



Joint Government-Industry R&D Forum

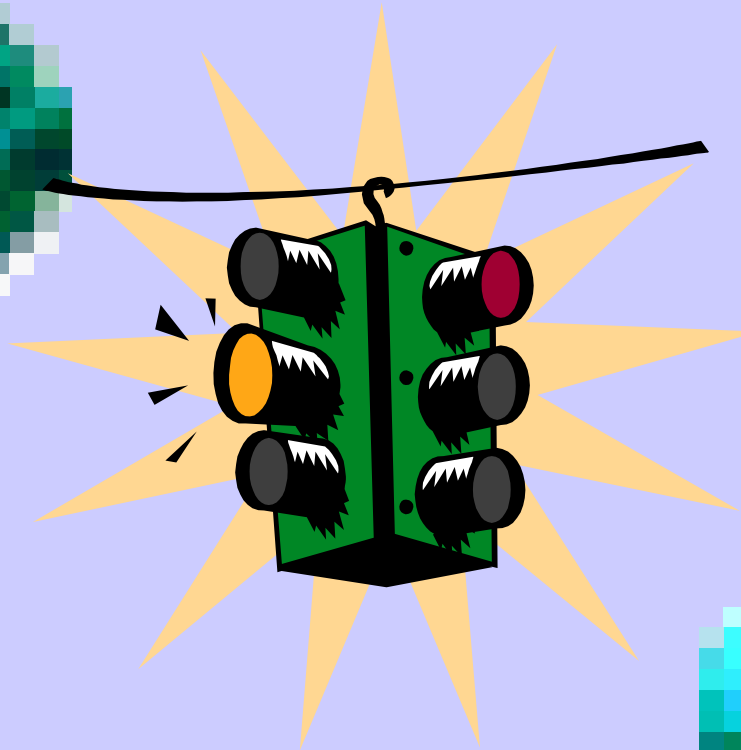
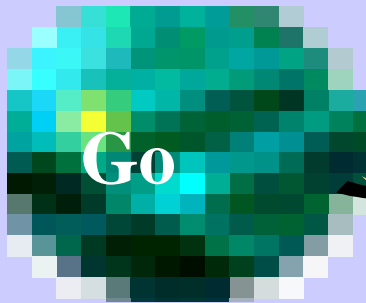
March 23, 2005

Angela Floyd



"Logic will get you from A to B.
Imagination will take you
everywhere." Albert Einstein

Measurement





Agenda Measurement

- Accuracy
- Diagnostics
 - Quality
- Communications



Measurement R&D Needs/Drivers

- Annual Pipeline Losses: \$300,000,000
 - Estimated that half is due to meter inaccuracy
 - Total value varies with price of gas



Measurement R&D Needs/Drivers Cont.

- A myth that all significant measurement errors balance out to zero within the industry
 - Instead, they persist all the way to the consumer
 - Treated as part of the cost of service
- Industry struggles to ID the source and magnitude of these errors



Mass or Volume





New Gas Sources

- LNG
 - Mass Balance
 - Cryogenics
 - Density
 - BTU

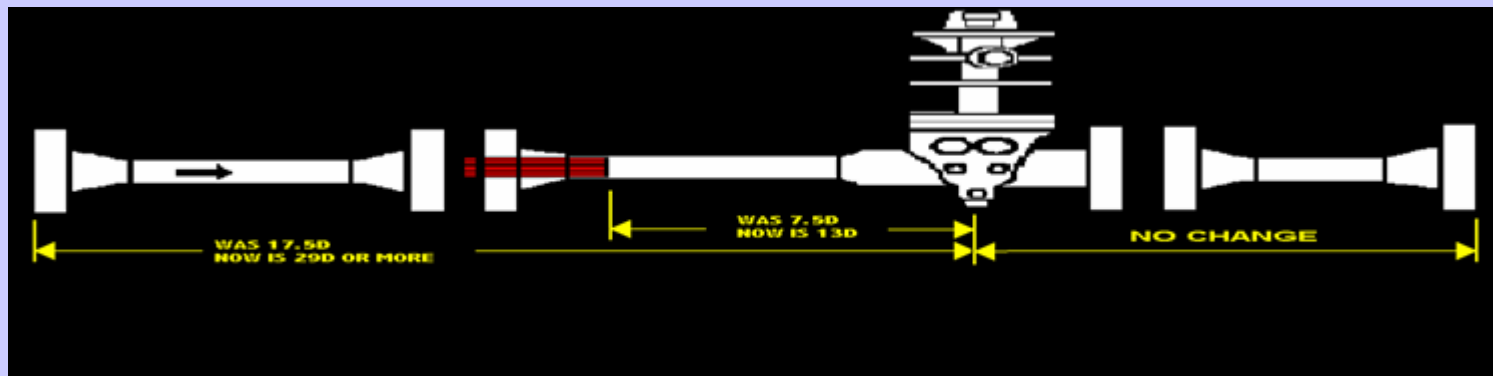
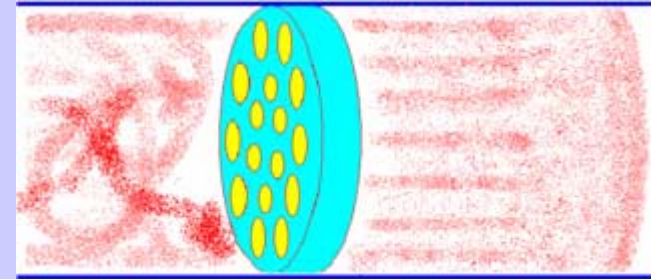
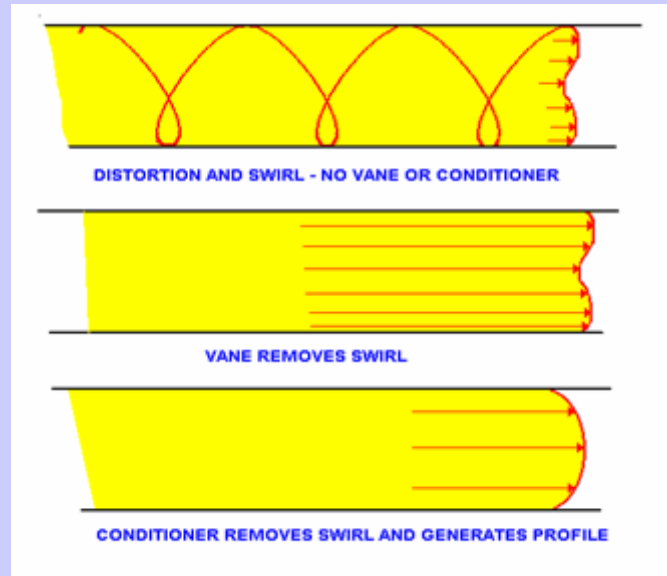
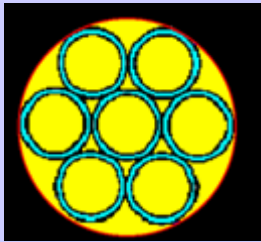




Measurement Diagnostics

- Smart meters
- Smart transmitters
- Meter redundancy
- Moving diagnostics into mechanical meters
- Self adjusting orifice plates!!!

Mechanical Conditioning



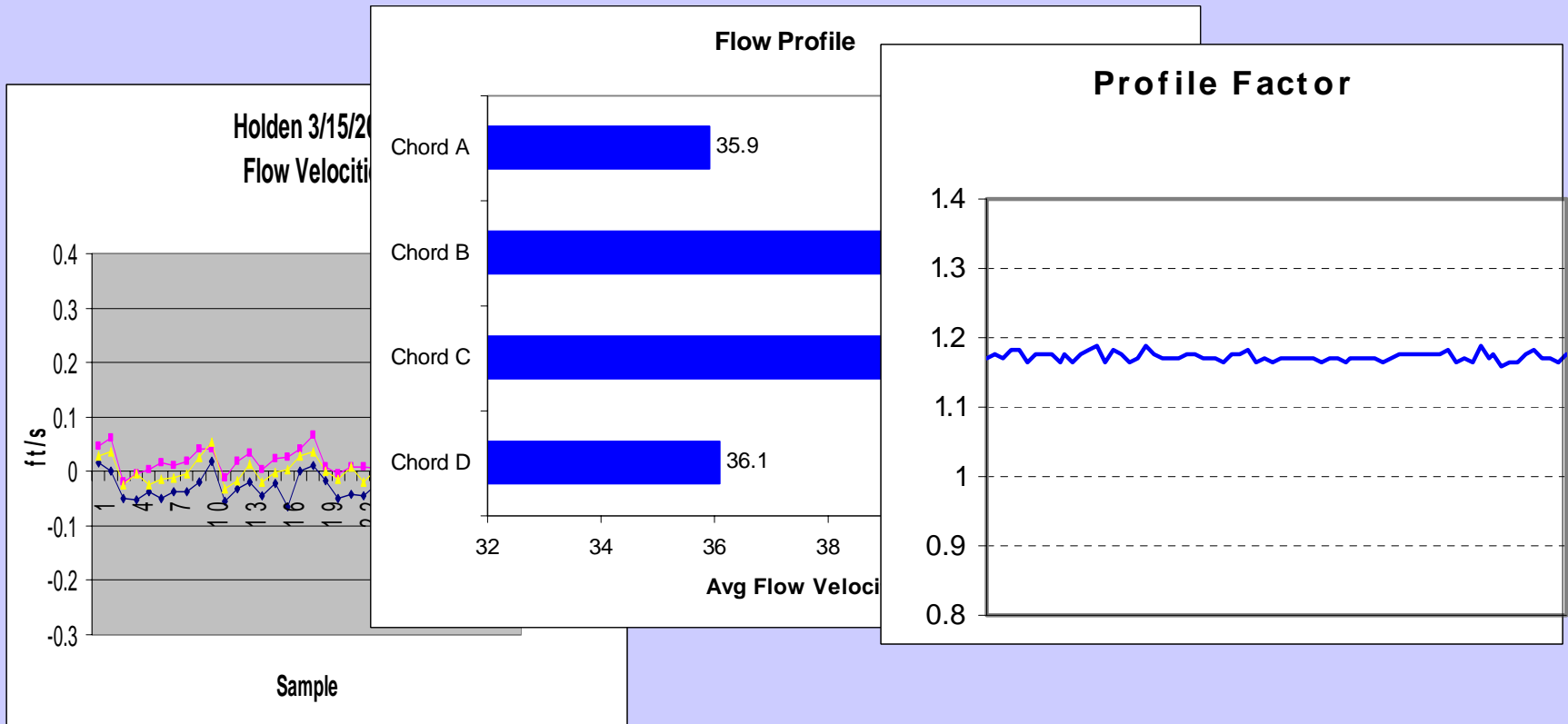


Electronic Meter Data

14	14	14	14	1324.869	19.62	111300	3	*****	*****	*****	2375	2375	4775	4775	2375	2375	3725	3725
15	15	15	15	1324.849	19.421	110200	0	*****	*****	*****	2300	2575	4250	4675	2300	2300	4100	4100
14	14	14	14	1324.842	19.478	110500	0	*****	*****	*****	2350	2350	4725	4725	2300	2500	4050	4050
15	15	15	15	1324.861	19.431	110200	0	*****	*****	*****	2150	2325	4850	4400	2400	2400	3825	3825
14	15	15	15	1324.86	19.348	109800	1	*****	*****	*****	2200	2350	4450	4450	2250	2475	3875	4250
14	14	14	14	1324.881	19.503	110600	0	*****	*****	*****	2475	2475	4475	4475	2425	2425	4175	4175
14	15	15	15	1324.834	19.414	110100	-1	*****	*****	*****	2450	2450	4650	4650	2375	2375	3750	3750
15	15	15	15	1324.842	19.491	110600	0	*****	*****	*****	2275	2275	4325	4650	2525	2525	3975	3975
14	14	14	14	1324.834	19.371	109900	1	*****	*****	*****	2325	2325	4275	4725	2350	2350	3775	4100
15	15	15	15	1324.842	19.567	111000	1	*****	*****	*****	2250	2250	4800	4800	2425	2425	3900	4225
15	15	15	15	1324.849	19.513	110700	-1	*****	*****	*****	2350	2350	4625	4625	2425	2425	4000	4000
14	14	14	14	1324.855	19.489	110600	-4	*****	*****	*****	2275	2425	4700	4700	2250	2425	3950	3950
15	15	15	15	1324.821	19.478	110500	-1	*****	*****	*****	2400	2400	4350	4775	2275	2275	4025	3700
15	15	15	15	1324.848	19.489	110600	1	*****	*****	*****	2325	2325	4300	4300	2375	2375	4200	4200
14	14	14	14	1324.855	19.608	111200	-1	*****	*****	*****	2400	2400	4725	4425	2375	2375	3550	4075
15	15	15	15	1324.828	19.472	110500	1	*****	*****	*****	2250	2250	4525	4875	2425	2425	3950	4300
15	15	15	15	1324.835	19.402	110100	-1	*****	*****	*****	2425	2425	4600	5000	2450	2450	4000	4000
14	14	14	14	1324.828	19.395	110000	0	*****	*****	*****	2400	2400	4500	4500	2175	2425	3875	4250
15	15	15	15	1324.828	19.423	110200	-2	*****	*****	*****	2300	2475	4650	4325	2325	2325	3700	4100
15	15	15	15	1324.842	19.433	110200	1	*****	*****	*****	2325	2325	4525	4525	2250	2250	4100	3850
14	14	14	14	1324.828	19.413	110100	-1	*****	*****	*****	2300	2525	4225	4575	2300	2475	3800	3800
15	15	15	15	1324.842	19.547	110900	1	*****	*****	*****	2300	2300	4450	4800	2275	2275	3875	3875
15	15	15	15	1324.823	19.571	111000	0	*****	*****	*****	2350	2350	4425	4425	2325	2325	3775	3775
14	14	14	14	1324.817	19.572	111000	0	*****	*****	*****	2350	2350	4500	4500	2350	2350	3675	4075
15	15	15	15	1324.83	19.577	111100	0	*****	*****	*****	2275	2425	4350	4800	2450	2175	4300	3775
15	15	15	15	1324.822	19.497	110600	0	*****	*****	*****	2225	2425	4450	4775	2450	2450	3975	3975
14	14	14	14	1324.854	19.455	110400	0	*****	*****	*****	2500	2300	4575	4575	2275	2275	3875	3875
15	15	15	15	1324.849	19.53	110800	0	*****	*****	*****	2400	2400	4900	4600	2400	2400	3925	3925
14	14	14	14	1324.847	19.466	110400	-2	*****	*****	*****	2325	2325	4550	4550	2300	2300	3800	3800
15	15	15	15	1324.802	19.515	110700	0	*****	*****	*****	2325	2325	4750	4750	2300	2300	4100	3775
15	15	15	15	1324.822	19.466	110400	1	*****	*****	*****	2325	2325	4325	4725	2300	2300	3800	3800
14	14	14	14	1324.817	19.574	111000	-1	*****	*****	*****	2350	2350	4700	4700	2275	2275	3575	4175
14	15	15	15	1324.841	19.419	110200	1	*****	*****	*****	2425	2425	4250	4650	2425	2425	3725	3975
15	15	15	15	1324.83	19.674	111600	1	*****	*****	*****	2400	2400	4525	4525	2250	2475	3775	3775
14	14	14	14	1324.835	19.493	110600	1	*****	*****	*****	2425	2425	4550	4550	2475	2475	3925	4250
15	15	15	15	1324.842	19.503	110600	0	*****	*****	*****	2400	2400	4800	4800	2400	2400	3575	3950
15	15	15	15	1324.842	19.542	110900	-1	*****	*****	*****	2225	2425	4500	4500	2350	2350	3925	3925
14	14	14	14	1324.784	19.579	111100	0	*****	*****	*****	2500	2300	4550	4550	2375	2375	3875	4200
15	15	15	15	1324.836	19.561	111000	-1	*****	*****	*****	2325	2325	4600	4600	2300	2300	3725	4050
15	15	15	15	1324.81	19.594	111200	-1	*****	*****	*****	2425	2425	4775	4325	2225	2425	3850	3850
14	14	14	14	1324.809	19.604	111200	-1	*****	*****	*****	2450	2450	4950	4575	2475	2300	3850	4325
14	15	15	15	1324.828	19.518	110700	0	*****	*****	*****	2450	2450	4500	4875	2375	2375	3800	4150



Graphical Displays



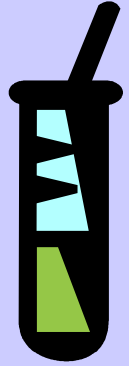


DATA

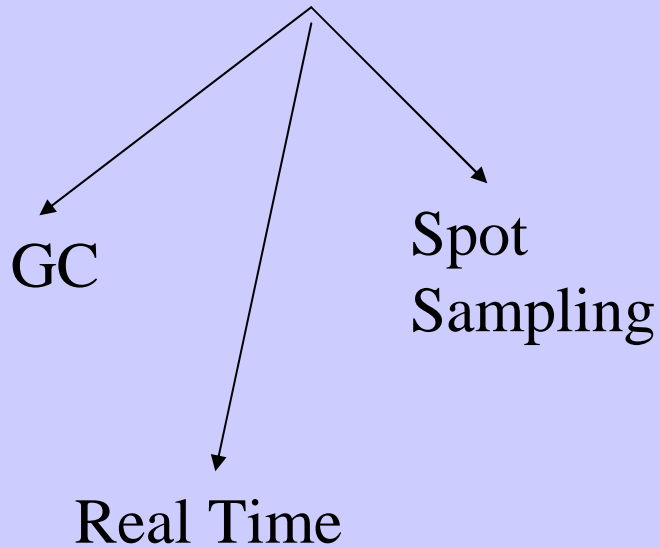
- What are we doing with all the data?
- Does it make sense to the user/technician?
- Can the meter self diagnose itself and send e-mail?



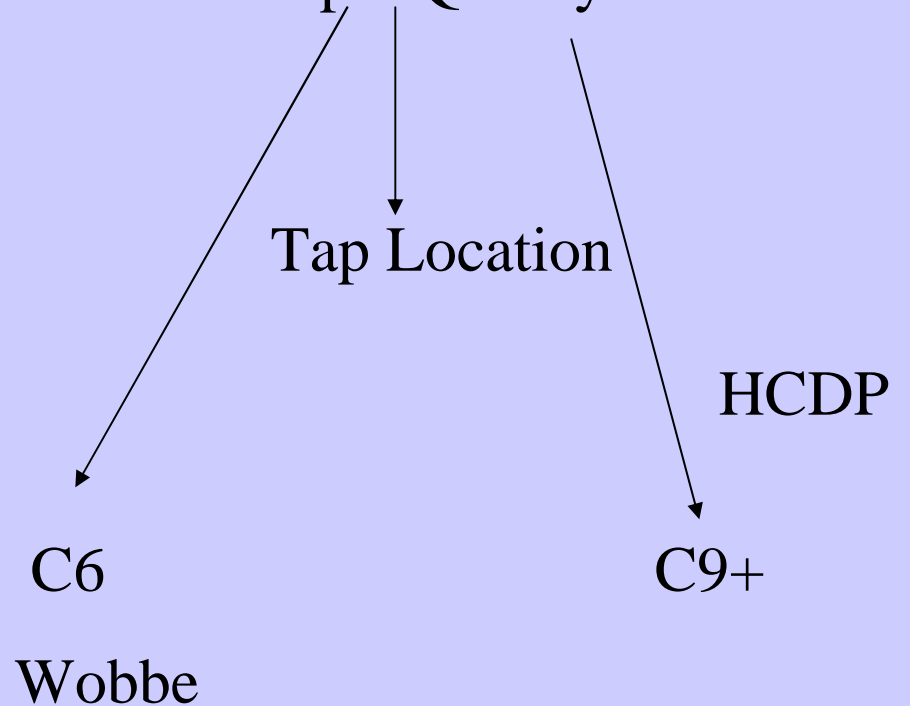
Gas Quality



Sample Process



Sample Quality



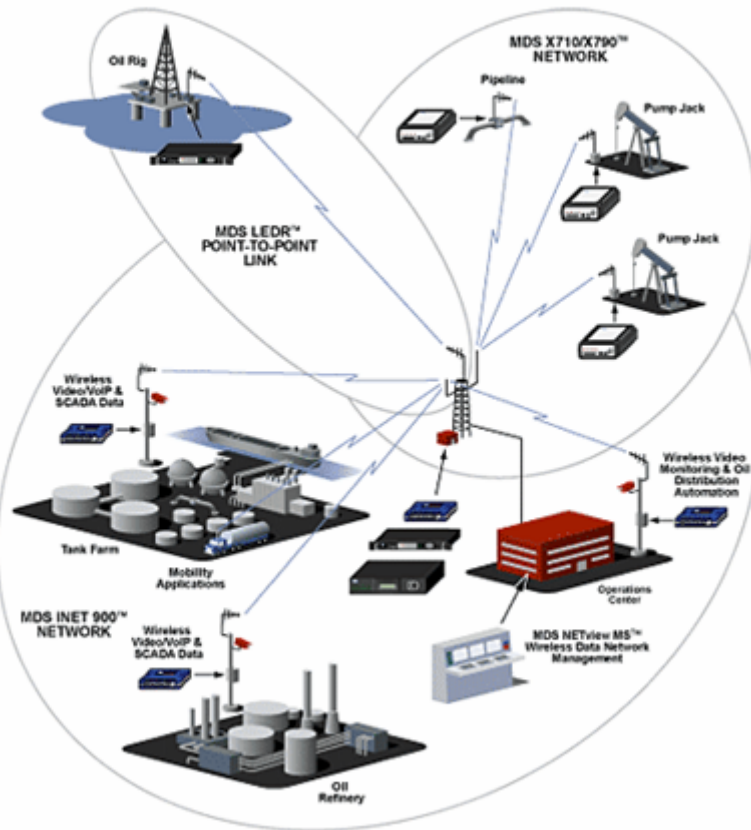


Quality ??

- How can we improve our sampling method?
- GC's for offshore – How good can they be?
- Do we need to measure C9+ or do the Equations of State suffice?
- Low price GC?

DATA Communications

Wireless Oil & Gas Automation & SCADA System
with Data, Mobility, VoIP and Video Monitoring





Communications Local and Remote

- Charts
- Serial Port
- MODEM
- Ethernet
- Wireless Ethernet
- What next? Volume and complexity of data?



Standards

- Standards committees sharing data?
- Faster reporting
- Recommendations versus Requirements
- Written to assist the user



Summary

- Lots of products and technology out there
- Computer Smarts are available but seldom used – need to be validated
- Need for dedication to Measurement R&D for increased independent product and theorem evaluation
- Quality analysis methods simplified for consistency

Measurement

