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Research Article

Retracted: Technical Inspection Engineering and Risk Based Inspection in order to optimize inspection plans

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ABSTRACT

In response to challenges such as stop or reduce production costs, aging equipment and more competition, different technologies such as Risk Based Inspection, adjustment in terms of maintenance and repair services with a focus on reliability, spread over 15-10 years. Risk Based Inspection methodology uses risk for prioritization and management of inspection programs.In these way inspection resources on devices with the highest risk (probability and consequence of failure) is concentrated.With this technology, prioritizing inspection equipment, optimization of inspection as well as the method and time of inspection programs is possible.Risk Based Inspection consequence of improving safety, reducing halt production and ultimately reduce the cost of production.In this paper the general principles of the method, described its role in improving inspection programs.

Key words: Risk Based Inspection, inspection programs, probability of failure, the consequences of failure, safety

INTRODUCTION

With time and increasing the life of a plant, maintenance requirements (Maintenance Requirements) is important. In order to improve safety and achieve optimal adjustment of investment in maintenance is required. In order to reduce the costs and benefits of a systematic inspection program is required. [1] Risk Based Inspection (Risk Based Inspection) from the early 90's response to the need for oil, gas and petrochemical equipment to manage risk and prioritize based on risk was developed. Risk Based Inspection a new approach in the management of inspection and risk assessment in order to plan, justify and interpret the results of the inspection, testing and monitoring its use. In this way, unlike traditional methods of inspection, but there is no fixed time interval defined for each device, and method of inspection specified time interval determined. Using a Risk Based Inspection while is avoiding frequent inspections, the inspection features and capabilities focused on devices with higher risk. [2,3] In Figure 1. The number and cost of accidents occurring in three different decades (1990-1960) in crude oil refining and petrochemical industries are shown.

Figure 1 The number and cost of accidents caused crude oil refining and petrochemical industry in three different decades

As it showed above, over time, the number of accidents and increased costs caused by them were increased. These results indicate that traditional technologies cannot guarantee the safety and management of industrial units is functioning without incident. The emergence and development of risk-based inspection management is therefore realistic view of such matters. In Figure 2, the main causes of waste in percentage terms in the refining of crude oil and petrochemical industry in the years 1960-1990 is given. As seen in the figure is the highest share in waste of material and mechanical damage. Risk Based Inspection has the greatest impact on mechanical damage.The Risk Based Inspection determines and identifies design errors before the establishment of effective incident.

Figure 2. Causes of crude oil refining and petrochemical industry waste in percent

All the other techniques to Risk Based Inspection and Safety were established based on risk. The output of these techniques for the input and output Risk Based Inspection and Safety to improve risk-based techniques implemented by organizations is used.

METHODOLOGY

Process hazards analysis and risk-based techniques and safety OSHA psm programs are an example. [3] API580 and API581 standards are three main methods of risk assessment.[3,4]

-Qualitative Approach

-Semi-quantitative method

-Quantitative methods

1. Qualitative Approach

Log data based on qualitative methods, descriptive information is available using the experience and history. This method requires less detailed information has, therefore, has its limits. This method is generally used to prioritize important part of a unit or a unit used to study Quantitative Risk Based Inspection. Assuming correct input data, the method for determining the probability of failure (Probability of Failure) method is very accurate. [3]

2. Semi-quantitative method

The risk assessment will be based on a clear set of rules. For example, the predicted probability of failure due to corrosion of the carbon dioxide wet on the basis of the Standard Model **De weard**and **Milliams** be determined. The accuracy of this method is affected by the quality of input data as well as the inherent accuracy of the model. This method is a good way to Risk Based Inspection and partly enjoys the benefits of both qualitative and quantitative methods. [3,5]

3. Quantitative methods

This method is much more accurate than qualitative approach and using it you may risk calculated for each device or part of a pipeline. Then, using the information available, the analysis can be a comprehensive inspection determines a unit. Computer-based quantitative data to determine the probability of failure is history. What distinguishes qualitative and quantitative method in the input data and the accuracy of the data and the accuracy of the results is output.

Figure 3 shows the outline of inspections based on risk and its relation to it. It is important to note that drawing flowchart was general and it was not based on the risk assessment methods (quantitative, qualitative or semi-quantitative).

RESULTS

To assess the probability and consequence of failure, circuit design corrosion (Corrosion Loop Design) done. This design in an operational unit based on the type of fluid, temperature, pressure and case material is formed. In Figure 4, a distillation unit in refinery corrosion is circuits that each color represents a corrosion circuit. After determining the probability and consequence of failure, risk assessment and determine the degree of deterioration Devices (Criticality risk assessment) done and finally develop and implement risk-based inspection (Inspection Plan) takes place.

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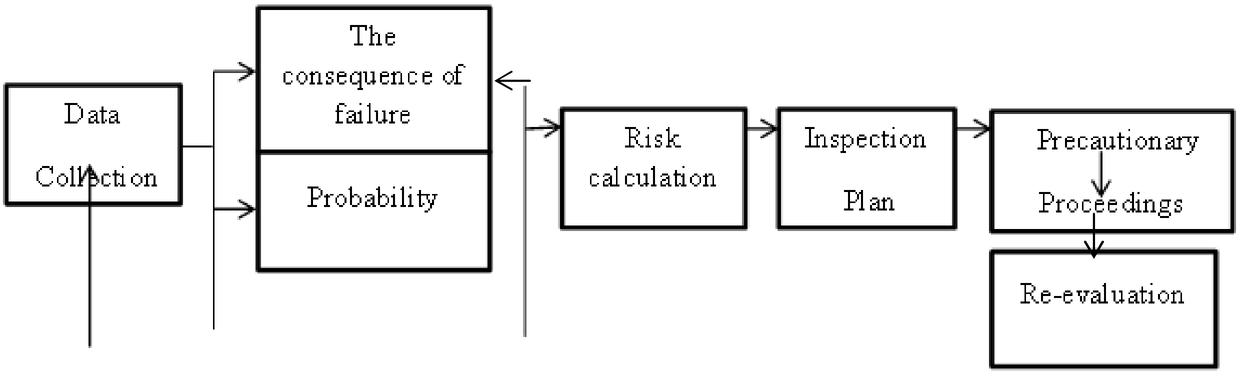

Figure 3. Schematic of risk-based inspection

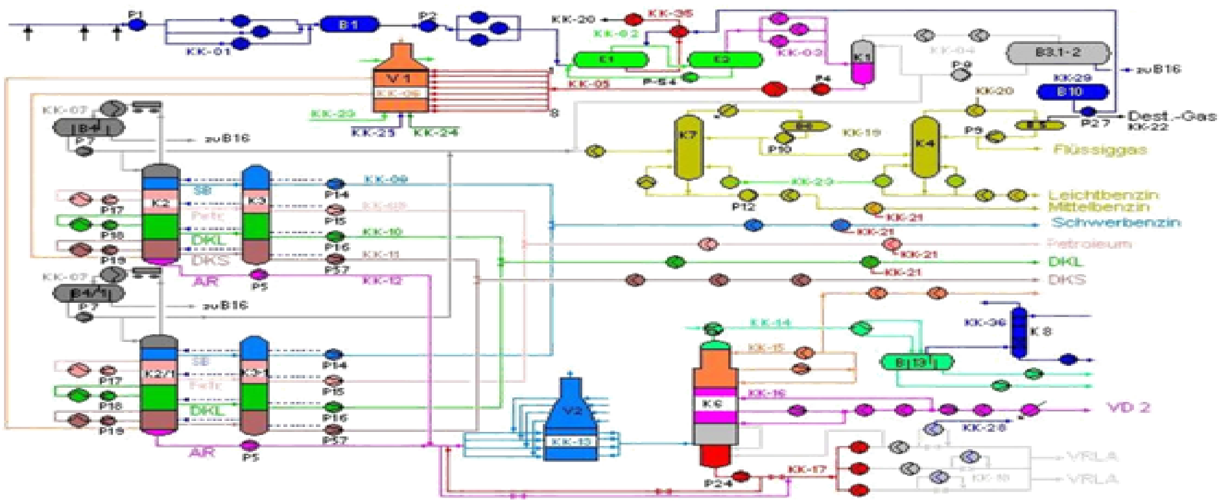

Figure 4. A circuit corrosion of a refinery distillation unit

Risk Management is a risk assessment process and the development of risk control is an acceptable value. Risk Reduction (Mitigation) is only part of risk management. [3]

Probability of Failure

The possibility of failure in risk-based inspection, estimating the probability of one or more mechanisms of degradation, is resulting in the waste of materials and restrictions (Loss of

Containment) . The evaluation of the degradation mechanisms that the device is sensitive to them and places that have been undertaken over several different failure mechanisms, sensitive specified. Types of corrosion mechanisms (internal, external, abrasion, corrosion fatigue, stress, welding, hydrogen sulfide wet) mechanisms creep damage hydrogen, softness at high and low temperatures as well as mechanisms sedimentation in evaluating the likelihood of failure are examined. In general, the probability of failure is determined by considering the following two factors:

1. egradation mechanisms and rate them as a result of working environment (internal and external) devices.
2. ffectiveness of the Inspection Program,to determine and monitor degradation mechanisms (to replace or repair the damage. [1,3]

Consequence of Failure

The consequence of failure predicts the outcome of a destruction device is evaluated. Assessing this factor can be done both quantitatively and qualitatively. Regardless of the method of qualitative or quantitative, is the main factors that are considered in assessing the consequences of failure as follow: [3,6]

- Flammable Events
- Toxic Releases
- Environmental Consequence
- Production Consequence
- Maintenance and Reconstruction Impact

Calculate Risk

The possibility of failure and the consequences of failure are two basic parameters in determining the risk of a risk is determined by multiplying them. [3,4,6]

Risk = Probability □ Consequence

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For each specific effect, risk calculation according to the following equation is determined:

Risk of a Specific Consequence= (Probability of a Specific Consequence) □ (Specific Consequence) Total risks calculated for each particular outcome, will determine the overall risk. Most of calculated risks were highest overall risk was almost time it. If the probability and consequence of failure is not expressed as numerical values, probability and consequence of failure risk by drawing on a risk matrix, is expressed.The following figure, a risk matrix is a 3 × 3. If both are low probability and consequence of failure is achieved the lowest risk and with number 5 has been determined.

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PROBABILITY OF FAILURE	CONSEQUENCES OF FAILURE: LOW (3)	MEDIUM (2)	HIGH (1)
HIGH (1)	3	2	1
MEDIUM (2)	4	3	2
LOW (3)	5	4	3

Figure 5 .Risk matrix (to number isspecified high risk 1 and low risk with the number 5).

Obtain the optimum combination of distance and time of the inspection techniques; Risk Based Inspection is one of the most important applications. By identifying the risk of each device, suitable inspection techniques for each piece of equipment is determined. With a Risk Based Inspection, at the same value search, the risk decreases. In Figure 7, risk management, using RBI and its effect on risk reduction compared to traditional inspection programs are shown. Due to the reduction of risks in RBI, inspection activities focused on high-risk equipment.

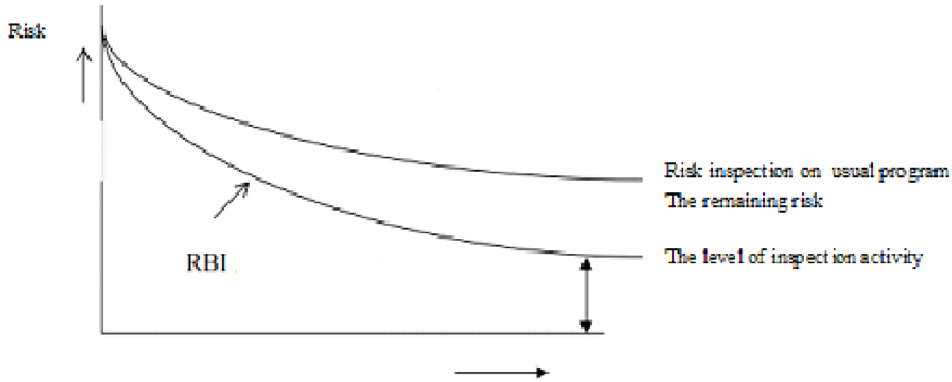

Fig. 7 Risk Management Risk Based Inspection using.

Natural disasters, deliberate sabotage, destruction of unknown design errors and mechanisms, are including factors that are causing this problem. The ultimate goal is to determine the time of inspection, is safe and compliant equipment during operation. The Risk Based Inspection, with a focus on according to the highest risk, better communication between failure mechanisms and efficiency of inspection on the appropriate mechanisms, will be established. [3]

RBI Benefits and Limitations

One of the main purposes of risk assessment is efforts to reduce mechanical damage, cost and waste materials. In short the benefits of establishing risk-based inspection are as follows: [1,3,5]

- Increased safety and equipment reliability
- Prioritization of Inspection
- Unplanned and Planned shutdown
- Inspection Effectiveness
- Longer Inspection Interval
- Increased consistency in inspection planning
- Identification of potential damage mechanism
- Identification of key process parameters affecting degradation rates
- Potential Inspection and Maintenance cost

In addition to numerous advantages, Risk Based Inspection is limited in the following cases.[3,4]

- Incorrect or inaccurate entry information.
- Improper design or installation errors related to equipment
- Incorrect process conditions
- Incorrect implementation of inspection programs
- Lack of trained personnel or poor teamwork
- Lack of legislation related to processing conditions and engineering information.
- Sabotage
- Natural disasters and external events
- Unknown destruction mechanism
- The inherent limitations of inspection methods

CONCLUSION

Risk Based Inspection methodology uses risk for prioritization and management of inspection programs. The inspection methods and resources available on the devices with the highest risk (probability and consequence of failure) is concentrated.

With this technology, prioritizing inspection equipment, optimization of the method and time of inspection and inspection programs is possible. Risk Based Inspection consequence of improving safety, reducing halt production and ultimately reduce the cost of production.

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