

Storage Tanks Gauge Pole Sleeve Cover for Floating Roof

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Abstract: Asset integrity management plays a vital role in ensuring operational excellence by balancing productivity, safety, and environmental protection. Storage tanks, particularly floating roof tanks, commonly utilize slotted guide poles to stabilize the roof, measure liquid levels, and obtain product samples. However, these slotted designs allow direct vapor release, making guide poles a significant source of volatile emissions that negatively impact ambient air quality. In response to increasingly stringent environmental regulations, gauge pole sleeves have been introduced as an emission control solution. These sleeves limit vapor escape by sealing the slotted openings, thereby reducing hydrocarbon emissions substantially. Implementation across more than 25 storage tanks at Aramco facilities demonstrated the effectiveness of this approach. As a best available control technology, the adoption of gauge pole sleeves is strongly recommended for hydrocarbon and volatile storage applications to mitigate environmental impact and comply with air quality standards.

Keywords: Emissions; Floating Roof; Gauge Pole.

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I. INTRODUCTION

Along with increasing productivity while preserving the environment and safety, asset integrity management is a critical component of operational excellence. Storage tanks are widely utilized in various industries, especially in petrochemical plants, storage terminals, oil refineries, and other establishments where a wide range of items are kept in storage. Most of the floating roof storage tanks are equipped with guide poles which are commonly used to prevent rotation of the floating roof as the rotation might cause damages to other appurtenances on the roof. The guide pole has been used to measure the volume and level of liquid in the storage tank and to take a sample of the stored liquid inside the storage tank. In order to make the measurement and sampling work effective, the guide pole is hollow in a vertical slots shape. These slots are designed in sequence on a vertical direction so that the liquid inside the guide pole and outside the guide pole can contact each other at any level (figure 1).

The guide pole is located inside the storage tank near the tank shell, with the bottom of the pole attached to the tank bottom shell course and the top of the pole attached to the top of the tank shell. As this guide pole passes through the floating roof, its fitting portion allows vapor contents to be discharged into the atmosphere. The slotted guide poles are considered as a high source of emission that is impacting the environment. As the ambient air quality has become an increasingly significant concern in recent years, international regulations often require the installation of an emission control device, such as a gauge pole sleeve, on slotted gauge (or guide) poles. With the use of gauge pole sleeve, the amount of volatile emission released from slotted gauge/guide pole will be reduced tremendously. A gauge pole sleeve is categorized as the best available control technique in reducing gauge pole emissions. Therefore, the gauge pole sleeve was installed in more than 25 storage tanks within Aramco facility.

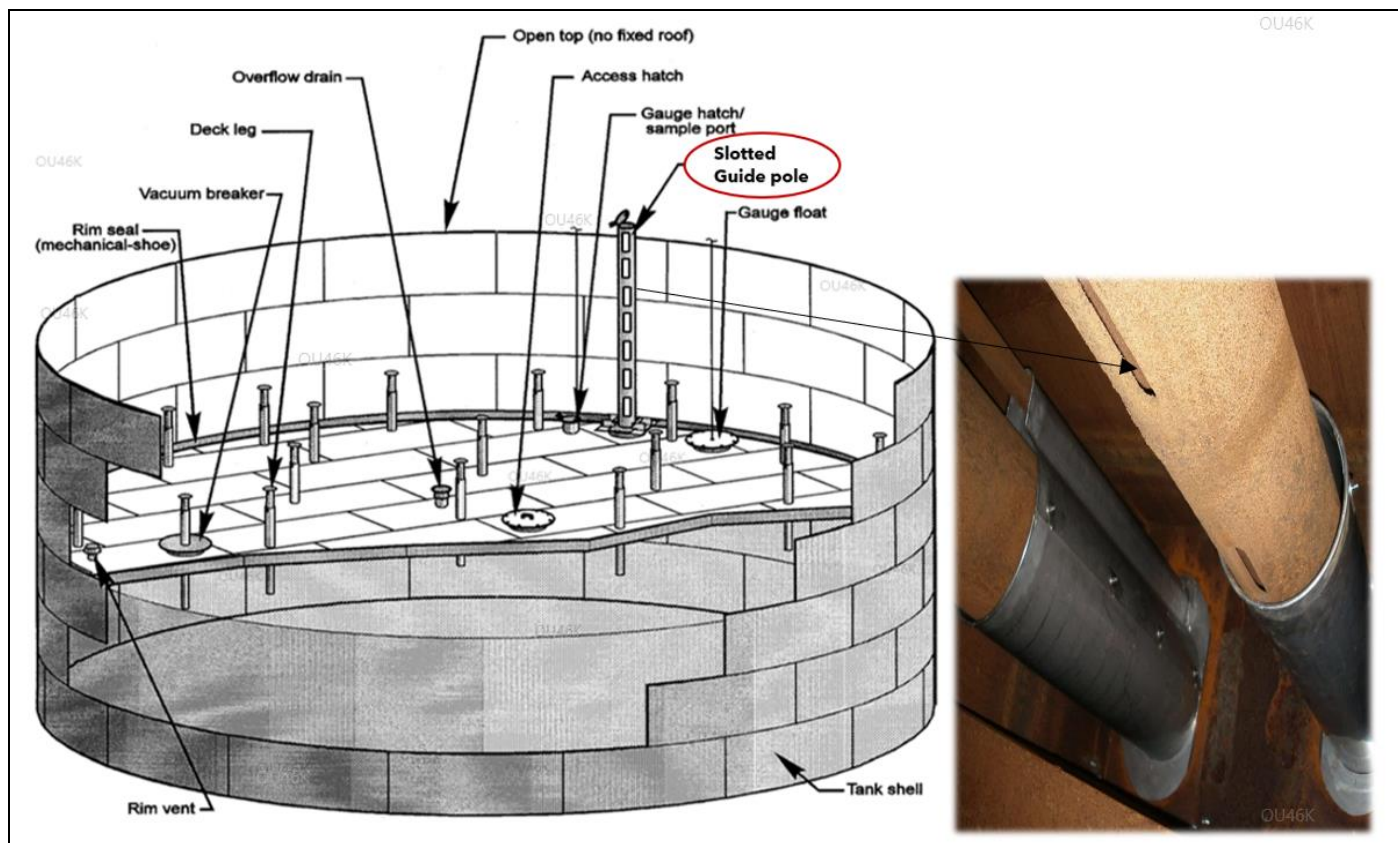


Fig 1 Guide Pole (Slotted)

II. MECHANICAL DESIGN DESCRIPTION

A gauge pole sleeve is a stainless-steel sleeve that is bolted inside the well of the external floating roof. This sleeve holds the penetration for the gauge pole and the well

dip pipe. The sleeve is extended down into the product while it is bolted on to the sliding plate that is on the top of the gauge pole well. Figure 2 shows a sample design of a gauge pole sleeve.

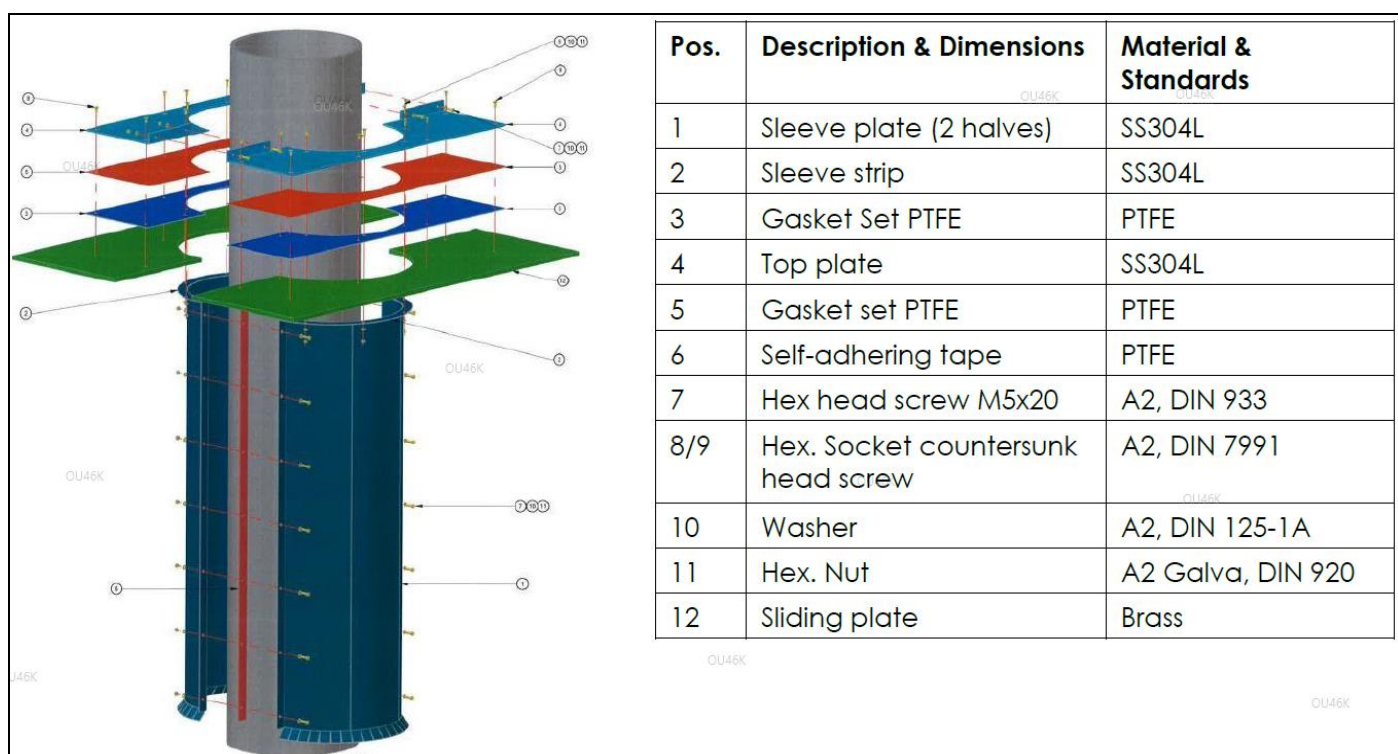


Fig 2 A Sample Design of a Gauge Pole Sleeve

➤ *The Main Components of the Gauge Pole Sleeve are as Follows:*

- Pole wiper on sliding cover.
- Well gaskets on top of fixed plate with non-metallic material (e.g. PTFE material).

- Pole sleeve seal or float with wipe seal.
- Adjustable mounting brackets and sleeve roller
- Anti-rotation brass rollers as shown in Fig 3.
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Fig 3 Gauge Pole Sleeve

➤ *Pole Wiper*

Pole wiper is a seal made from rubber which is attached to the top of the sliding plate and extending over the annular gap between the guide pole and the sliding plate. The function of gasket is not only limited to eliminate emissions coming out of the gap, but also reduces the amount of stock clinging to the pole. This happens when the tank level is at lower position, by wiping the external of the guide pole and reducing losses from the tank.

➤ *Well Gaskets*

The well gasket function is to seal the gap between the sliding plate and the fixed stilling well cover. The sliding plate allows a degree of movement for the roof of the storage tank.

➤ *Pole Sleeve:*

The pole sleeve is connected to the sliding plate which surrounds the guide pole down the way to the liquid product.

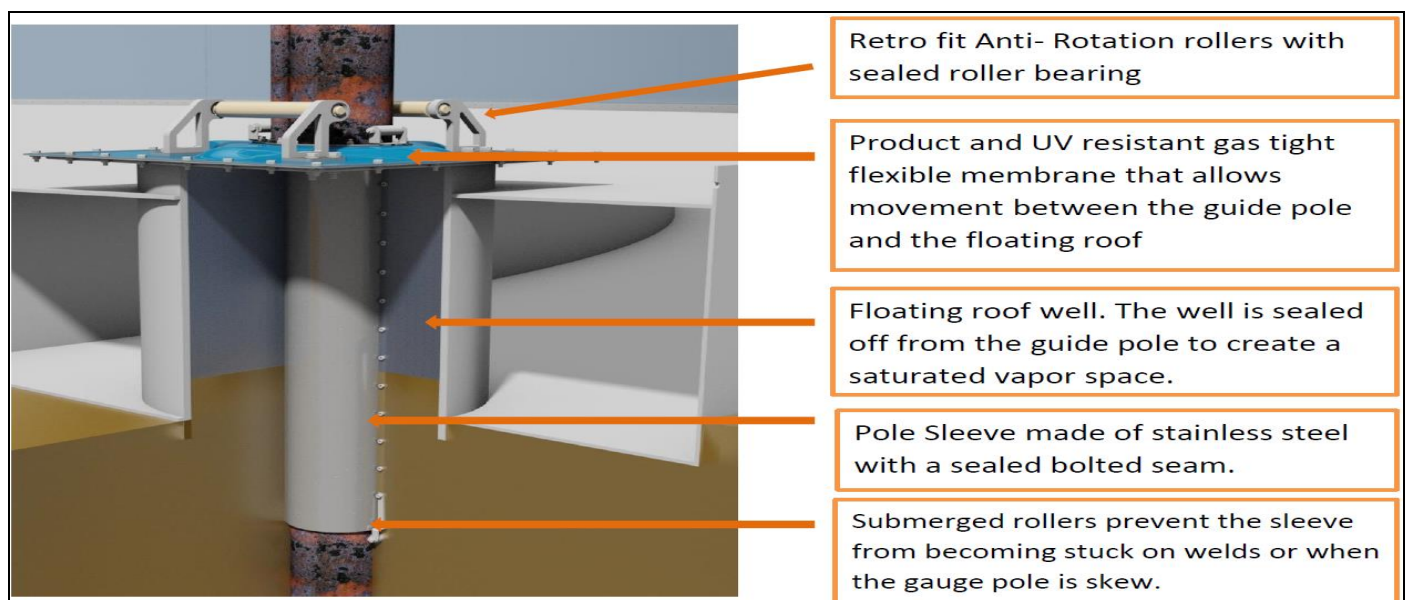
This role will create a barrier between the well vapor space in addition to the guide pole.

III. ADVANTAGES AND FEATURES

➤ *There are Several Advantages of Gauge Pole Sleeve:*

- High emission reduction.
- Maintenance free.
- Fast and easy installation where also it can be installed on while the tank is in-service.
- The design can be customized based on the tank design and condition.

Figure 4 shows how emission can escape if the gauge pole sleeve is missing.



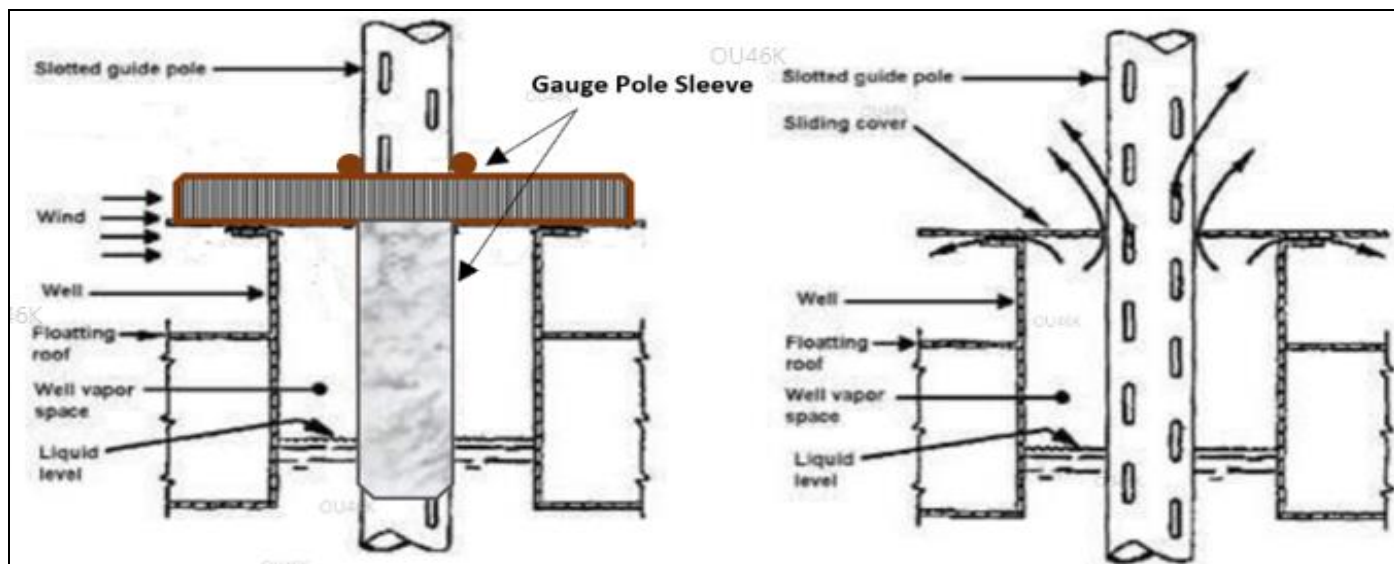


Fig 4 Emission Losses without Gauge Pole Sleeve

IV. TANK EMISSION STUDIES

This study is based on fixed roof, and external floating roof with slotted guide pole without sleeve, and with sleeve. Gauge pole sleeve will significantly reduce emission where they are considered as the best available control technique for

several environmental codes and regulations. When comparing external floating roof emissions to fixed roof tank emissions, the use of a gauge pole sleeve will decrease the percentage of emission for more than 99%. Below table is a sample study that shows the result of an emission calculation (Table 1).

Table 1 Slotted Guide Pole without Sleeve, and with Sleeve.

Storage tank description	Annual emission	Emission reduction
	kg	%
Fixed roof tank, no emission reduction measures	845,088	0
External floating roof tank (EFRT) with slotted guide pole and gasketed sliding cover	13,990	98.34
EFRT with slotted guide pole, gasketed sliding cover and sleeve	4,287	99.49

The API Manual of Petroleum Measurement Standard evaporative loss calculation leads to a conclusion that more than 98% of evaporative loss reduction from the guide pole can be obtained by installing a pole sleeve.

In addition, a study was conducted in one of Saudi Aramco terminals which shows the reduction of evaporative loss from refined product tanks when utilizing all sealing devices together (primary seal, secondary seal, guide pole seal) as shown in figure 5.

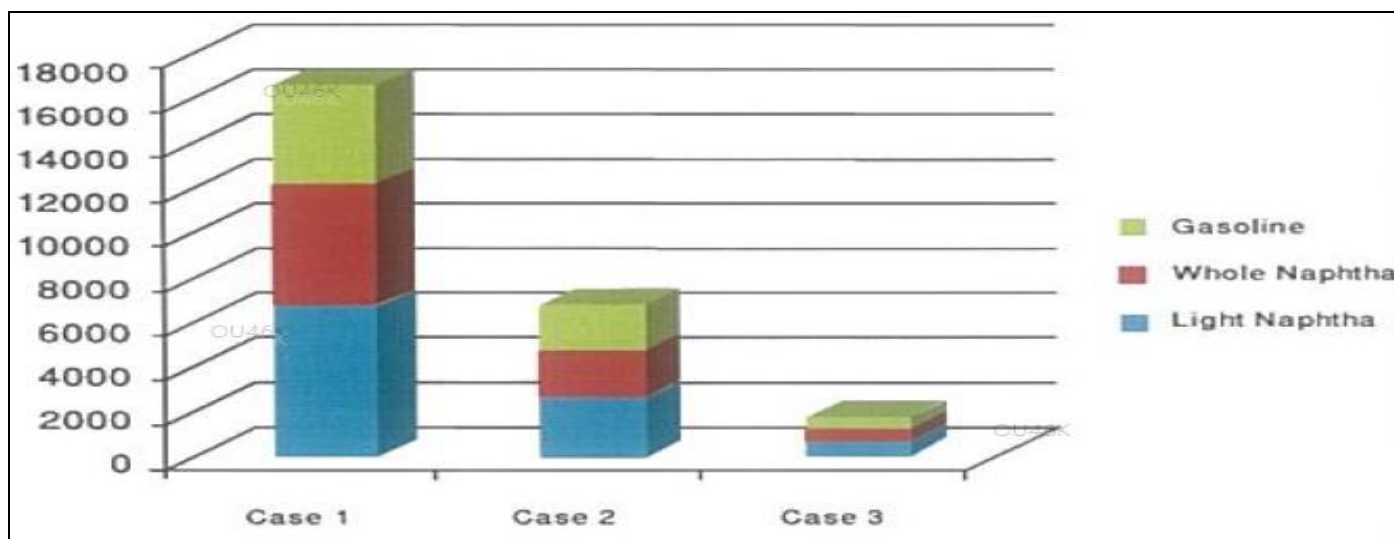


Fig 5 A Study of Evaporative Loss for Refined Products

Furthermore, a comparison study was conducted by one of the tank manufacturers to compare between all of the available emission control seals for the guide pole. The study showed that the gauge pole sleeve has better features rather

than other alternatives. The guide pole sleeve is higher in emission reduction, lower in fire hazard, lower in causing damages/blockage to rollers, and lower in corrosion (Table 2).

Table 2 Comparison between available sealing devices

	Steel Plate Guide Pole Cover	Guide Pole Sock	Guide Pole Sleeve
Static Emission Reduction	low	high	high
Emission Reduction during floating roof Movement	low	moderate	high
Ease of Installation	yes	yes	yes
Fire Hazard	moderate	yes	no
Accumulation of hazardous vapors between LEL* and UEL**	moderate	yes	no
Chances of blocking guide pole rollers	low	high	low
Possibility of moisture corrosion	low	moderate	low
Life Span	moderate	moderate	high

* "Lower explosive limit (LEL): the lowest concentration of gas or vapor which will burn or explode if ignited".

** "Upper explosive limit (UEL): the highest concentration of gas or vapor which will burn or explode if ignited". The mixture is explosive from the LEL to the UEL, and it is very lean to burn below the LEL.

V. CONCLUSION

In recent years, more concerns about ambient air quality have grown significantly. As the slotted guide poles are considered as a high source of emission which is impacting the environment, a guide pole sleeve shall be recommended for most of the hydrocarbon or volatile emission storage tank. The amount of volatile emission generated by slotted gauge/guide poles will be significantly decreased with the usage of gauge pole sleeves. Based on this paper, the greatest available control method for lowering gauge pole emissions is a gauge pole sleeve.

REFERENCES

- [1]. American Petroleum Institute. (2020). API 650: Welded Tanks for Oil Storage (13th ed.). March 2020.
- [2]. American Petroleum Institute. Manual of Petroleum Measurement Standard Chapter 19.2: Evaporative Loss from Floating Roof.
- [3]. CTS Global. (n.d.). Corrosion Protection Systems. Retrieved from www.cts.global
- [4]. HM Tank. (n.d.). HM Tank: Leading Supplier of Tank Equipment and Services. Retrieved from www.hmttank.com
- [5]. Sheppard Arts. (n.d.). Sheppard Arts: Industrial Painting and Coating Specialists. Retrieved from sheppard-arts.com
- [6]. Scribd. (n.d.). Scribd: eBooks, Audiobooks, and More. Retrieved from scribd.com
- [7]. Myers, P. E. (1997). Aboveground Storage Tanks (1st ed.).