It is essential to consider process history when reviewing operator alarm limits in the context of alarm stewardship and formal rationalization. For far too long limits have been implemented on a ‘try-it-and-see’ approach that leads to higher operator load weakening the operators’ trust in the alarm system, potentially leading to delays in acting, and adding extra work later in re-reviewing the limits. Reasons for avoiding such consideration in current alarm reviews may include the complexity of the data and overhead of review. In this paper we demonstrate techniques of data analysis based on the parallel coordinate plot that streamline and improve this, enabling the inclusion and reference to process operating envelopes in all alarm reviews.

Operator alarms are essential for the economic operation of process plants, avoiding process downtime and contributing toward increased process safety. There has been much recent attention on these systems and the introduction of the EEMUA 191 guidelines and IEC62682 standard for the management systems concerned with alarms. However, of necessity, little detail is provided for the practice of setting these alarm limits. In most approaches to alarm limit setting and philosophies, while attention is paid to consequences and consequence threshold, current process performance and capability is rarely considered in this process. This leads to alarm sets that cause unacceptable operator performance and do not contribute to improved operation or safety.

Correct positioning of alarm limits is the primary determinant of the effectiveness and performance of an alarm system. The methods used today are univariate, opinion-based and presume independence with the limits on other variables. We show that the limits are not independent but are all related to an operating envelope of the process. This new understanding transforms and substantially simplifies the setting of alarm limits consistent with an operating envelope of the process and makes an invaluable contribution to increased operator effectiveness and process safety.

Including historic process data in the alarm rationalization process is required to avoid these pitfalls. The size of the required datasets, and the difficulty of visualizing, let alone interrogating, this data using traditional methods, has led to adapting the parallel coordinate projection as the
enabling technique for visualizing sets of alarm limits and their relationship with operating history, operating envelopes, and operator response.

Using interrogative visualization of process history in the alarm review context increases effectiveness, producing limits that already consider process operation, and identifying early in the process issues that are usually only seen after the new limits have been put in place, allowing necessary operational and engineering changes to be investigates months or more earlier than now, while producing a set of limits consistent with this operation. These methods also increase the speed of the review, allowing smaller teams to perform most of the work independently and providing a common framework for communication.

Pitfalls and issues that can be identified by using the historic data include mis-sized equipment, poor control, lack of capability and failed equipment. We demonstrate how these are identified in the context of alarm review.