

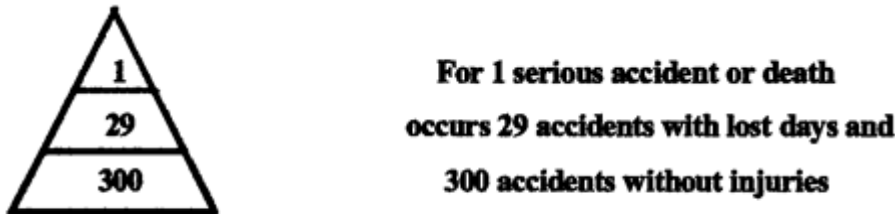
**GAS DISTRIBUTION GRIDS SAFETY INDICATORS**

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**Abstract**

In the Netherlands, the safety of the gas distribution system is a hot issue. The public perception is that the safety of the system is decreasing, whilst the industry thinks that it is business as usual and that neither the number of incidents nor the consequences of incidents are larger than they used to be. Which of the claims is true? To this question no objective answer was available. First of all, no accessible database existed that contained records of all relevant incidents. Secondly, there was no agreed upon method to combine all those incidents into a simple, easy to understand indicator of safety. As an answer to these questions a Safety Indicator was developed in the Netherlands. This safety indicator combines a theoretical framework with actual incident and malfunction data resulting in a quantitative model.

In the gas industry it is known that several causes can lead to accidents. E.g. leakage can lead to fire or explosions. These fires and explosions can lead to mortalities. It is known that the higher the leakage rate, the higher the chance of explosion and mortalities. The Safety indicator uses this relation which was first used by Heinrich .



**Figure 1. Pyramid of Heinrich. Source: Heinrich (1931)**

This triangle describes the relation between rare occurrences that have a high impact (accidents) and the more numerous occurrences with a low impact.

Translating this to a gas distribution system the Safety indicator uses the relation between accidents and the more numerous number of malfunctions to calculate the risk contribution for every type of malfunction. Using this relation, the safety contribution for every malfunction can be calculated without the necessity of an accident to occur. This leads to a strong instrument that gives an objective answer to the earlier raised questions.