Kuwait 4th Flow Measurement Technology Conference

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الراعـي الرسمـي

AHMED ALTERKAIT

Snr Eng, Manufacturing Excellence - KNPC

KNPC EFFORTS TOWARDS REDUCING HYDROCARBON LOSS & FLARE GAS MANAGEMENT

- Introduction.
- Challenges
- Efforts Made:
  - Review the measurement methodology :
    losses type, Source , measurement & breakdown
  - Defining the uncertainties.
  - reconciliation method & Correction factors
- Conclusion

Introduction

- KNPC Operates highly complex Refineries.
  - Complex units & integration
  - Thousands of valves flowmeters & analyzers
  - More than 20 Elevated Flare Stacks

- Current Capacity over 700,000 BPD

Challenges

- In 2015, High hydrocarbon loss (by balance) reported.

  Refinery Loss (loss by balance) = Refinery input – Refinery output – Fuels + (Δ Inventory).

- The same was captured by SAB & raised in the parliament.

Efforts Made

- committee formed to review accounting methodologies & practices being followed.
- Defining the losses type, Source breakdown, accounting Methodologies
- Defining the uncertainty reasons.
- Defining the correction factors

Finding :

Loss Types:

- **Controllable loss :** Losses that can be reduced to the bench mark levels based on the refinery configuration.

- **Non-Controllable loss** : Losses that is part of normal refinery operation (i.e. side products or side loss)

Finding:

Controllable Losses	Breakdown	Measurement Method	Reference
H/c loss through Flares (Ex H2)	13%	*Flowmeters*	Chevron feedback , International Standards
H/c loss to Bio-treatment	6%	Analysis + Calculation	**Newly Identified**, IP Document Page 34
H/C in Sea Water effluent		Analysis + Calculation	Record Available , to be reported
API Evaporation & Process Fugitives		Analysis + Calculation	Records available, to be re-classified and reported as per the standards. IP Document Page 8
Hydrogen Venting		Flowmeters	Record Available. To be included in loss report for MAA & MAB

Finding:

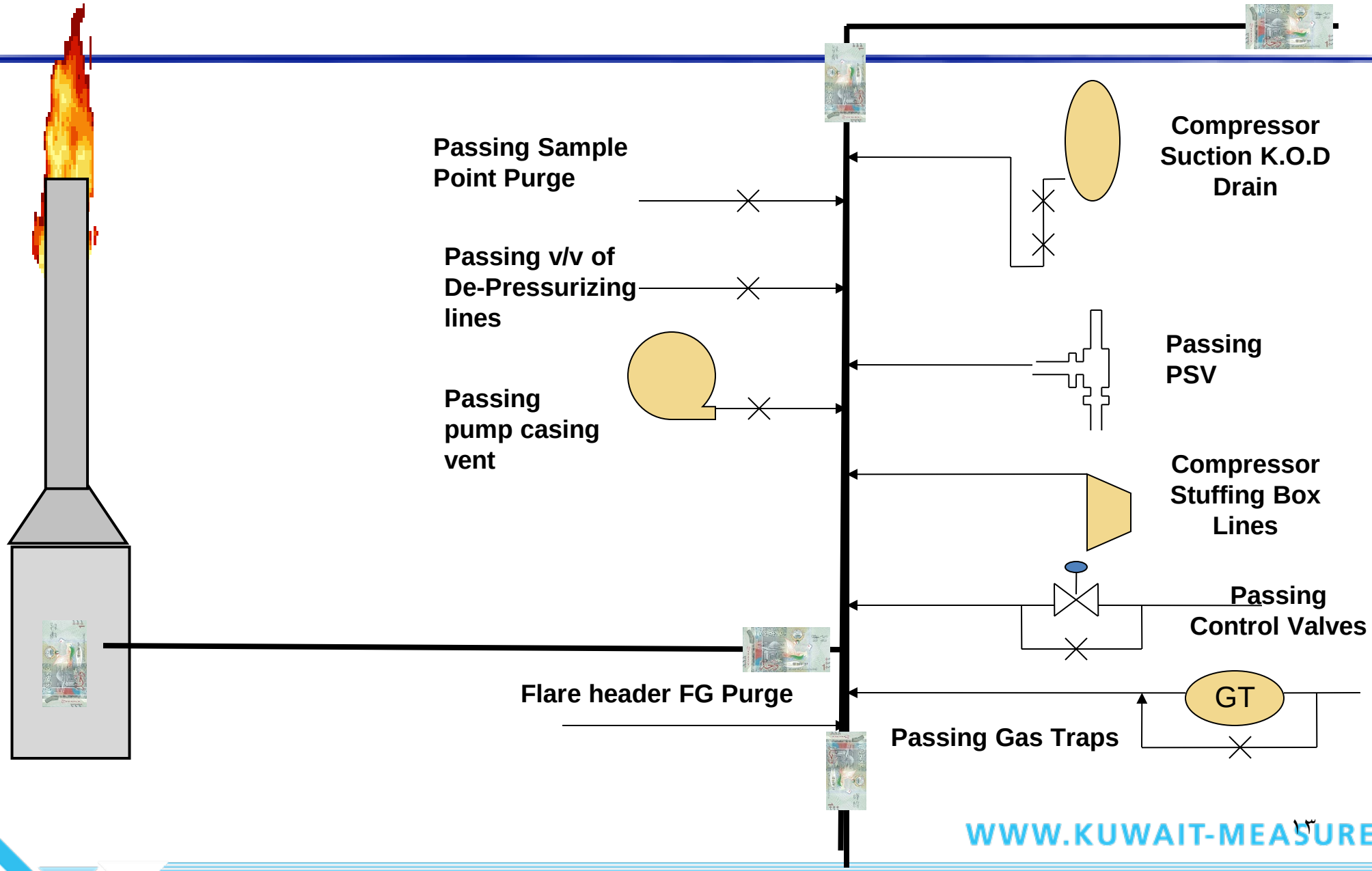
Non-controllable Process Losses	Breakdown	Measurement Method	Reference
Carbon loss as CO_2 from HP Units	71%	Mass Balance, part of production	International Standard IP Doc Page 34 & Solomon Methodology
H2 loss as H_2O from SRU Units	10%	Mass Balance, part of production	International Standard, IP Doc page 7 Record available to be reported.
Nitrogen Loss as NH3		Mass Balance, part of production	International Standard IP Doc Page 34 **No record for MAA & SHU.**
FCC Coke		Heat Balance	Solomon Methodology
CCR Coke		Heat Balance	**Newly Identified** found in IP Document page 7
Flare Pilot & Purge		Design figures	Solomon Methodology
VOC Emissions		analysis & calculations	Solomon Methodology
Hydrocarbon in dispatched Ash (WWT) / waste		analysis	**Newly Identified**, found in IP document Page 9

Defining the uncertainty reasons

- Instrumentation errors
  - Test run to ensure instrumentation accuracy.
    - Systematic error.
    - Random error.
- Non-hydrocarbon interference.
  - Analyze the flared gas and deduct the purge gas quantities and the non hydrocarbon gases.
- Zero value losses
  - Part of the refinery operation.

Reconciliation method & Obtaining Correction factors

- Reconciliation method link



FUP HYDROCARBON FLARE STACK (62-ST-101/102)

NEXT

Unit	Tag. No	Description	Flaring	Value	FLARE INSTRUMENTS SPECIFICATIONS		
					VALUE OPEN %	FLOW RANGE NM^3/H	High Alarm
FUP Main Flow Meter (A)	62FR104.PV	FUP H/C FLARE 62-ST-101		0.18	-	0-20000	NIL
FUP Main Flow Meter (B)	62FR105.PV	FUP H/C FLARE 62-ST-102		0.26	-	0-20000	NIL
FUP ARD (Unit 81)	81FI323.PV	REACTOR H/C COMM HDR		257.62	-	0-10000	13
	81FI325.PV	FRACT. H/C COMM HDR		54.55	-	0-3000	13
	81FI326.PV	COMP. COMM HDR		752.41	-	0-2000	13
	81PRC077.OP	V-026 FRACT GAS KOD	NO	36.07	50-100	-	NIL
FUP ARD (Unit 82)	82FI323.PV	REACTOR H/C COMM HDR		10003.15	-	0-10000	NIL
HCR (Unit 84)	84FI513.PV	FLARE GAS REACTOR SIDE		-7.52	-	0-5000	50
	84FI514.PV	FLARE GAS FRACTIONATOR		761.36	-	0-2000	1000
	84PC116A.OP	V-110 FEED SURGE DRUM	NO	-5.00	50-100	-	NIL
	84PIC301.OP	V-301 CLPS Off Gas HR/FLARE	Yes	59.84	0-100	-	NIL
	84PIC304.OP	V- 320 FRACTIONATOR OVERHEAD	NO	-5.00	50-100	-	NIL

MAIN

Reconciliation method & Obtaining Correction factors

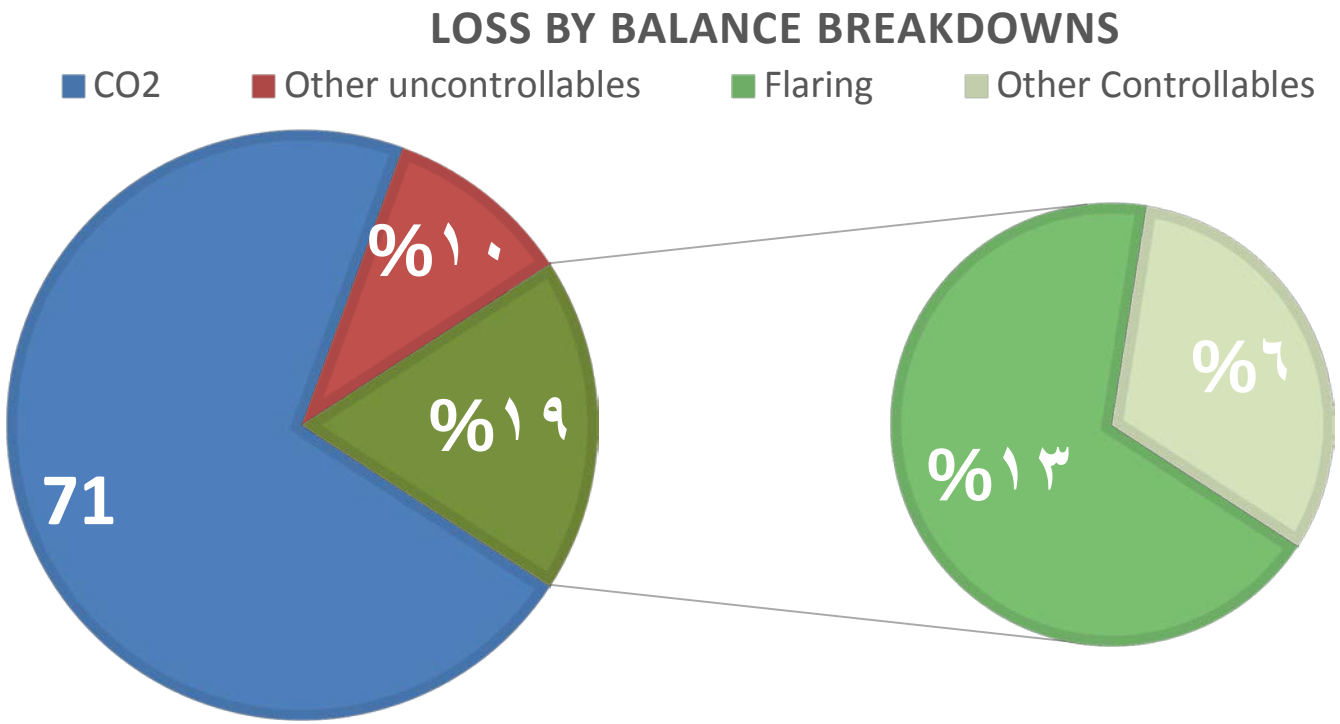
- Obtaining Correction factors
  - Lab analysis.
  - Field survey. Link
  - Mass Balance.

AccuTrack – a small hand-held device that measures the sound created by gases or liquids passing through an opening.

V-Pac – a much more sophisticated device to measure sound. Can estimate quantity of passing.

IR Camera – Multi-purpose tool that projects real-time picture showing temperature gradients.

Conclusion



- 81% of the refinery reported loss found to be zero value, wherein 71% due to CO2 venting from HPU.
- Max Unaccountable Loss for MAA = 0.7% & MAB = 0.5%
- Totally new sources of losses have been identified.

Conclusion

- H/C Loss Book Value reduced by 81 %
- Improvement in physical HC Loss reported by Solomon since 2014 study.

➉ KNPC are within the international companies practices. < 1%

➉ KNPC reached the boundary for the first quartile for 2018 Solomon study with hc loss of about 0.2X%.

THANK YOU