event	3
H	Requires increased monitoring or evaluation of equipment	6

Table 1. Example Failure Effects

Ongoing Event Data Collection

Event Data Collection involves the ongoing collection and retention of past and ongoing event data in a central location. Data should be collected for any events that result in any of the identified effects. For each event, the data collected should include, as a minimum, the information shown in Table 2.

Date and time of event	Duration of event
Date and time of event discovery	Effect(s) of event
How event was discovered	Recurring Event (y/n?)
Categorization of event (e.g., equipment failure, personal injury, "near miss")	Reference to other related documents (e.g., work orders)
Equipment identifier(s)	General overview of event
Equipment failure mode/mechanism/cause (if known)	

Table 2. Event Data Collection Requirements

To identify the events and collect the associated information, the following information sources should be reviewed/interviewed:

- Regulatory reports, including, but not limited to OSHA, EPA, NRC, and local agencies
- Plant operating/production reports
- Incident Investigations
- "Near Miss" Investigations
- CMMS Work Order History
- Interviews with Plant Operators, Maintenance Personnel, and Management

The best mechanism for retention of event data is a database, which will allow easy analysis of the data. The database implementation may be through a specific SEE database or use of the site's CMMS.

The development of the SEE Program must also address the mechanism(s) for ensuring that necessary data is provided to the SEE database. Data collection requires complete and accurate information reporting, and availability of the data to the individual(s) responsible maintaining the SEE database.

Periodic Pareto Analysis of Event Data

The SEE database will determine the rank of each event based upon the effects (or potential effects) associated with each event. Periodically, plant personnel should generate an ordered listing (i.e., Pareto chart) of events by event rank value. In addition, other Pareto charts should be developed by equipment identifier and process line, to identify specific equipment and/or lines which may be "bad actors." Pareto results can be used to prioritize the allocation of resources for Event Analysis, and to guide the evaluation of recommendation effectiveness.

Event Analysis

The purpose of this task is to identify "applicable" and "effective" activities that address the event(s) being analyzed. An activity is "applicable" if it is capable of (1) preventing future events by eliminating the (root) cause, (2) predicting equipment failure with sufficient time to allow for correction prior to a complete, catastrophic failure, (3) inhibiting failure by retarding degradation, and/or (4) finding "hidden failures." Sometimes the words "technically feasible" are used instead of "applicable." This task involves the analysis of the equipment and/or human performance failure modes and mechanisms of the events. The results of this analysis are used to identify applicable activities (e.g., PM/PdM, design changes, operating practice changes), which could, if implemented, prevent, predict, inhibit, or find equipment failure. The "effectiveness" of these PM activities is not of direct concern at this point, and is addressed shortly.

Event Analysis must address the specific event which occurred, and will apply principles of root cause failure analysis (RCFA) and reliability-centered maintenance (RCM). As such, for events involving equipment failure, this task will also include an overall review of the equipment failure modes and mechanisms to ensure that overall reliability issues are addressed. Information that can be reviewed for determining failure mechanisms are as follows:

- Facility-specific failure data (e.g., work orders, monthly operating reports) for the equipment being analyzed and for similar equipment at the facility
- Equipment design review (including contact with the vendor) to identify maintenance preventable wearout failure mechanisms
- Experience-based engineering judgment of the SEE analysis team

In addition, for all events, this task will include consideration of other areas of the plant to which the analysis may apply. This is an important consideration, as it can eliminate “common cause” failure modes, and prevent similar incidents from occurring in other parts of the plant.

Categories of activities which should be considered include the following:

- Preventive and Predictive Maintenance
- Design Changes
- Operating Procedure and/or Process Changes
- Training

Once the “applicable” activities are identified, those that are “effective” must be identified and implemented. An applicable activity is “effective” if it provides a cost or safety benefit.

The effectiveness evaluations will result in recommendations to add, delete, modify, or consolidate existing PM/PdM activities; design changes, operating practice changes, or any combination of these types of changes. The evaluation considers event failure effects, the applicable activities, the currently performed activities, and the safety, health and environmental impacts of these various items.

If the evaluation determines that an activity change is warranted, the recommended change is documented, along with the basis for the change. This information should be reported in a format that serves as guidance for implementation.