

Kuwait 4th Flow Measurement Technology Conference

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### **OFFICIAL SPONSOR**









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# Measurements in Leak Detection system

# KOC Consumer Fuel Pipelines-Challenges



LDS monitored KOC Consumer Fuel Pipelines-Services

- Fuel Gas Subiya PS, Doha PS, Al-Zour PS Shuaiba PS, Shuwaikh PS Shuaiba Industrial Area
- ✤ Gas Oil Subiya PS, Doha PS Al-Zour PS
- LSFO Subiya PS, Doha PS
  Al Zour PS
  - Crude Oil Subiya PS



## LDS in KOC Consumer Fuel Lines Covers:

- Pipelines of Size 4" Up to 52"
- Pipeline sections of Length 6 KM Up to 120 KM
- Combined pipeline sections of 177 KM



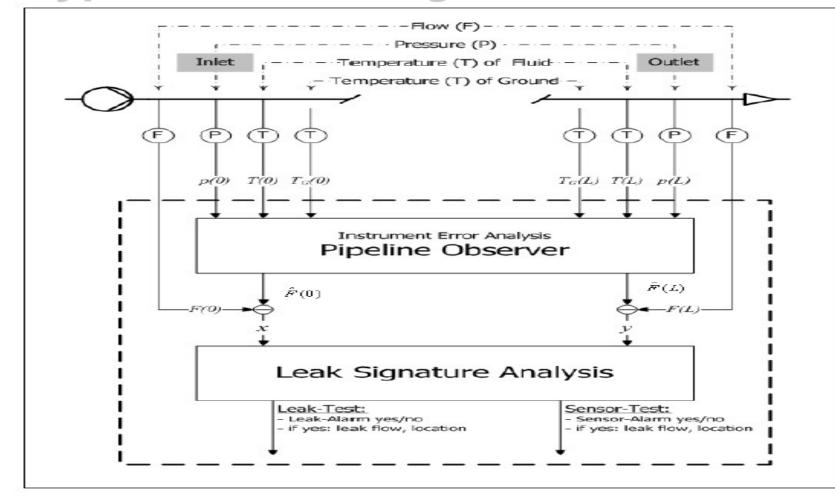


## Leak Detection system: Methods

- Non Continuous:
  - Routine Inspections
  - Intelligent Pigging
- Continuous:
  - External type:- Acoustic Systems, Fiber Optic Cables, Video Monitoring...
  - Internal type: Mass Balance, Pressure Point Analysis, Statistical Systems, Real Time Transient Model...

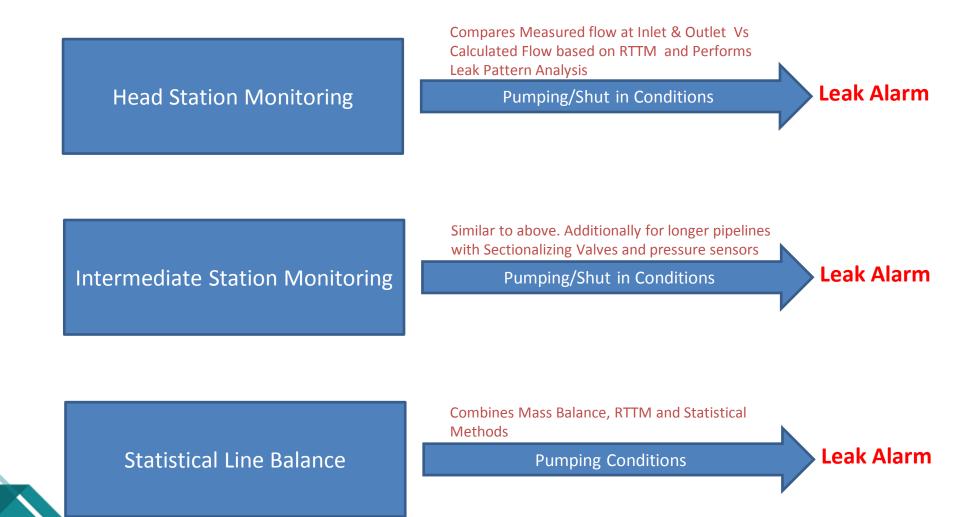


### Measurements in Leak Detection system-RTTM Typical Block Diagram



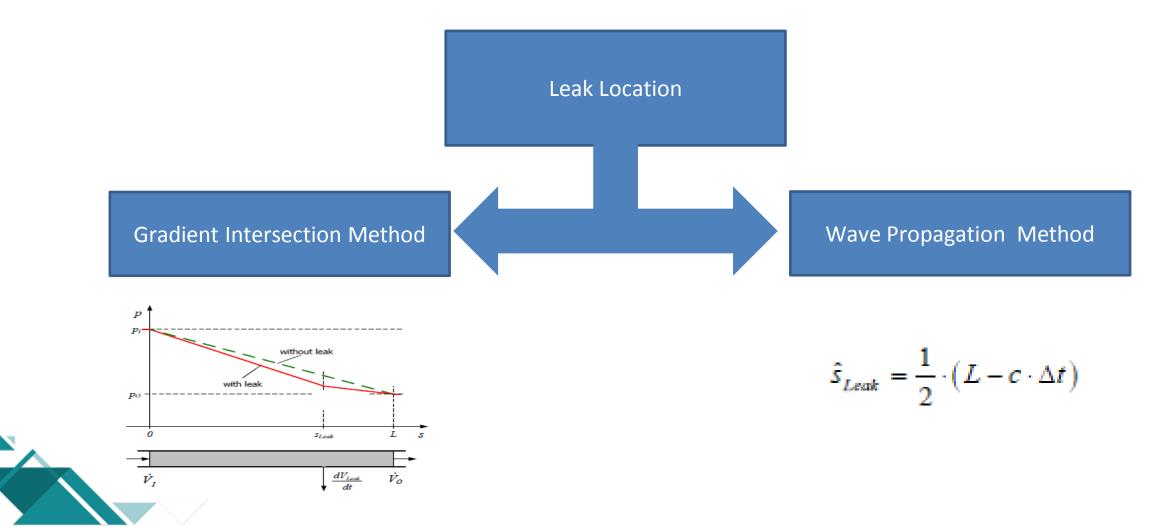


### Measurements in Leak Detection system-Software Modules





### Measurements in Leak Detection system-Software Modules...



### Operator: Administrator Y040B: MAA -> Azzour Gas Trap Facility (Fuel Gas) -Hot System Imping Conditi Head Station Pumping Condition Sub Stations Pumping Conditi Under Pressu Y0408 Shut-In Conditio Main State Data State Not Active Signature test Not Applicable System 3A -Online Nominal Steady No Alarm No Alarm Watchdog DK Data OK Hot Differential tes Not Activ Signature test Not Applicable Not Active System 3B Online Nominal Steady No Alam No Alarn Watchdog B Data Of Standby Differential tes Not Activ 296.7 SVS-A02 SVS-A01 180110251 5012L1502A 5012L1502B 1911502 5012L1503A 5012L15038 MMSCED 14.0 19.0 350000.0 14.0 19.0 18.4 18.4 18.1 18.1 deg C barg Sm3/h deg C barg barg barg barg barg PI PI FI п PI PI PI PI п ZI 180ESDV1512 501XV1502 501XV1503 SVS-A03 296.7 012L1504A 5012L15048 501PI1554 MMSCFD 0111751 17.6 17.6 350000.0 17.4 17.4 17.4 14.0 14.0 barg barg barg barg Sm3/h barg deg C deg C PI PI PI FI п PI PI п 501XV150-501E50V1509 501-S-0428A SVS-A01 SVS-A02 SVS-A03 0 km 51.52 km Shut-In Condition Detail. **Betall** Line. Simature Tes Not Active Not Active Status Not Applicable Status Spositivity Sonsitiuitu ionsitivity Spositivity 0,00 299.12 Sm3/h Sm3/h Alarm Infor Leak rate Statistical Leak rate Statistical 0.00000 0.25354 MMSCED 0.00000 MMSCE km ion Wave method 0.00 139814.594 139814.594 Sm3/h osition Gradient method 69907.297 Sm3/h **Positive Threshold** ositive Treshold 118,506850 118,506850 MMSCED 59,253425 MMSOFE 0.00 bar Pos. Grad.meth. Pressure dro 0.000 0.000 Sm3/h 0.000 Sm3/h 0.00 km Negative Threshold egativeTreshold 0.000000 0.000000 MMSCFD Position Wave method 0.000000 MMSOFD 0,00 0.00 Sm3/h 0.00 Sm3/h Leak rate Estimated eak rate Estimated 0.00000 0.00000 MMSCFD MMSCFD 0.00000 0.00 0.00 **Position Gradient me** km 0.00 km Position Wave metho Time ' Information Operator Group Alarm Comment 06/11/2013 11:27:55 Guest Y0408 SystemState Y0408 LDS System in Tuning Mode Event/Alarm History Scraper Tracking System Profile Hot System **Pipeline Overview** System B **Custom Trend** Trending Legend

### Measurements in Leak Detection system-Typical Dashboard

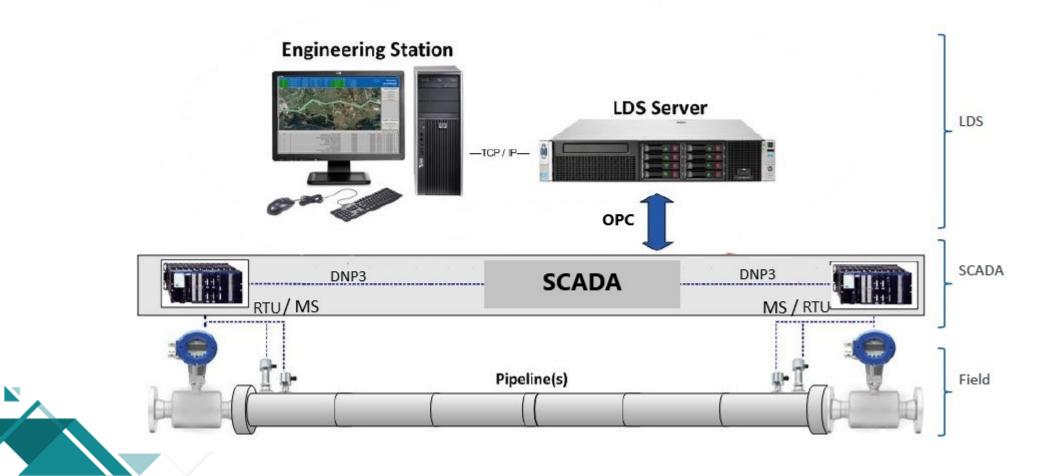


### Measurements in Leak Detection system-Performance Criteria as per API 1155 for 40" Fuel Gas Line

	Steady	Transient state**	
Sensitivity			
Minimum detectable leak rate	1%	2%	
Response time for 100% leak rate	<u>&lt; 1 min</u>	<u>&lt; 1 min</u>	
Response time for 10% leak rate	<u>&lt; 4 min</u>	<u>&lt; 5 min</u>	
Response time for 5% leak rate	<u>&lt; 8 min</u>	< 11 min	
Response time for 1% leak rate	<u>&lt; 12 min</u>	N.A.	
Reliability			
Incorrect leak alarm declaration rate (overall)	≤ 1 / year	≤ 2 / year	
Robustness			
Loss of functionality due to instrument outages	see below*		
Loss of function due to pump state changes	none		
Loss of function due to valve state changes	none		
Loss of sensitivity due to pump state changes	none**		
Loss of sensitivity due to valve state changes	none**		
Start-up stabilization period	none**		
Accuracy			
Leak localisation for 100% leak	<u>&lt; 1%</u>		
Leak localisation for 10% leak	< 2	<u>&lt; 2%</u>	
Leak localisation for 5% leak	<u>&lt;</u> 3%	<u>&lt; 5%</u>	
Leak localisation for 1% leak	<u>&lt;</u> 5%	N.A.	
Leak Rate error	<u>&lt; 1%</u>	<u>&lt; 1%</u>	

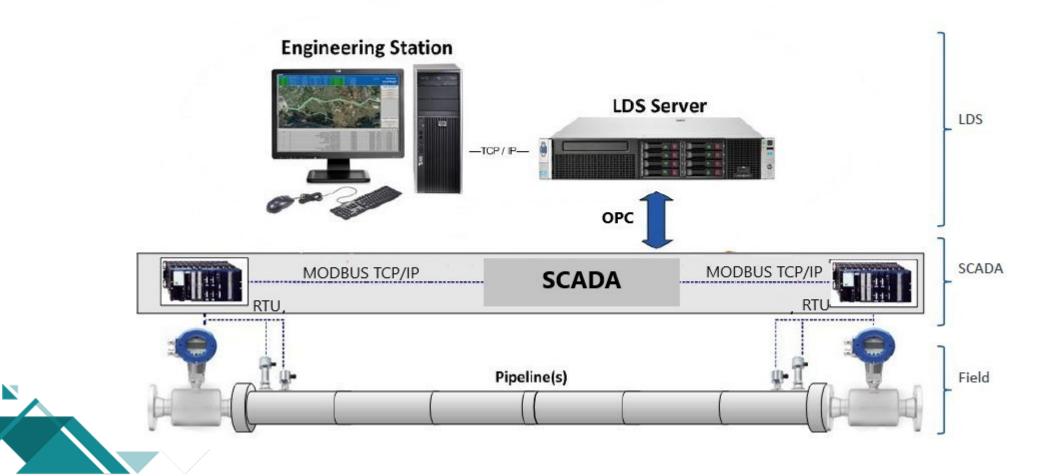


### Measurements in Leak Detection system-Data Transfer Issues

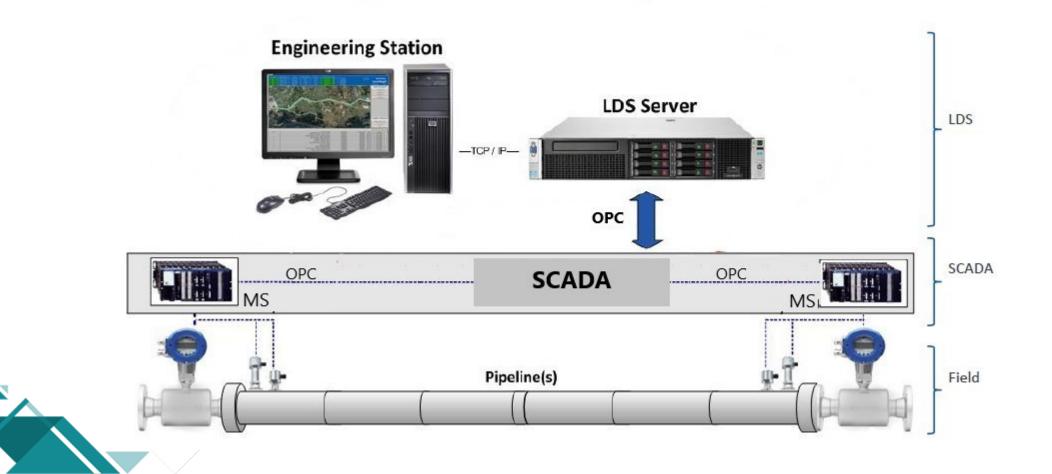




### Measurements in Leak Detection system-Modified RTU Communication



### Measurements in Leak Detection system-Modified Metering Skid Communication





### Measurements in Leak Detection system-Tuning Phase Issues

- Mandatory Tuning while pipeline is in operation
- Require to be Tuned for all Flow profiles
- Involves Multiple stake holders and their requirements
  - Practically difficult to achieve



### Measurements in Leak Detection system-Operational Issues

- Generate false alarms if operating in a flow region which has not been tuned
- Operating in lower flow rates may generate false alarms
- Process upsets and subsequent transients in upstream/down stream facilities
  - Well trained operator is required to identify false alarms



# THANK YOU

