بسم الله الرحمن الرحيم

و أنزلنا الحديد فيه باس شديد

و منافع للناس وليعلم الله من ينصره ورسله بالغيب إن الله قوي عزيز

صدق الله العظيم

الحديد الآية 25

Dedication

I truly sacred this research to

my parents. friends and all who assisted me to achieve it in

acceptable form required

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Abstract

This study is aimed to cover and highlight the causes of failure of the sliding ladder and the rollers of the floating roof tank No.703 at Royan station of Sudanese Petroleum Pipe Line Company (SPPC), and to suggest remedy measurements. The sliding ladder was completely damaged for unknown reasons, this occurred while the floating roof was moving up.

The plates that hold the seal between the roof of the tank and the shell courses to avoid losses due to vapor or leakages were harmed too , finally the railway guide of the rollers was found to be bent.

The same failure occurred on tank No.704 which indicate that a real problem exists which needed to be investigated. This was the first time for such problem to occur in the above mentioned company in spite of having floating roof tanks erected since 1977 and they are functioning properly.

The damaged parts of the floating roofs were constructed locally by Sudanese company while foreign contractors erected others. Similar design to this damaged tank in railway guides, differs in the roller size are used to store the same product was erected by Romanians is functioning properly. An analysis to the ladder and the rollers were carried out to investigate the possible causes of that failure.

The cause of failure was attributed to the material of the roller and it is suggested to replace the aluminum rollers by steel fabricated rollers and to use the same ladder with the same operational conditions at Elroyan station with some precautions for the roof level in operation.

List of abbreviations

Abbreviations	**Meaning**
SPPC	Sudanese Petroleum Pipeline Company
EFR	External floating roof
TVP	True vapor pressure
I FR	Internal floating roof
CB&I	Chicago Bridge &iron Company
SFR	Steel fabricated roller
M.O.R	Mass of the roller
E.M.O.L	Effective mass of the ladder
NRV	Non return valve

List of Symbols

Symbol	Quantity	Units
d_1	Diameter of the roller (upper)	m
d	Tank diameter	m
E_1	Modulus of elasticity of aluminum	N\m²
E_2	Modulus of elasticity of carbon steel	N\m²
ν_1	Poison ratio for aluminum	---
ν_2	Poison ratio for carbon steel	---
d_2	Diameter of the roller (lower)	m
σ_c	Compressive stress	MPa
b	Contact width	m
P_{max}	Maximum pressure	Pascal
Ḿ	Effective mass of the ladder	kg
F'	Effective force on the ladder and the roller	Newton
Z	Section modulus	---
Sy_c	Compressive yield strength	MPa
HB	Brinell hardness	---
ρ	Density of Mogas	kg/m^3
g	Gravitational acceleration	m/s^2
q	Flow rate	m^3/hr

Symbol	Quantity	Units
h	Hydraulic head	m
m	Mass of the roof	kg
v	Instantaneous velocity	m/s
KE	Kinetic Energy	N.m
$\bar{y}$	Centroid	m
I	Second moment of area	m^4
S_y	Surface fatigue stress	MPa

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