

Interface Detection and Easy, Rugged Compliance Testing

Buster Brown

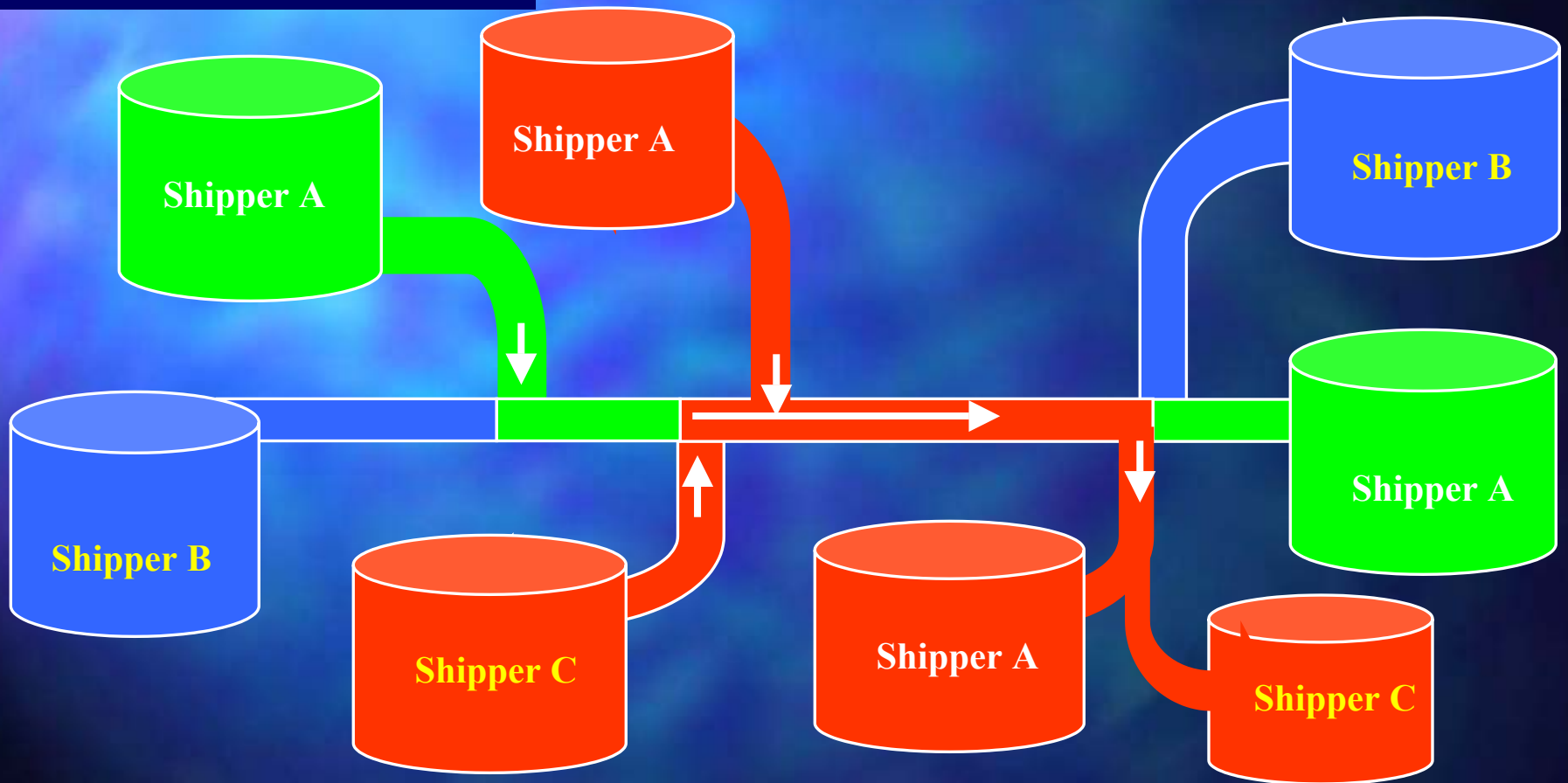
Colonial Pipeline Company

EPA Workshop Presentation

November 20, 2002

Product Batching

Multiple Origins and Destinations




















Colonial delivers 90 different products for 85 customers to 270 terminals and more than 1,000 storage tanks.

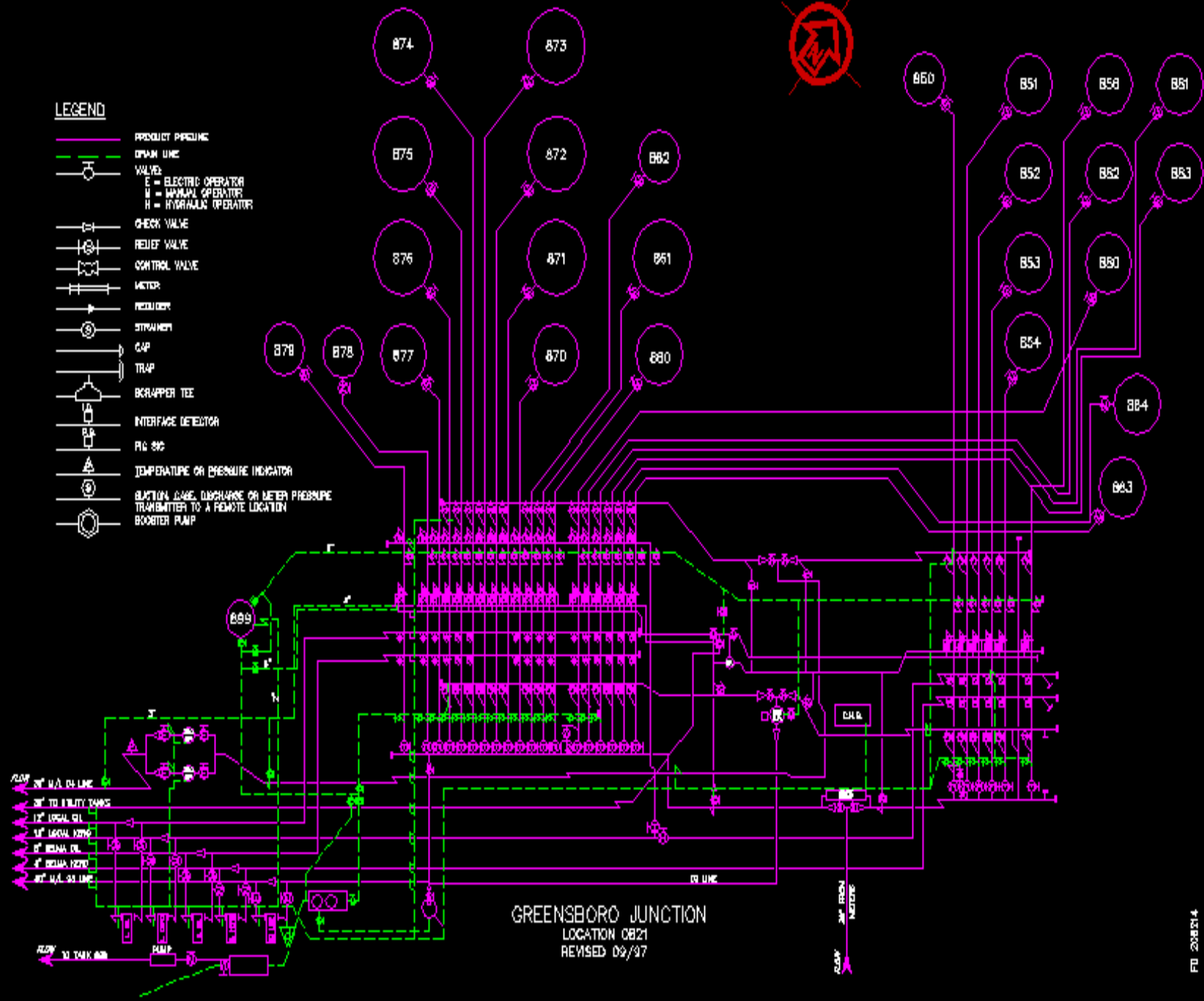
Oversight Testing

- Acceptance (Certificate of Analysis)
- Origin
 - Pre-shipment Tank
 - Lifting
 - Lab
 - On line (gravity, flash)
- Delivery Oversight



LEGEND

-  PRODUCT PIPING
-  DRAIN LINE
-  VALVE
 - E = ELECTRIC OPERATOR
 - M = MANUAL OPERATOR
 - H = HYDRAULIC OPERATOR
-  CHECK VALVE
-  RELIEF VALVE
-  CONTROL VALVE
-  METER
-  REGULATOR
-  STRAINER
-  CAP
-  TRAP
-  SCRAPER TEE
-  INTERFACE DETECTOR
-  PG TAG
-  TEMPERATURE OR PRESSURE INDICATOR
-  BLACTION GAUGE, DISCHARGE OR METER PRESSURE TRANSMITTER TO A REMOTE LOCATION
-  BOOSTER PUMP



Origin Testing

- Pre-shipment Tank Sampling
 - Stratification
 - Test Reproducibility
- Lifting Verification
 - Mainly lab equipment
 - On line detects 'spots'

Delivery

- Assure compliance (Good in = good out)
- Determination of cut point
 - Interface size
 - Flow rate
 - Valve travel time
 - Allowable commingling

On Line Measurement Requirements

- Sensitive
 - gives response to small changes
- Cycle Time
 - Pipeline flow rate and interface size
 - Location of installation (How far upstream)
- Accuracy
 - Strictly cut point or oversight

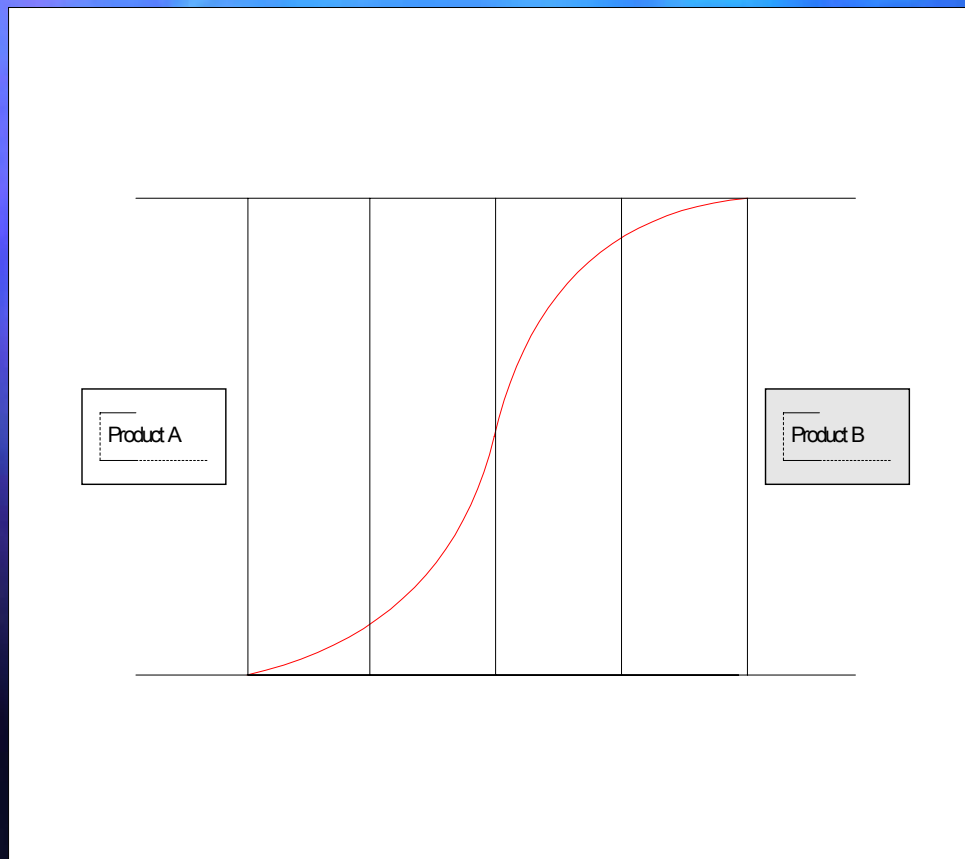
How fast does the next product arrive?

<u>Diameter</u> <u>(Inches)</u>	<u>Distance</u> <u>(Miles)</u>	<u>Maximum Rate</u> <u>(BPH)</u>	<u>Interface Volume</u> <u>(Barrels)</u>	<u>Arrival Time</u> <u>(Minutes)</u>
40	1,047	50,000	15,000	18
36	1,047	37,000	12,500	20
16	14	6,000	200	2
16	106	3,900	600	9
16	206	7,000	890	8
12	24	3,350	130	2
12	254	4,200	530	8
10	7	4,000	50	1
8	24	2,650	60	1

How much commingling can be accepted?

- 2,500 barrel batch at 10 ppm
- 6.2 barrels of 2000 ppm will raise batch sulfur to 15 ppm

Where do we cut?



- For 12" – 254 mile pipeline with interface size of 530 barrels
- 25% cut = 4% of Product B in 25% of total interface
- $530 * .25 * .04 = 5.3$ bbls
- 8 minute interface arrival would require decision and switch in 2 minutes

Field Testing Equipment

- Fast – verification and action must be made quickly
- Accurate – basis for origin and delivery testing, used for pipeline acceptance
- Simple – complexity leads to errors in measurement

Bart Harvard – Typical Pipeline Operator



Conclusions

- Pipelines will attempt to eliminate all pipeline interface from ULSD
- Fast on-line detection is the best method – only other method is over protection
- On-line sensitivity and cycle time is critical
- Field equipment should be simple, fast, and accurate