Journal of Industrial Engineering and Halal Industries (JIEHIS)
Vol. 3 No. 2 December 2022
P-ISSN 2722-8150
E-ISSN 2722-8142

Identification of Causes in The Dirty Gas Pipeline in Oil and Gas Delivery Process at JOB Pertamina Talisman Jambi Merang

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Abstract

Pigging is a routine maintenance method for cleaning the inner pipe surface. The treatment method uses an object called pig. In the world of piping, there are 4 (four) components that are very important and interrelated in carrying out pigging, namely pig launchers, piping systems, pig receivers, and pigs. Pig Launcher is a tool that is used to fire pigs into piping systems, while pigs are objects that are used according to their functions on surfaces in piping systems. The purpose of this study was to identify the cause of dirty gas pipelines in the oil and gas delivery process at JOB Pertamina Talisman Jambi Merang. From the results of the analysis and discussion, identified causes of dirty gas pipes, namely non-standard work procedures, no commitment to pigging activities from the management, non-standard equipment, use of non-standard and outdated anti-corrosion, lack of training on pigging, and low employee awareness of the importance of pigging.

Keywords : pigging; dirty; gas pipe; piping

INTRODUCTION

Maintenance is important in maintaining work equipment so that it does not cause greater costs, even though it cannot be felt directly, but the results of maintenance will be felt in the future. Some of the benefits of maintenance include so that no components are damaged suddenly, avoid large damage costs, and so that the equipment can be used for a long time (Akbar, 2022), (Marimin, 2022). With the equipment that is maintained, of course it will also have an impact on the quality of the product that will be produced. Where, service quality indicators are client satisfaction and perceptions, for example shown by the presence or absence of complaints from service users (Mujiraharjo & Basuki, 2019).

According to Assauri (2004) maintenance is an activity to maintain or maintain factory facilities or equipment and make necessary repairs or adjustments or replacements so that there is a satisfactory production operating condition in accordance with what was planned. The word maintenance is taken from the Greek terein which means to care for, guard and maintain. Maintenance is a combination of various actions taken to keep an item in, or repair it to an acceptable condition.

In this case the processing process involving fluids in the oil and gas industry involves a lot of piping systems. In the oil and gas industry, the pipelines that are distributed are long distances, even hundreds of meters. Various types of pipes of various sizes are used to transport crude oil and processed gas from one location to another. When the piping system is in charge of distributing process fluid, the reliability of this fluid flow system must be guaranteed. Obstacles or congestion that occurs in the distribution pipe must be avoided, so that the fluid can flow smoothly. To achieve this goal, cleaning the inside of the pipe should be done regularly. When the operators of the piping system encountered problems in the pipes, they thought of imitating the way people clean dirt, namely by wiping or scrubbing the dirt using a solid object. Solid objects that are inserted into pipes for cleaning purposes later are known as pigs (pressure indicator gauge). So that the meaning of this cleaning tool is not scientifically interpreted with other meanings, the term "pig" is not translated and adopted as is, both in spelling and pronunciation. Furthermore, from the noun pig, a derivative of the word pigging arises to express an action performed with an object called pig.

In this case, the company has carried out pipe maintenance with the inclusion of chemical liquid (crotion inhibitor) to prevent corrosion. However, this treatment turned out to be not effective enough because dirt or solids were still found in the laboratory report after sampling in the gas and condensate lines. Then do the pigging activity.

Therefore, in this study, several types of Pig were used, including Foam Pig which is very effective in absorbing liquid and carrying dirt, so the ability to absorb liquid and the liquid content in the pipe to be cleaned is thought to affect the performance of the pigging process. The initial velocity of the gas before being loaded by the pig will certainly determine whether the pig can start the movement or not, and then if it is already moving, it will be at high or low speed. One more thing that is thought to be the determinant of the pig's performance is its unique property in the form of its ability to absorb liquids.

On the basis that there is still a lot of dirt stuck to the inside of the pipe, this study took the initiative to identify the cause of the dirty gas pipe in the oil and gas distribution process at JOB Talisman Jambi Merang. Where distribution is an important part of the business process (Basuki, 2017). Therefore, identification of the cause of dirty gas pipes is important to do. Where there have been many studies that have identified the causes of the effects that have occurred, including in one study the causes of nata de coco which are abundantly moldy (Basuki & Fahadha, 2020), and also in a study identified priority defects that need attention (skin torn, thin skin, lorek skin) in the shaving process (sheepskin tanning) (Basuki, 2019).

It is hoped that after knowing the cause, the gas pipeline will be better maintained and better maintained, so that the oil and gas delivery route will not be hampered and will run smoothly in the delivery of oil and gas.

LITERATURE REVIEW

Research on maintenance such as the flushing system as a fluidization pipe cleaning system in estuary channel maintenance technology (Pristianto, 2010), then there is maintenance on the blowmould machine, where the causes of critical components and component replacement intervals are sought (Ahmadi & Hidayah, 2017), then there are also analysis and priority determination system for handling damage to drinking water pipes, thus providing input to the operation and maintenance department in determining which damage reports are prioritized and prioritized to be handled (Witanti, Harihayati, & Peraiyantika, 2022).

Research on pigging has been carried out by various experts. In the form of simulations, including Nguyen, et al (2001) have done it in a series of gas piping systems. Then there is also research on the analysis of the correlation coefficient of friction and the opportunity for pipe cleaning with foam pig (Setyarini & Natalisanto, 2016), then there is also research in the form of designing a pig launcher for gas pipes (Mandraguna & Afiff, 2018).

Pigging is defined as the act of launching an object called a pig into the pipeline. While the pig is a form of tool that can be launched into the pipe by following the fluid flow in the pipe. The name pig first appeared because of the sound it makes. When the object was launched, there was a loud sound like a pig squeaking, so that the term "pig" arose, which was interpreted as a pig. At the next time, an appropriate length was sought for pig, and finally it was known as an abbreviation for pig as the Pressure Inspection Gauge (Wikipedia, 2022). According to Cordel & Vanzant (1996) at this time there are various kinds of pigs for various purposes, if summarized the main uses of pigs are:

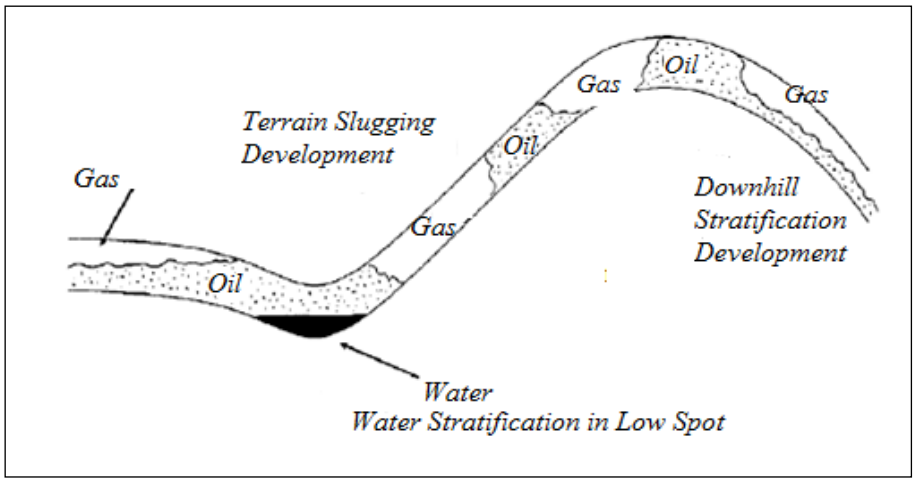
1. Separate different products that must flow in the same pipe
2. Clean the sediment and mud stuck to the pipe wall
3. Apply the Corrotion Inhibitor along the inner side of the pipeline
4. Eliminate entrapment of liquid in gas stream, or eliminate entrapment of gas in liquid stream
5. Inspection of the inside of the pipe

Problems in The Piping System

In the industrial world, fluid flow through the piping system has become a daily thing. According to Tiratsoo (1992), in this fluid flow problems are often encountered such as:

1. The deposition of solids in a liquid or gas fluid flow, so that the inside of the pipe becomes increasingly narrow and the flow is obstructed. Solids in the walls of pipes carrying fluids can be called debris
2. Freezing of liquids and forming soft and tough solids. This is common in petroleum streams, and such solids are called waxes
3. Condensation of gas flow components, forming a liquid. The liquid formed due to condensation in the pipe is usually called slug
4. The emergence of bubbles in the liquid flow. Long-distance piping systems usually owned by oil companies will experience more severe problems than industries that only have short-distance piping

Examples of problems arising from the passage of natural gas through mountainous terrain can be illustrated in Figure 1 as follows:



Source: Nurcahyo (2011)

Figure 1. Condition of gas flow with slug formation

These piping problems can be overcome by including a device that can push material out of phase with the fluid being flowed. According to Carito (2008) the object must meet the requirements, at least:

1. Strong, not easy to wear or break and break in the face of various obstacles
2. It can run smoothly in pipe bends and some forms of shells
3. Inert, does not react with the fluid being flowed.
4. Has good insulating power, so that the applied pressure or pressure difference can easily move the object
5. It is slippery, meaning it moves smoothly on a rough surface

The bend of the pipe must be adjusted so that the pig can run smoothly. The turning radius is regulated in the pipe line installation standard, so that the pipe line is piggable or can be passed by pigs as listed in Table I below:

Table 1. Provisions for pipe bends that pigs can pass through

Pipe diameter (D)	Turning radius
4 Inch	20 D
6 and 8 Inch	10 D
10 Inch and bigger	5 D

Source: Nurcahyo, N (2011)

For example, for a 4 inch pipe must be given a bend with a radius of at least 20 x 4 inches or equal to 80 inches. In ASME B31.4 & ASME B31.8 the turning provisions are slightly different, for example for pipe diameters less than 12 inches in the standard the turning radius is 18D.

Supporting Facilities: Flow Pipe

Pipe is a tubular object that has a diameter and thickness that functions as a means of transporting fluids, both liquid and gas from one place to another. In its use, pipes are made of metal and non-metal materials with various sizes, diameters and lengths. The piping system is a series consisting of pipes, fittings, flanges, valves and other fittings which are arranged in accordance with the needs of fluid transportation facilities. In the planning of gas piping systems, careful thought and calculation in the selection of appropriate standards to function properly and last a long time. Judging from the material of manufacture of pipes can be classified as follows:

1. Metalic piping
   a. Ferrous metal pipes
   b. Non ferrous metal pipes
2. Non metalic

The use of pipes is so extensive and involves various types of pipe fittings which are also produced by various factories and countries, it is necessary to standardize the size, type of connection, thickness and so on so that production from a factory can be used properly. The standards in piping include: diameter size, length size, wall thickness and type of material.

Standard Size

1. Pipe diameter sizes in general and according to ANSI / ASME nominal pipe sizes are commonly referred to as diameters / diameters, namely:
   a. Inside diameter
   b. Out side diameter
   c. Nominal diameter
   d. For pipes measuring 1/8" to 12" the NPS is not the same as the outside diameter of the pipe
   e. For Pipe sizes > 12" NPS is the same as the outside diameter of the pipe

2. Pipe length size
   There are several types of length and generally ranging from 6m (20') to 12m (40') are as follows:
   a. Uniform length: length 21 ft
   b. Normal length: length 12 ft
   c. One half random: length 8 to 16 ft
   d. Single random: length 12 to 22 ft
   e. Double random: length 40 ft
   f. Cut length: length according to the customer

Pipe Wall Thickness Standard

The pipe wall thickness for each nominal diameter or nominal diameter varies according to the specified class and ability to withstand the pressure and working temperature of the fluid flow. There are three standard wall thicknesses for carbon steel pipes which are still the reference, as follows:

1. Standard weight (STD)
   The pipe wall thickness Standard Weight is intended to withstand relatively low pressures and temperatures. The safe working pressure for this standard is a maximum of 150 Psi
2. Extra strong or extra heavy (EX or EH)
   The size of this type of pipe is thicker than the standard weight, intended to withstand medium pressure and temperature (+ 300 Psi) of the fluid that passes through it.
3. Double extra strong and double extra heavy (XXS or XXH)
   Standard pipe XXS and XXH, has a thickness level that is more than the other two standards, and is intended for

METHODS

To keep the focus on the issues to be resolved, it is necessary to limit the scope of the research. The scope of this research is as follows:

1. The research was only conducted on the gas production process of the 12-inch pipeline from Gading Island to the Kenawang River
2. The study was conducted for one month

Data were obtained based on field observations and interviews with related parties. Data were collected and analyzed using fishbone diagrams. Fishbone diagram or Ishikawa diagram was first introduced by Dr. Kaoru Ishikawa, an expert from Japan, is one method of improving quality. This diagram is often called a cause-and-effect diagram (Basuki, 2019).

RESULT AND DISCUSSION

Based on the results of observations in the field and the results of interviews that have been carried out with related parties, there are several things that can be summarized regarding the causes of dirty gas pipes. The causes of dirty gas pipes can be seen in the fishbone diagram Figure 2 as follows:

P-ISSN 2722-8150
E-ISSN 2722-8142

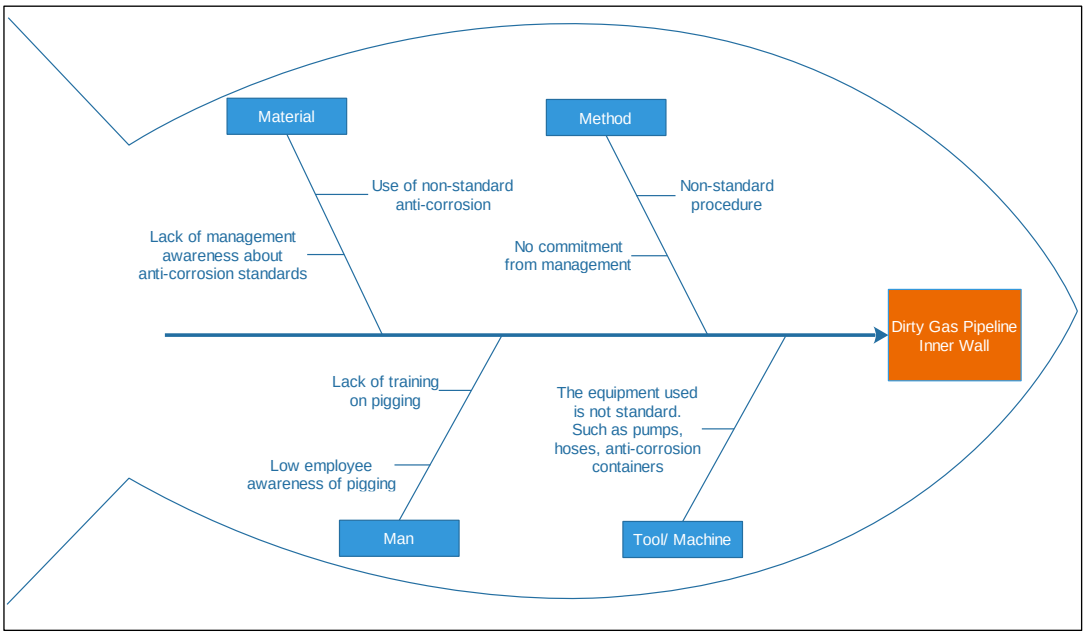


Figure 2. Cause and effect the inner wall of the pipe is dirty

Based on Figure 2 above, it can be seen that there are many things that cause dirty gas pipes. Among them are method factors, material factors, equipment or machine factors, and human factors. Of the four factors, the following detailed details of the factors, causes, and consequences that will occur, can be seen in Table 2 as follows:

Table 2. Cause and effect the inner wall of the pipe is dirty

Factors	Causes	Effect
Method	Non-standard work procedures, work arbitrarily and not properly scheduled	Dirty gas pipeline inner wall
	There is no commitment regarding Pigging activities from the management to fix the wrong gap	
Tool	The equipment used does not meet the standards set by a company, the equipment is damaged and does not work optimally	
Material	Use of non-standard and expired anti-corrosion	
	Lack of attention from management regarding fogging and especially the use of good anti-corrosion	
Man	Lack of training or training on pigging	
	Low employee awareness about the importance of pigging	

From Table 2 above, it is very important for companies to pay attention to the causes of dirty pipe inner walls. Because with this, it can anticipate the occurrence of dirty pipes that continue to be able to make the pipes clogged and the oil and gas delivery process to be hampered.

CONCLUSION

From the analysis and discussion that has been carried out, it can be concluded that, the causes of dirty gas pipes include non-standard work procedures, no commitment to pigging activities from the management, non-standard equipment, use of anti-corrosion that is not standard and has expired, lack of attention from management regarding pigging, lack of training on pigging, and low awareness of employees about the importance of pigging. From the identification of the cause of the dirty gas pipe, the company must pay more attention to the causes that have been identified, in order to prevent an effect that can harm the company, in this case the inner wall of the gas pipe becomes dirty and has the potential to clog the pipe, so that it can hinder the delivery of oil and gas.

ACKNOWLEDGMENT

The author would like to thank Mr. Harun Roni who has helped in this research.

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