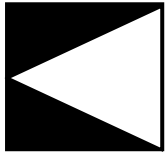Kam
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"Clean Diesel Fuel Implementation Workshop"

November 20 – 21, 2002

On-Line Optical Interface Detection
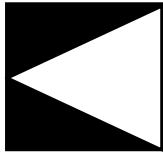
Presenter: Chris F. Hastings
              Marketing & Sales Manager,
              Kam Controls, Inc.
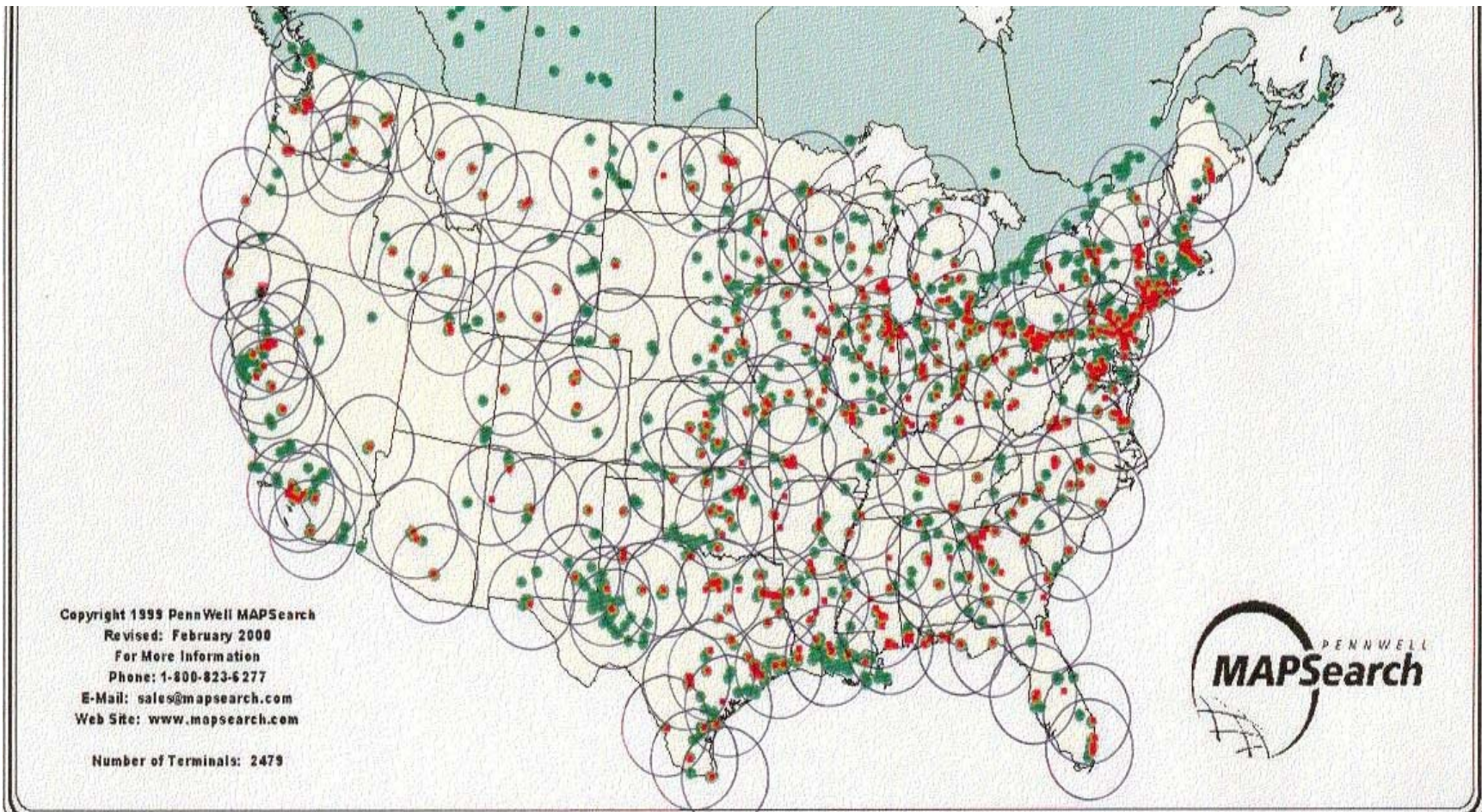   ChrisHastings@KamControls.com

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Liquids Pipelines – approx 80,000 miles

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Terminals in the U.S. - 2479

Copyright 1999 PennWell MAPSearch
Revised: February 2000
For More Information
Phone: 1-800-823-6277
E-Mail: sales@mapsearch.com
Web Site: www.mapsearch.com

Number of Terminals: 2479

PENNWELL
MAPSearch

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Pipeline Operations - Definitions

- Pipeline - closed conduit that connects two petroleum terminal storage facilities.

- Batch - volume of refined petroleum product with common physical properties.

- Tracking - Location of the leading or trailing end of a given batch inside a pipeline at some point in time.

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Pipeline Operations - Current Situation

- Batches serially enter a pipeline, then move the length of the pipeline and are delivered to terminals at intermediate points and finally the endpoint of the pipeline.

- Various pipeline controlling actions are based on the locations of batch interfaces.
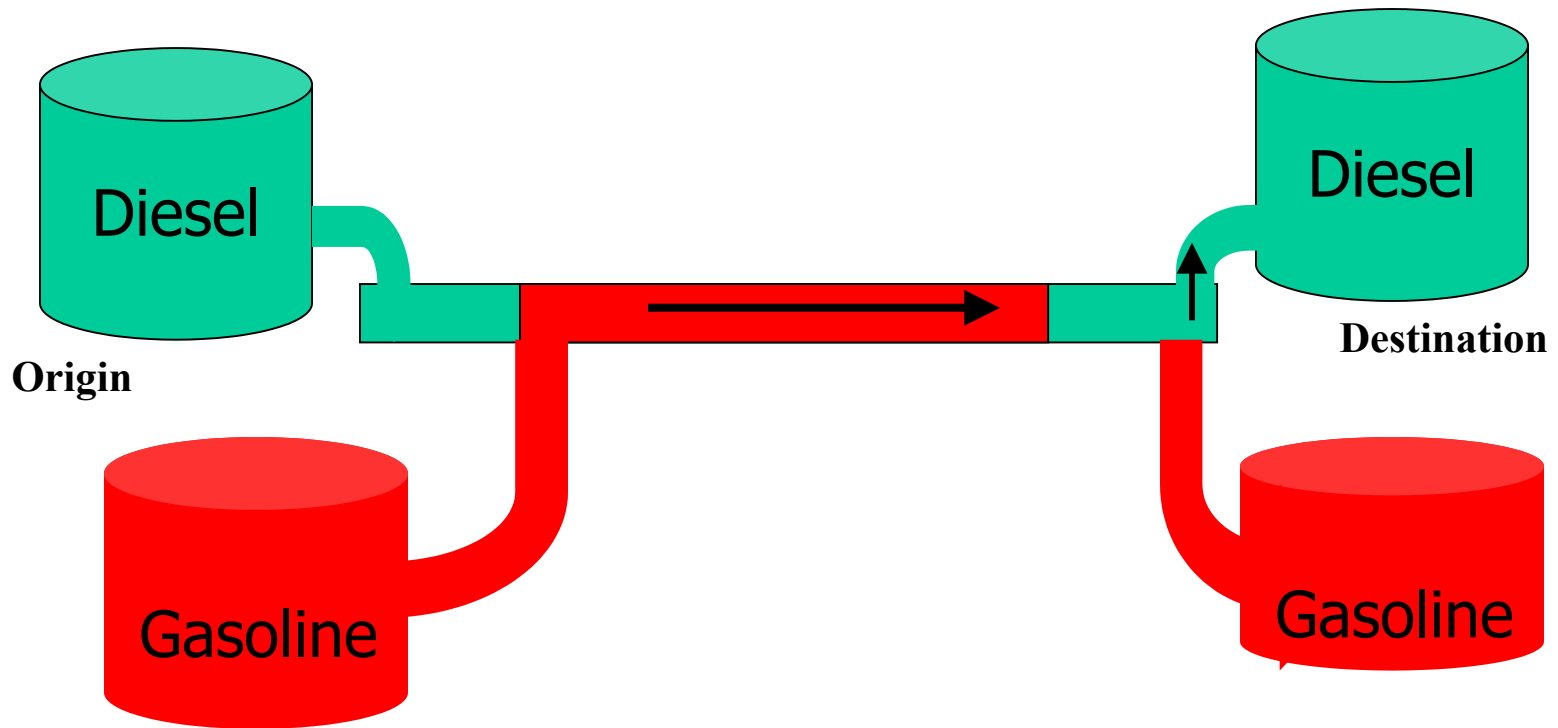
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Pipeline Operations – Fuel Management

- Track batches in order to determine the location of a batch in a pipeline at some point in time.

- This could be the current location or a projected location in the future.

- Use "best available" technology.

- Determine batch location accurately.

Product Integrity

- Different product batches are "pushed" through the system abutting each other.

| Reformulated regular gasoline | Low sulfur diesel fuel | Kerosene/ Jet Fuel | High Sulfur Diesel | Conventional regular gasoline | Premium gasoline | Reformulated premium gasoline |

Increasing the number of distinct product types complicates the product distribution systems.

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On-Line Optical Interface Detectors

Reliable Pipeline Interface and Quality Detection for Efficient Fuel Management

KAM OID installs through full opening valve to provide speed of light interface detection

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Kam Controls - Optical Products

"Why Interface / Quality Detection?"

- Many Products have very similar API Gravity
  - Existing Instrumentation not originally designed for this service
- Eliminate Missed Interfaces
  - In many cases existing Instrumentation not capable of interface detection
  - Many Product have very similar API Gravity, very similar Color
  - Reduce Product Downgrading
  - Reduce Transmix
- Minimize Operational Costs - Increase Profitability
  - Accurate / repeatable interface detection with reliable Instrumentation
- Improve Product Quality - Increase Profitability
  - Instrumentation specifically designed for this service
  - Early indication of Contamination (i.e. water)
- Automate Batch Cut Process
  - Operators now able to concentrate on tasks requiring analysis and judgment for operational and integrity-related projects and solutions
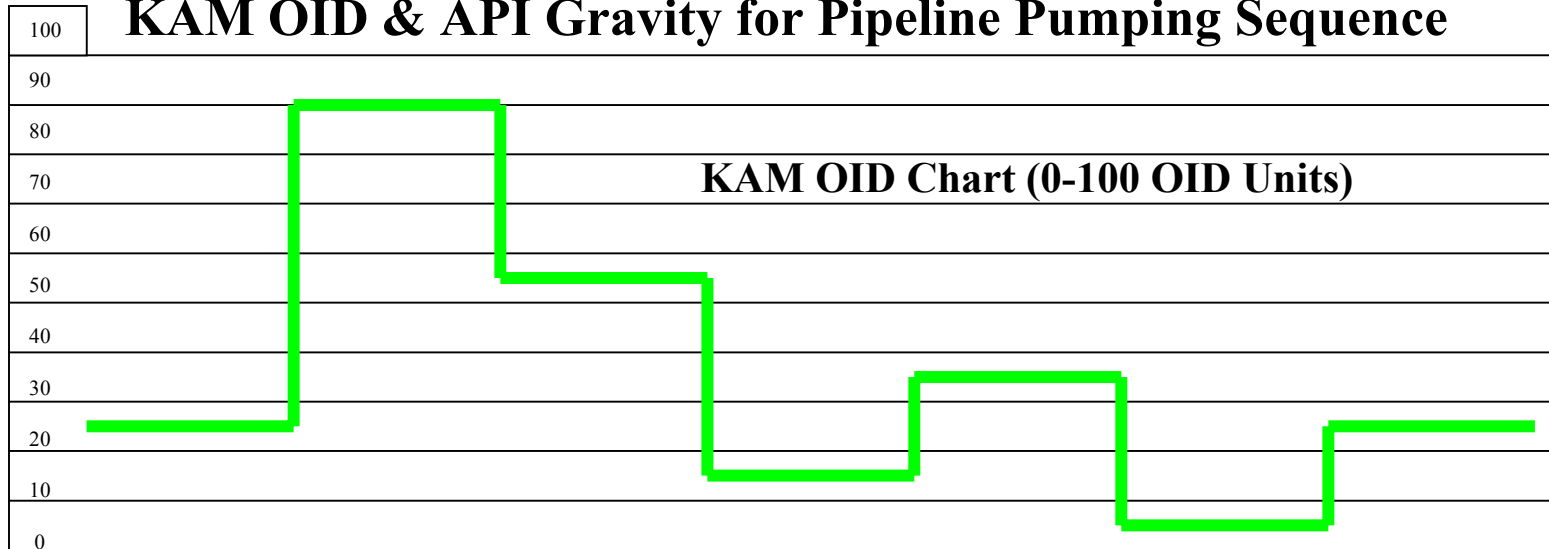
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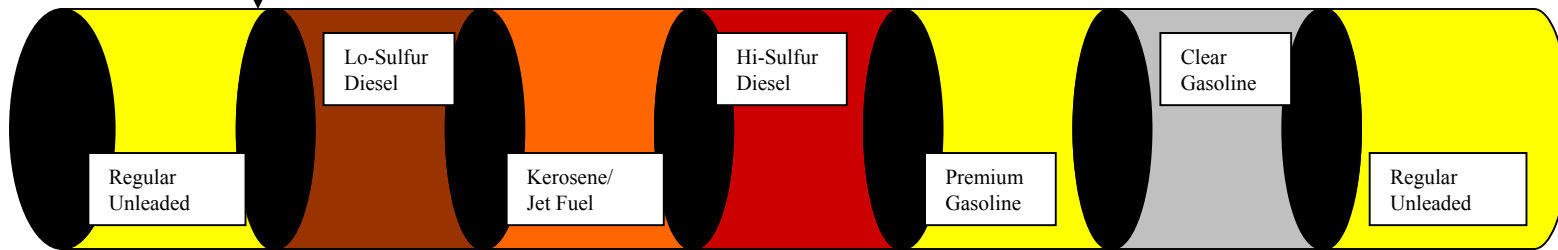
Kam Controls - Optical Products
"State of the Art Technology"

- Patented Technology
- Automatic, Real-Time "Speed of Light" Interface Detection and Product Quality of Refined Products including Synthetic Oils
- Quick, Accurate, Repeatable detection of the products "optical signature"
- Each product has a unique "optical signature" therefore more detectable
- Wide spectrum of light sources utilizing IR, NIR, MidIR, White thereby improving reliability, increasing repeatability and eliminating false signals
- Can be fitted on Main Line or in the Analyzer / By-Pass Loop
- Lines can be "Pigged" as the OID sits at the pipe wall
- Mounted on the pipeline with NO PUMP reduces Operators environmental exposure to leaks / spills caused by mechanical failures
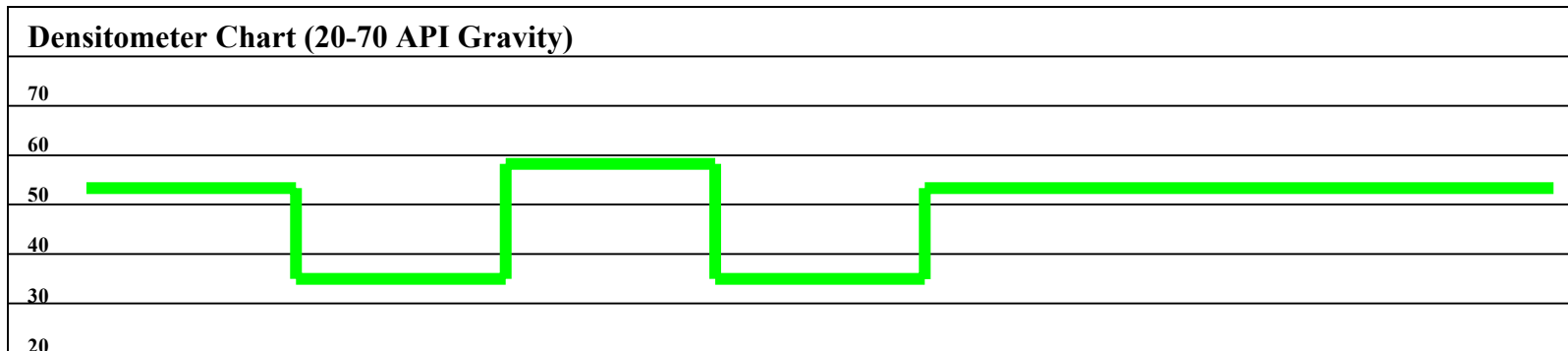
KAM OID & API Gravity for Pipeline Pumping Sequence

KAM OID Chart (0-100 OID Units)

100
90
80
70
60
50
40
30
20
10
0

Product Interface   Typical Batching Sequence for Pipeline Products

| Regular Unleaded | Lo-Sulfur Diesel | Kerosene/ Jet Fuel | Hi-Sulfur Diesel | Premium Gasoline | Clear Gasoline | Regular Unleaded |

Densitometer Chart (20-70 API Gravity)

70
60
50
40
30
20

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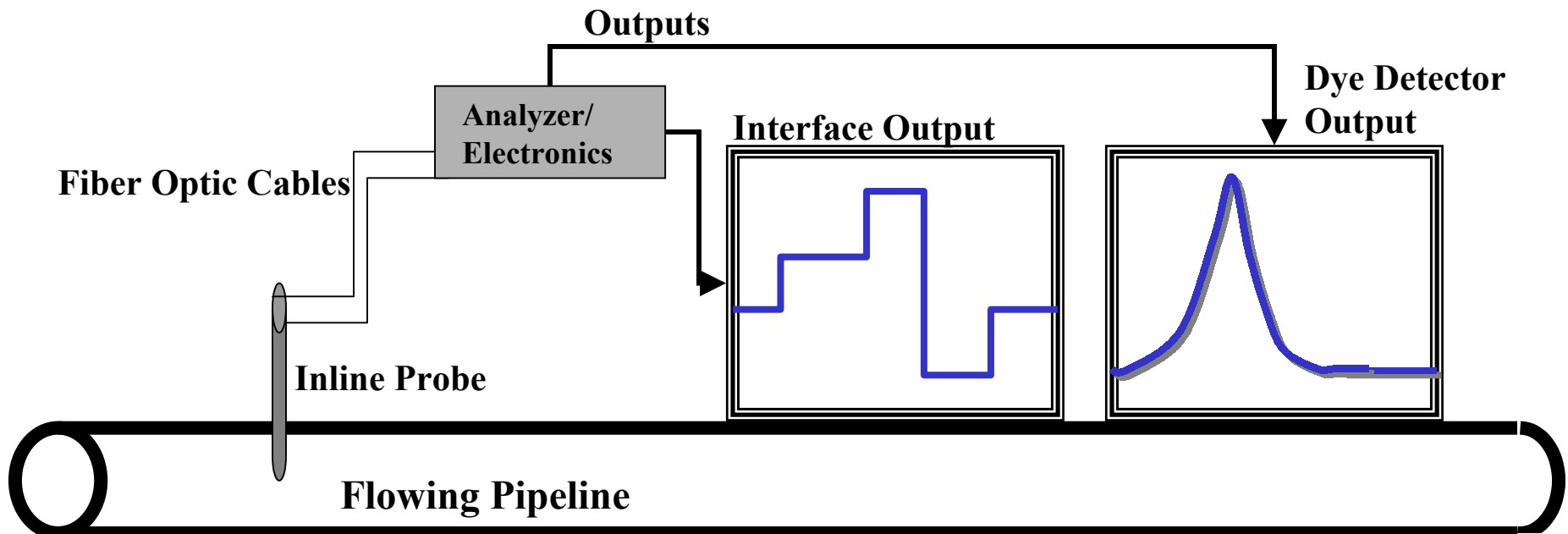
<u>Proven Design - Ease of Operation & Ownership</u>

- Minimal Operator Training for Installation
- Operator Friendly Technology
- Highly Accurate tool providing a clear, defined, repeatable "cut signal"
- Probe w/fiber optic cables, analyzer electronics
- More Safely, more Efficiently and with less Downtime

Outputs

Dye Detector Output

Analyzer/ Electronics

Interface Output

Fiber Optic Cables

Inline Probe

Flowing Pipeline

![Kam Controls Incorporated logo] Kam Controls Incorporated

Kam OID Typical Installation

**Kam OID
Hearne, TX
4" ANSI 600
Operated by Shell
Oil Products US**

This unit now operating for 12 months trouble-free, with all batches being "cut" from OID signal. Densitometer no longer used for "batch cuts".

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Customer's Needs & Application Requirements

Typical Objectives

- ## Automate Batch Cut Process
  - Reduce number of Operator "callouts"
  - Streamline operations from Central Control Facility

- ## Eliminate Missed Interfaces
  - Many Product Have Similar API Gravity and Color
  - Eliminate manual sampling errors

- ## Improve Product Quality, Increase Profitability
  - Early indication of Contamination (i.e. water)
  - Reduce Product Downgrading
  - Reduce Transmix

Kam Controls Incorporated

The Kam Solution for Cost Effective Fuel Management

Patented technology for accurate, reliable, repeatable detection of interfaces and product contamination.

Maintenance free operating for Remote and Main Station installations.

Fast becoming accepted as the #1 OID instrument by Pipeline Operators in North America.