# DISTRIBUTION TUTORIAL

## Product Integrity During Movement

- Different product batches are "pushed" through the system abutting each other. The product is kept in turbulent flow to minimize interfaces, the mixing zone between batches.
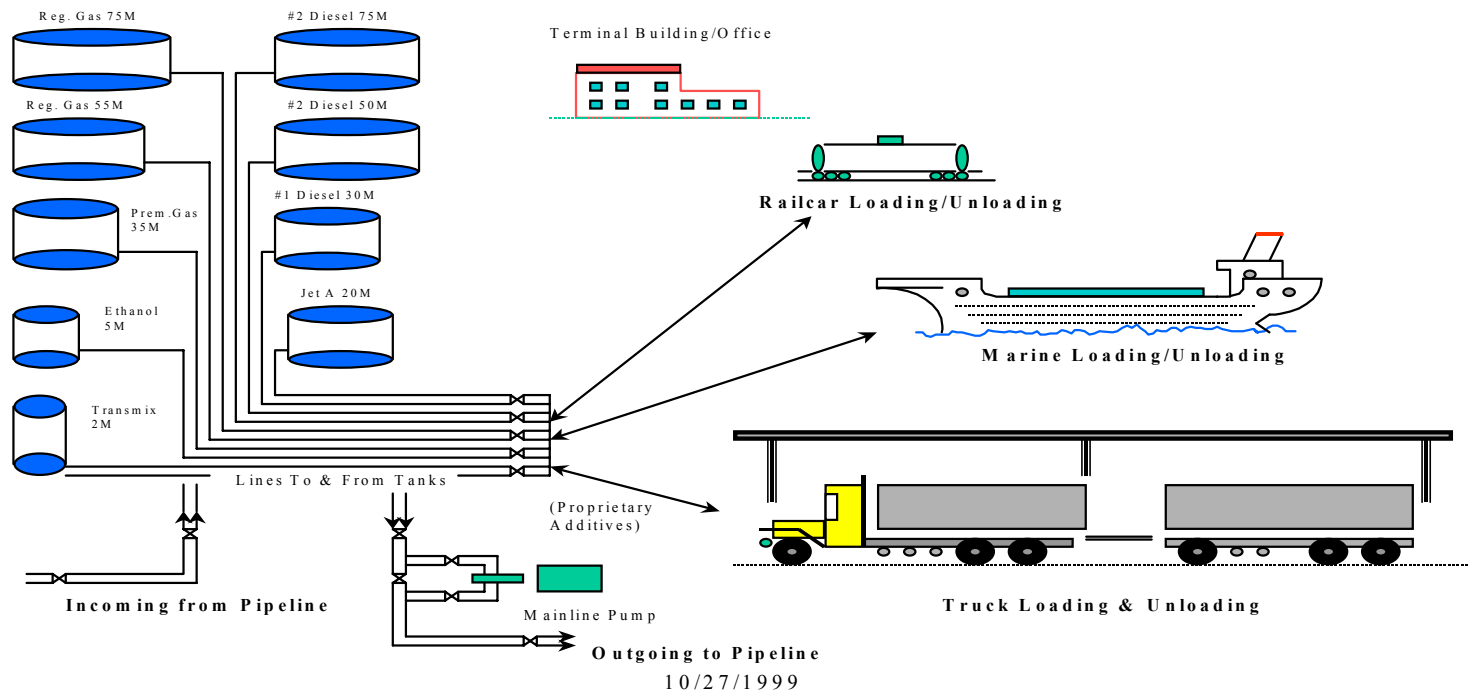


| Reformulated regular gasoline | Low sulfur diesel fuel | Kerosene / Jet Fuel | High Sulfur Diesel | Conventional regular gasoline | All premium grades | Reformulated regular gasoline |
|---|---|---|---|---|---|---|

- Pipelines use optimum sequencing of product grades to reduce the potential for contamination and/or downgrading of the products transported.
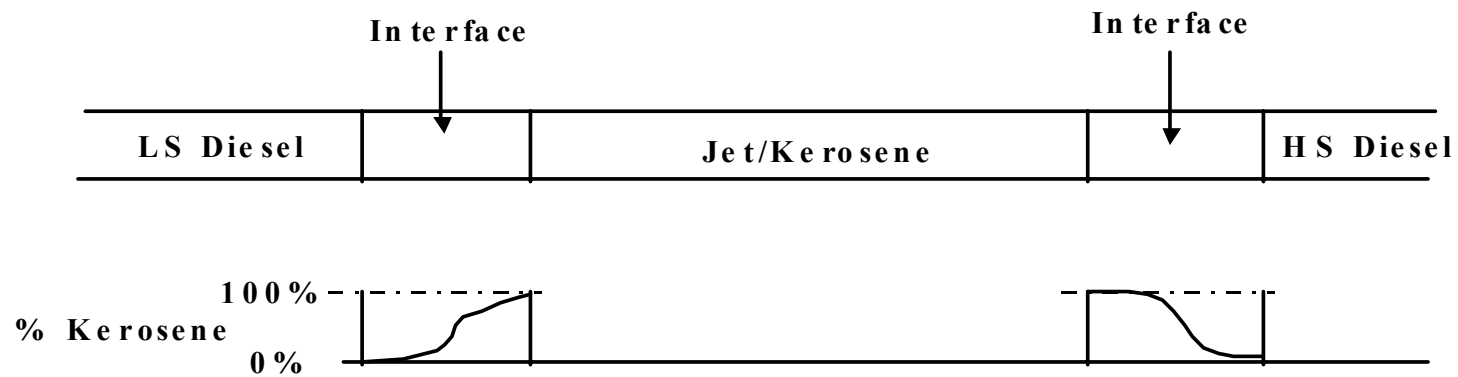
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## Typical Products Terminal

Reg. Gas 75M

#2 Diesel 75M

Terminal Building/Office

Reg. Gas 55M

#2 Diesel 50M

Railcar Loading/Unloading

Prem.Gas 35M

#1 Diesel 30M

Marine Loading/Unloading

Ethanol 5M

Jet A 20M

Transmix 2M

Lines To & From Tanks

(Proprietary Additives)

Incoming from Pipeline

Mainline Pump

Truck Loading & Unloading

Outgoing to Pipeline

10/27/1999

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**Product Integrity During Movement - Handling Procedures**

■ **Example: Low Sulfur Diesel, Jet/Kerosene, and High Sulfur Diesel:**

Interface                                             Interface

| LS Diesel | | Jet/Kerosene | | HS Diesel |

% Kerosene     100%

0%

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## Product Integrity - Current Diesel Handling Procedures

■ **Example: Jet/Kerosene, High Sulfur Diesel and Low Sulfur Diesel:**

Cuts are made to preserve Jet/Kerosene quality

Interface is delivered with preceding and following batches of LSD and HSD into tankage

Sulfur in interface can be put into LSD and still remain on spec
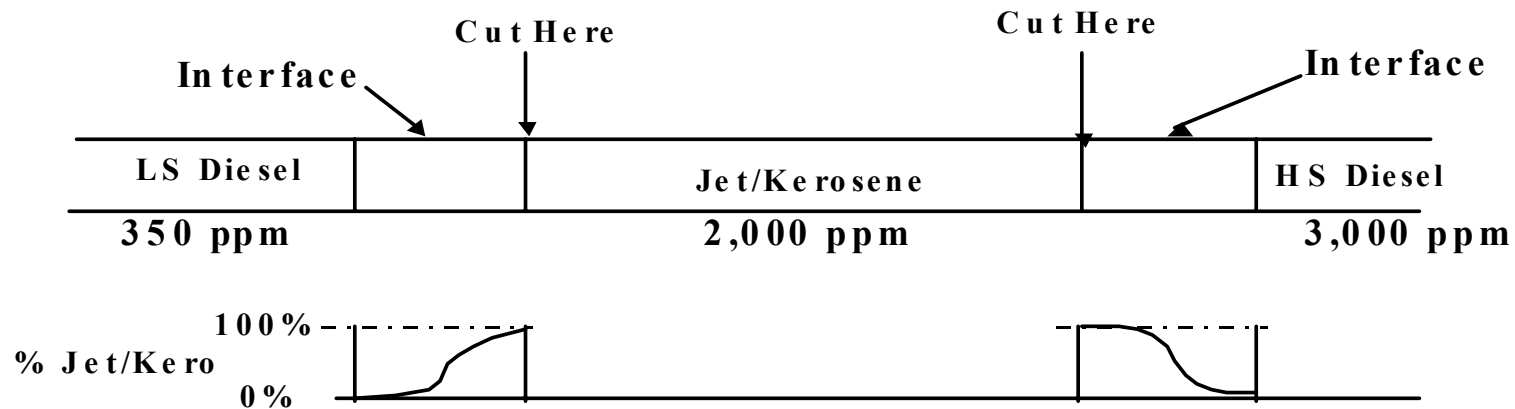


Interfaces are lost from Jet/Kerosene and gained by LSD and HSD batches
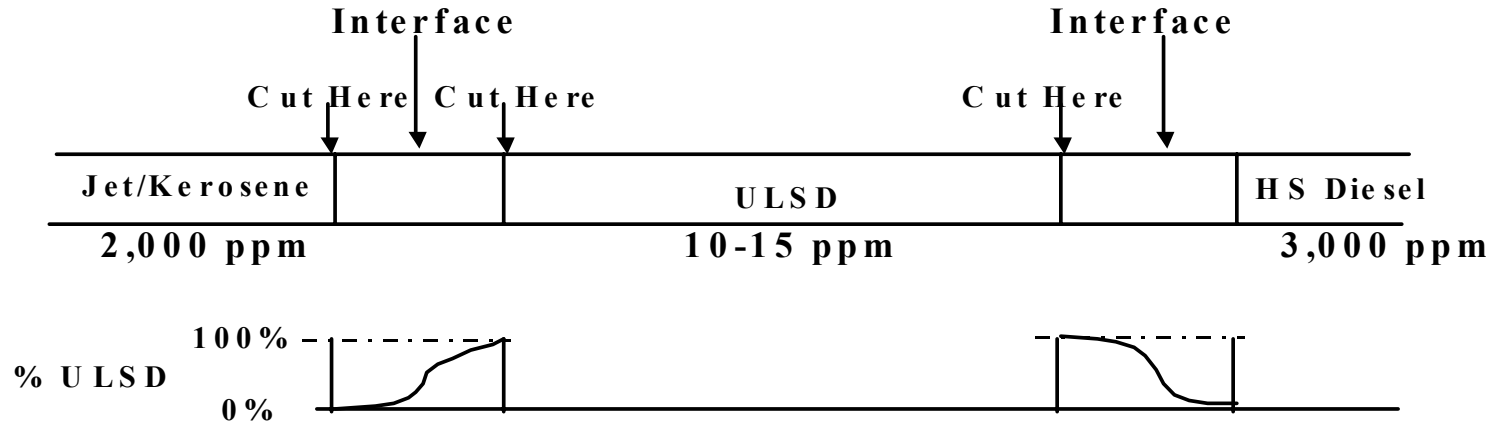
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## Product Integrity – Future ULSD Handling Procedures w/HSD

- **Example: Jet/Kerosene, ULSD and High Sulfur Diesel:**
  Cuts are made to preserve Jet/Kerosene and ULSD quality
  Jet/ULSD Interface must be removed, ULSD/HSD Interface can be delivered with HSD batch into tankage
  Sulfur in interface can <u>not</u> be put into ULSD and still remain on spec

Interface                                              Interface

Cut Here    Cut Here                          Cut Here

| Jet/Kerosene | | ULSD | | HS Diesel |
|---|---|---|---|---|
| 2,000 ppm | | 10-15 ppm | | 3,000 ppm |

% ULSD    100%

0%

Interfaces are lost from ULSD and Jet/Kero batches
Interface is gained in HSD batch,
Jet/ULSD interface must be removed and put into HSD tank

5

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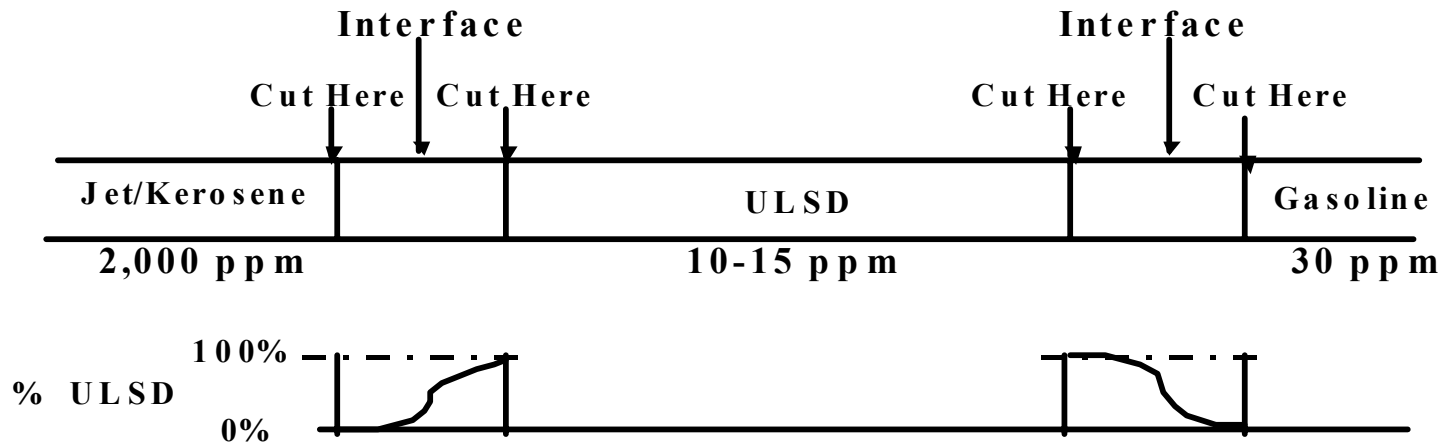**Product Integrity – Future ULSD Handling Procedures w/o HSD or LSD**

■ Example: Jet/Kerosene, ULSD and Gasoline:
  Cuts are made to preserve Jet/Kerosene and ULSD quality
  Jet/ULSD Interface must be removed,
  ULSD/Gasoline interface must be removed
  Both Interfaces must be reprocessed

Interface                                          Interface

Cut Here   Cut Here                      Cut Here   Cut Here

| Jet/Kerosene | | ULSD | | Gasoline |

2,000 ppm                    10-15 ppm                    30 ppm

100%

% ULSD

0%

**Interfaces are lost from ULSD, Jet/Kero and gasoline batches**
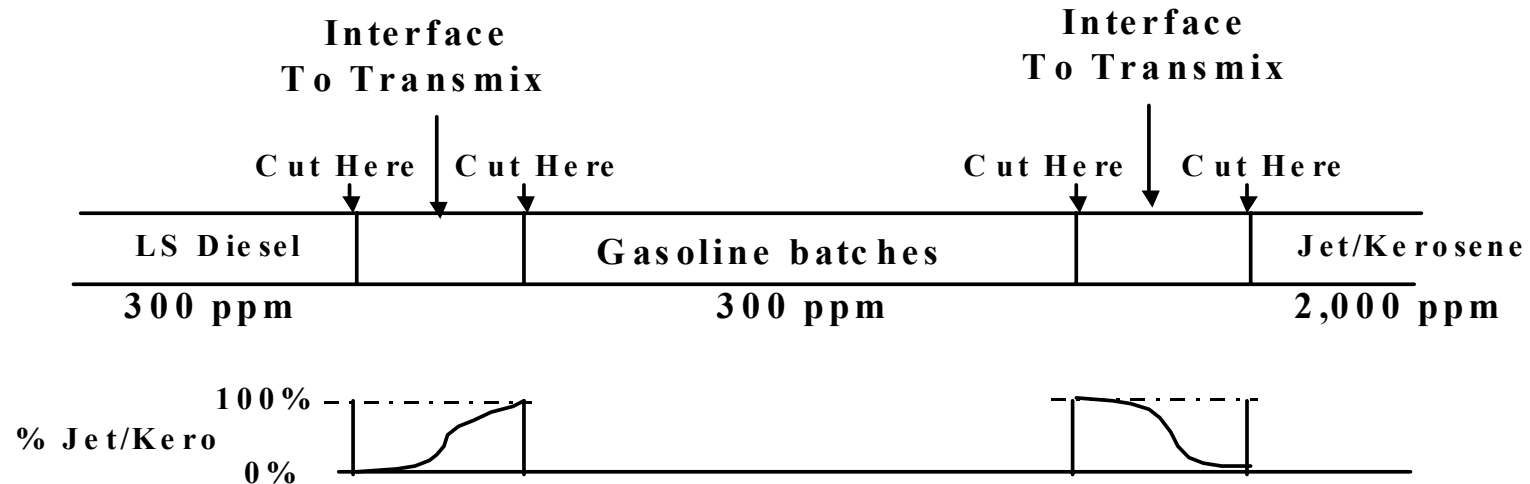
6

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## Product Integrity - Current Diesel/Gasoline Handling Procedures

- Example: Jet/Kerosene, Gasoline and Low Sulfur Diesel:

  Cuts are made to preserve Gasoline and Diesel quality
  Gasoline/Diesel Interface (Transmix) must be removed
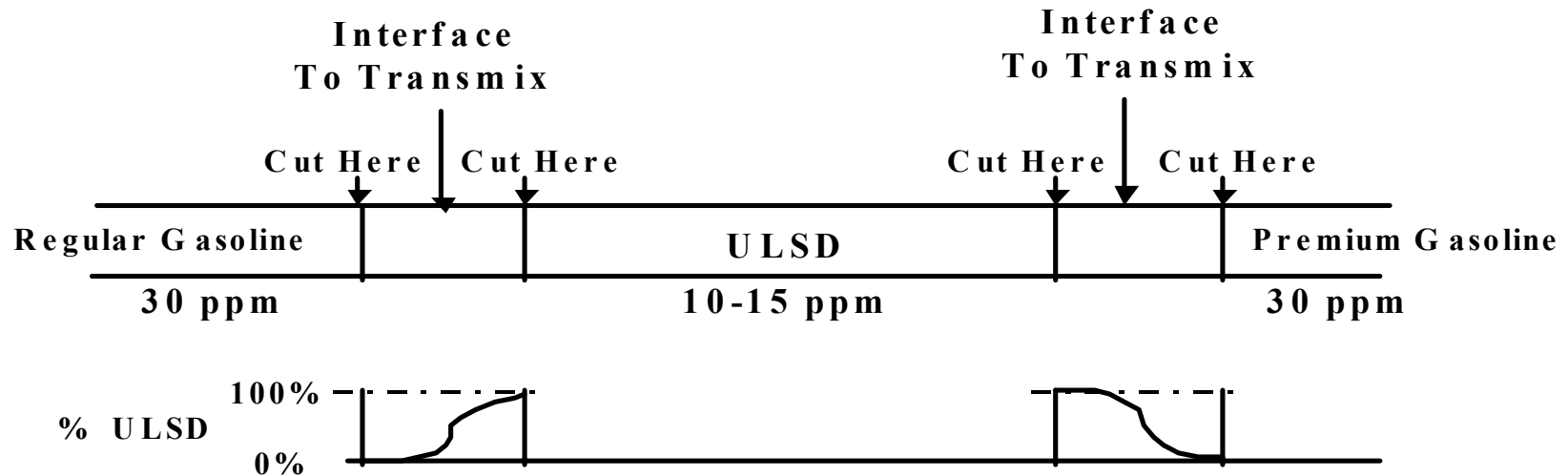  Small amounts of Transmix can be reblended into Gasoline

Interface
To Transmix

Interface
To Transmix

Cut Here    Cut Here                          Cut Here    Cut Here

| LS Diesel | | Gasoline batches | | Jet/Kerosene |

300 ppm                    300 ppm                    2,000 ppm

100%
% Jet/Kero
0%

Interfaces are lost from both Gasoline and Diesel/Jet

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**Product Integrity – Future ULSD/Gasoline Handling Procedures**

- **Example: ULSD is wrapped by Gasoline batches to protect quality**
  **Cuts are made to preserve Gasoline and ULSD quality**
  **Gasoline/ULSD Interface (Transmix) must be removed**
  **Small amounts of Transmix can be reblended into Gasoline**

Interface
To Transmix

Interface
To Transmix

Cut Here | Cut Here

Cut Here | Cut Here

Regular Gasoline

ULSD

Premium Gasoline

30 ppm

10-15 ppm

30 ppm

% ULSD

100%

0%

**If Interfaces remain at current sizes, the Transmix volume will double**
**Gasoline losses to transmix will at a minimum double**

8

# KEY POINTS

- Front and back Interfaces combined can be 3-10% (or more) of the batch volume depending on system configuration and batch size
- Cuts are required at breakout points and at the destination terminal
  - Typical pipeline movements will require 1 – 4 cuts
  - Longer pipeline movements will require more cuts
- Transmix/interface tankage is necessary
- Today's transmix re-processors will be unable to recover ULSD
  - ULSD transmix must be downgraded to LSD or HSD or sent to a refinery for reprocessing
- Transmix volumes could double – or more
  - Complex protective cut will create additional transmix
  - If a system does not handle LSD or HSD
    - ULSD interface must go to transmix
    - Jet interfaces must go to transmix
    - Wrapping ULSD with gasoline will double transmix
    - Wrapping ULSD with jet will double transmix
- Each pipeline system is unique with different operations and different interface considerations