

# Strategic Fuels Blending Management & Technology

## Self-Study Training Seminar Manual

**SAMPLE**

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# OMS-02 Strategic Fuels Blending Management and Technology Training Curriculum

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Module-1	Session-1 Overview and fundamentals			Module-5	Session-1 Linear and non-linear Blend Models			Module-9	Session-1 Online Blend Control and Optimization		
	Overview of Refining				Linear Blend Models				Advanced Online Blend Control & Optimization		
	Refinery Offsite Operations				Non-linear Blend Models				Control and Optimization of run-down blending system		
	Fuel Blending Operations in Refining				Methods to Handle Blend Non-linearity				Data Reconciliation and Feedback		
	Blending Problems and Challenges				Control Matrix of Qualities				Technology Set of Hardware and software		
						Gasoline, Diesel and Fuel Oils Specifications			System Architecture - Integration and Interfaces		
Module-2	Session-2 Blending field equipment			Module-6	Session-2 Blend Optimization and Specifications			Module-10	Session-2 Blending Project Justification		
	Blenders Configurations				Advanced Blend Control Strategy				Where and how to start		
	Tank Farm and Automatic Tank Gauging System				Blend Optimization				Methodology to Assess the Current State of Blending		
	Pumps, MOV's and Control Valves				How to estimate and update Blending values				Identifications of Automation Areas		
	Additives Control and Monitoring				Spectrum based Blend Indexes				The Quality giveaway - Concept, Cost and reduction Benefits		
Blend Header Design Considerations			Biofuels - A perspective Part-I Gasohol								
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Module-3	Session-3 Qualities Analysis and Measurements			Module-7	Session-3 Regulatory Blend Control			Module-11	Session-3 Blending Project Implementation		
	Quality Relationships and Measurements				Optimum Blend Control System Strategy				Project Implementation Phases & Strategy		
	Lab Analysis of Stock and Product Qualities				Regulatory Blend Control Operations				How to realize and sustain benefits		
	Online Analysis of Stock and Header Qualities				Blend Trim Control				Required Enterprise Changes		
	Model Based Tank Qualities Measurement				Ethanol Blending				Special Topic - Blending and Hydrocarbon Management		
Module-4	Session-4 All about octane and its measurements			Module-8	Session-4 Offline Blend Optimization and Planning			Module-12	Session-4 Wrap-up and Winding down		
	The Mysteries of Octane				Refinery-wide Planning & Scheduling				Putting it All Together		
	Octane Measurement by Knock Engine				Offline Blend Planning and Optimization				Discussion Forum - Individual Refinery Blending Operations		
	Integrated Analyzers Technology and Applications				Demonstration of An Offline Blend Optimizer System				Feedback and Certificate Awards		
	Octane Measurement by Spectrum based technology				Lab Exercise to solve an LP problem of a small refinery						
	Comparison of Knock engine versus Spectrum based methods										
	NIR and NMR versus CFR analyzers - Selection and Cost Effectiveness										

Notes: Each topic duration is 20-30 minutes, Total number of slides are 800+  
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**Next enclosed is a  
sample slides from  
session-3 of the  
curriculum.**

# Fuel Blending Operations in Refinery

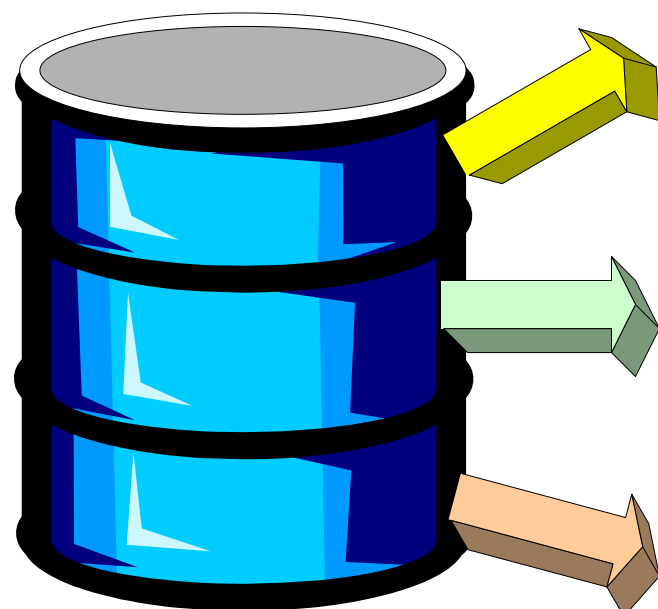
# Overview

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- **Products Yield**
- **Types of Blending**
- **Gasoline Blending**
- **Diesel Blending**
- **Kero Blending**
- **Fuel Oils Blending**
- **Lube Oils Blending**
- **Naphtha Blending**



# Products Distribution



**One Barrel of  
Crude Oil**

Product	Gallons	% Yield
Still Gas	1.89	4.26%
Liquefied Refinery Gas	1.76	3.96%
Naptha for Feedstocks	0.63	1.42%
Special Naphthas	0.13	0.29%
Kerosene	0.17	0.38%
Finished Aviation Gasoline	0.04	0.09%
Kero-Type Jet Fuel	3.99	8.98%
Finished Motor Gasoline	19.69	44.34%
Distillate Fuel Oil	9.7	21.84%
Other Oils for Feedstocks	0.5	1.13%
Residual Fuel Oil	1.76	3.96%
Petroleum Coke	2.14	4.82%
Asphalt and Road Oil	1.34	3.02%
Lubricants	0.46	1.04%
Miscellaneous Products	0.17	0.38%
Waxes	0.04	0.09%
<b>Total</b>	<b>44.41</b>	<b>100.00%</b>

**1 BLS = 42 Gallons gains Volume due to decrease in Densities of Products.**

# Types of Products Blending

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- Gasoline (Mogas)
- Diesel (Middle-Distillate)
- Kerosene
- Fuel Oils
- Lube Oils

# Gasoline Blending

- **Stocks**

Usually 6-12 in number, e.g. Naphtha, Reformate, FCC, HDS, Isomer, Alkylate, Butane, Isopentane, Merox, MTBE *(The stocks are produced by various refinery process units)*

- **Products**

**Leaded and Unleaded** *(leaded being phased out worldwide)*

Regular - 78-82

Premium - 83-90

Super Premium - 91-98 *(Octane Grades)*

- **Specifications**

RON, MON, RDOI, RVP, 10%, 50%, 90%, S, Arom, Ole, Bnz, TOx, VOC, Lead

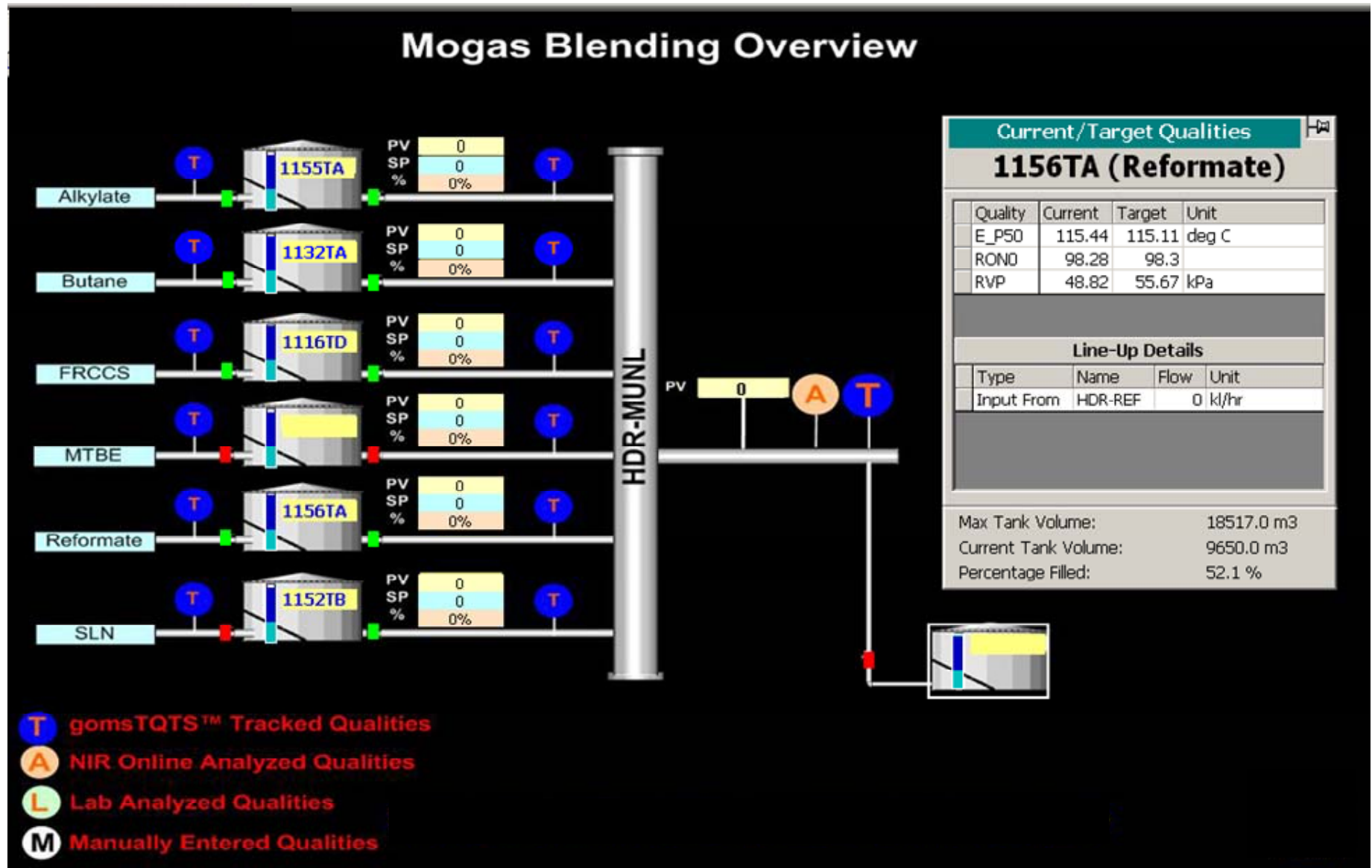
- **Mode**

**Tanks-to-Tank Inline Blending**  
*(Infeasible to blend in Run-down mode)*

- **End Uses**

**Cars, small vehicles**

# Example of gasoline Blending



# Diesel Blending

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- **Stocks**

Usually 3-6 in number, e.g. CDU middle distillates, Hydrocracking streams, *(The stocks are produced by mainly by CDU and Hydrocracking units)*

- **Products**

Light middle distillate fuel for special and general purpose, marine diesel, heavy distillate fuel

- **Specifications**

Cetane Index, Pour Point, Cloud Point, Sulfur, Viscosity, 90% pt

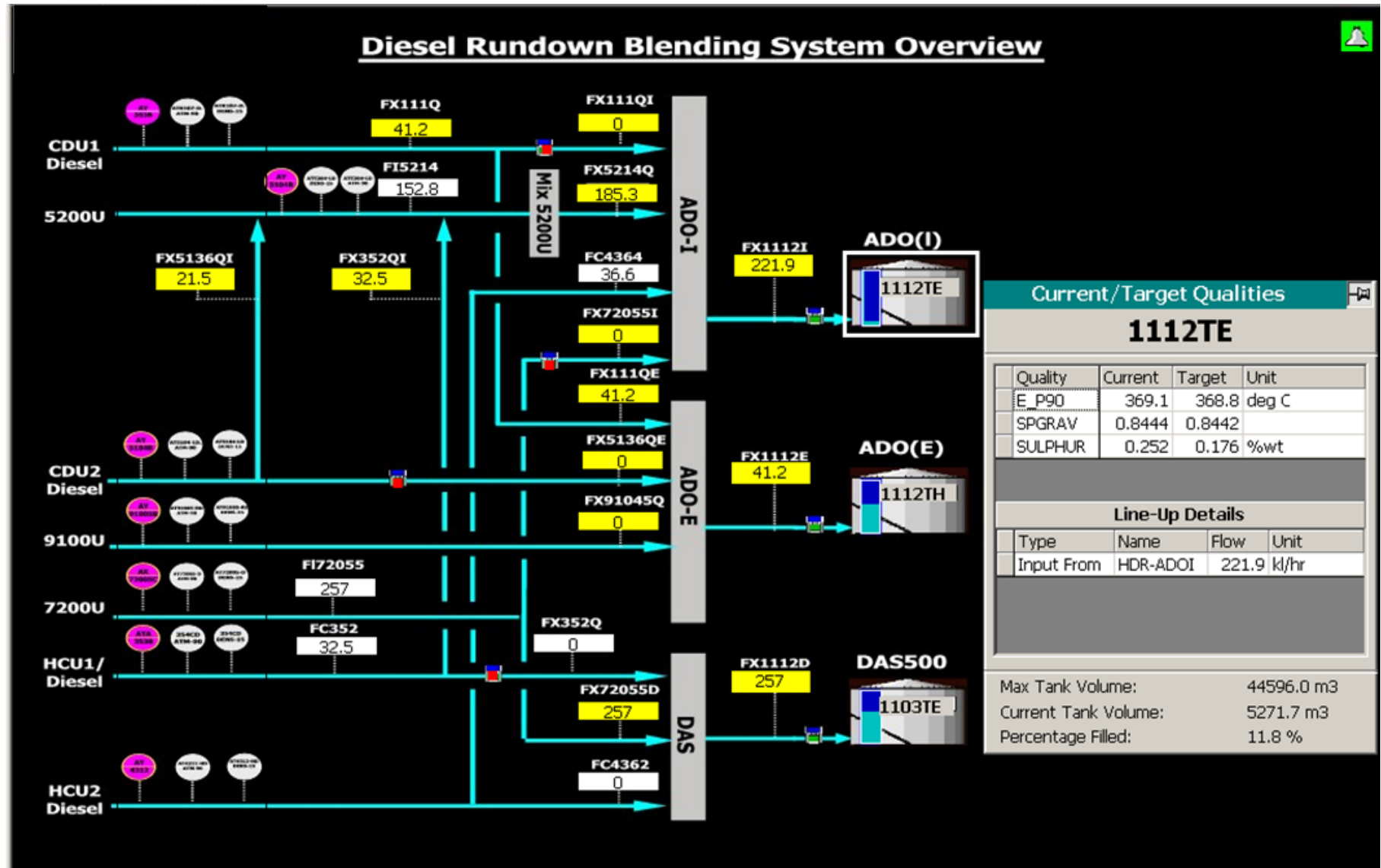
- **Mode**

Run-down to Tanks or Tanks-to-Tank Inline Blending

- **End Uses**

Commercial vehicles, Construction equipments

# Example of Diesel Blending

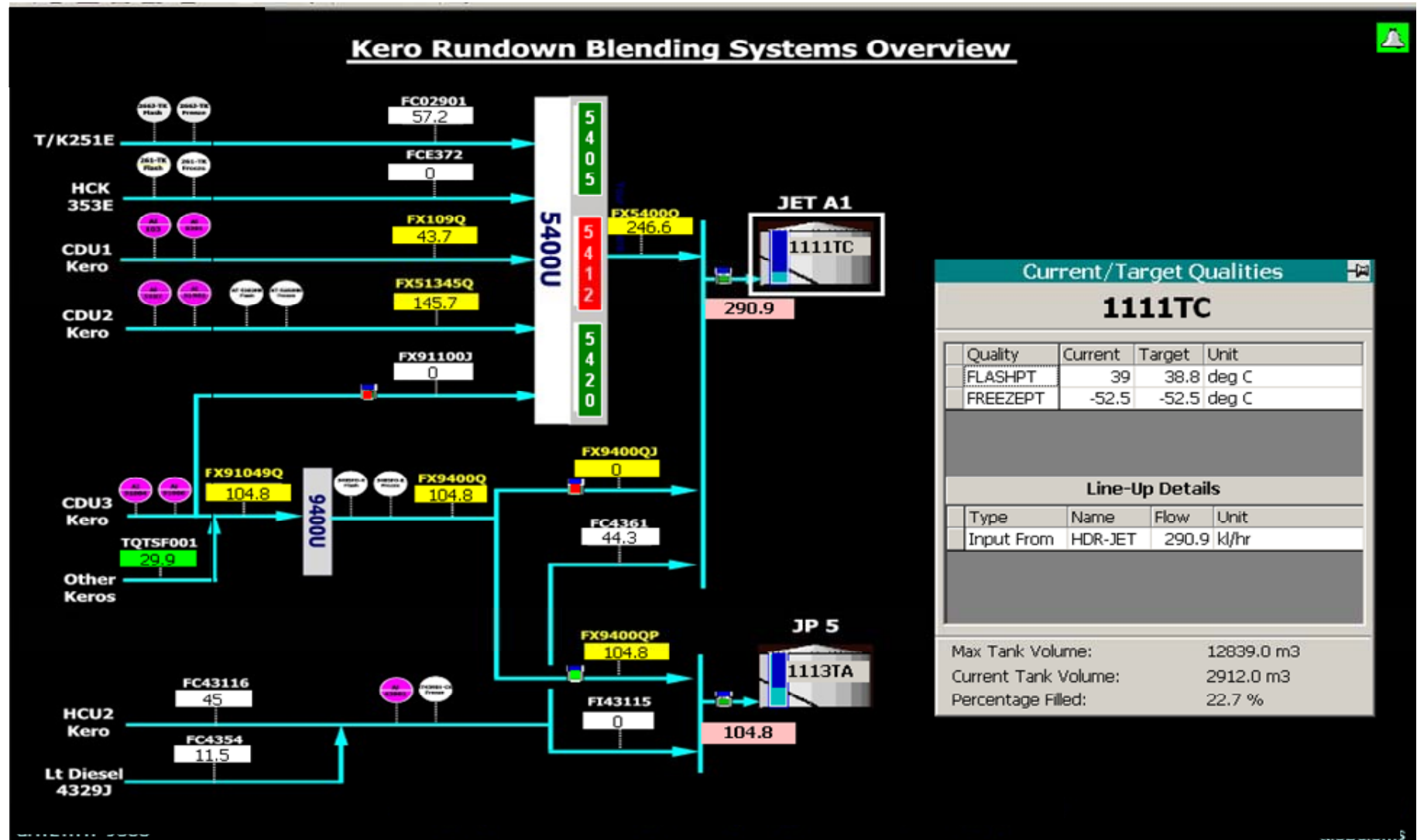


# Kero Blending

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- **Stocks** Usually 3-6 in number, e.g. CDU Kero, Hydrocracker Kero, light Diesel
- **Products** JET and JP products
- **Specifications** Freeze pt, Flash pt
- **Mode** Rundown-to-Tank Inline Blending  
*(Impractical to blend in tank-to-tank mode)*
- **End Uses** Aviation and home fuel

# Example of Kero Blending





# Fuel Oils Blending

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- **Stocks**

Usually 3-6 in number  
Light Cycle Oil (LCO), Slurry,,  
Base Fuel Oil (BFO) mostly from  
Vacuum Distillation Unit

- **Products**

LSFO, HSFO, Marine FO, Bunker  
FO,Boiler

- **Specifications**

Viscosity, API, Sulfur, Flash pt,  
Pour pt

- **Mode**

Tanks-to-Tank Inline Blending  
*(Infeasible to blend in Run-down mode)*

- **End Uses**

**Ships, Boilers, Furnaces**

# Lube Oils Blending

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- **Stocks**

Refined Base Oils (6-9 for a recipe)  
Additives  
Synthetic base Oils

- **Products**

300-400 Grade formulations for all kinds of end uses

- **Specifications**

Viscosity, Insolubles, water, Total base Number (TBN), Salt, Total Acid Number (TAN)

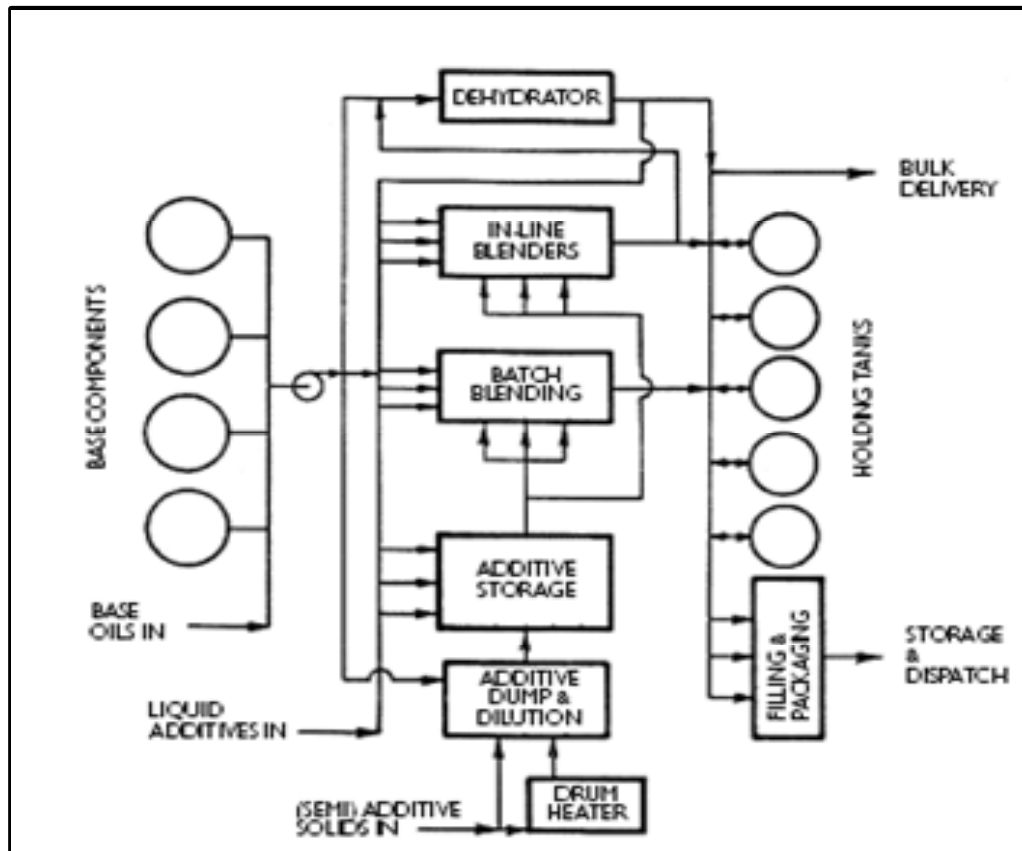
- **Mode**

Tanks-to-Tank Inline Blending  
*(Infeasible to blend in Run-down mode)*

- **End Uses**

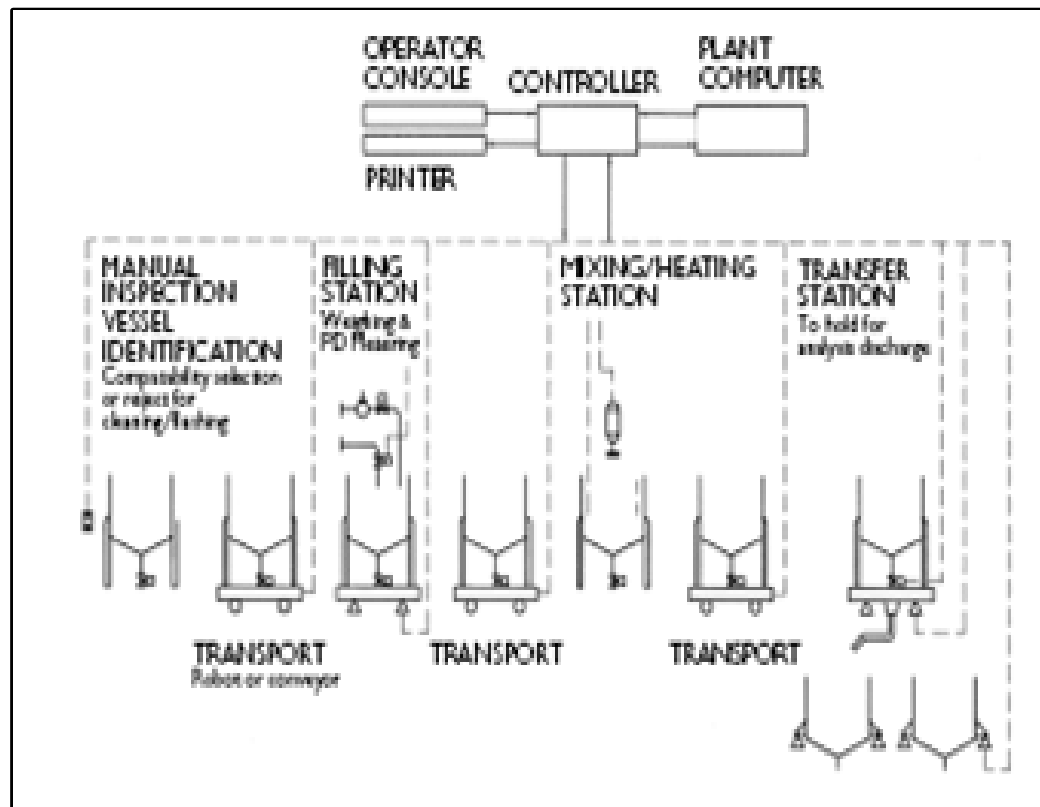
Vehicles, machines

# Example of stationary batch tank Lub inline-Blending



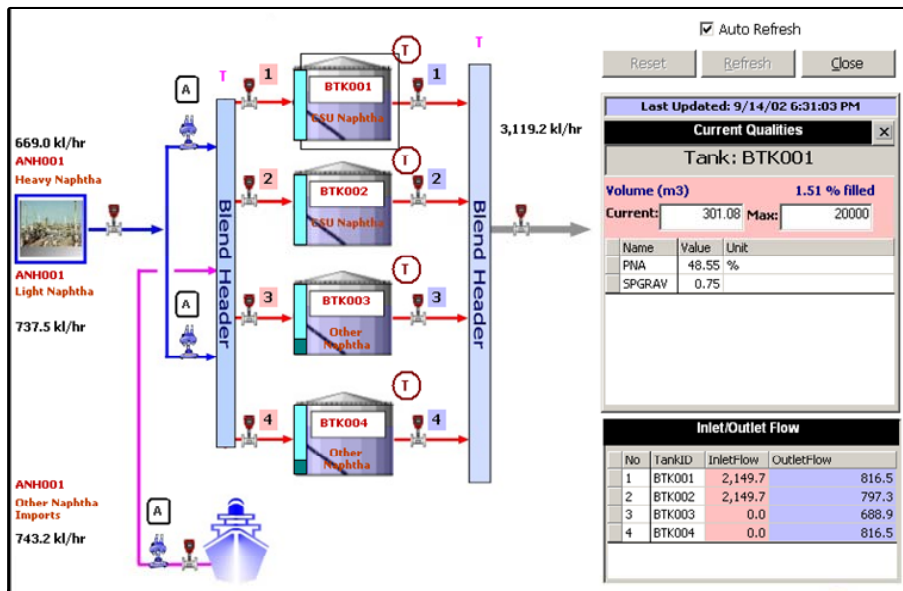
- Large number of formulations 300-400
- Up to 10,000 Batches per year
- Each batch size maximum 2-3 tons or
- Contamination is a big hazard issue
- Inline blender is economical only for lube plant capacity greater than 20,000 Tons/year
- Shorter blending hours
- Can meet product demands quickly as hold time is low
- Batch tank is stationary and requires lots of pipings and control valves

# Example of Moving Batch Tank Lube-inline Blending



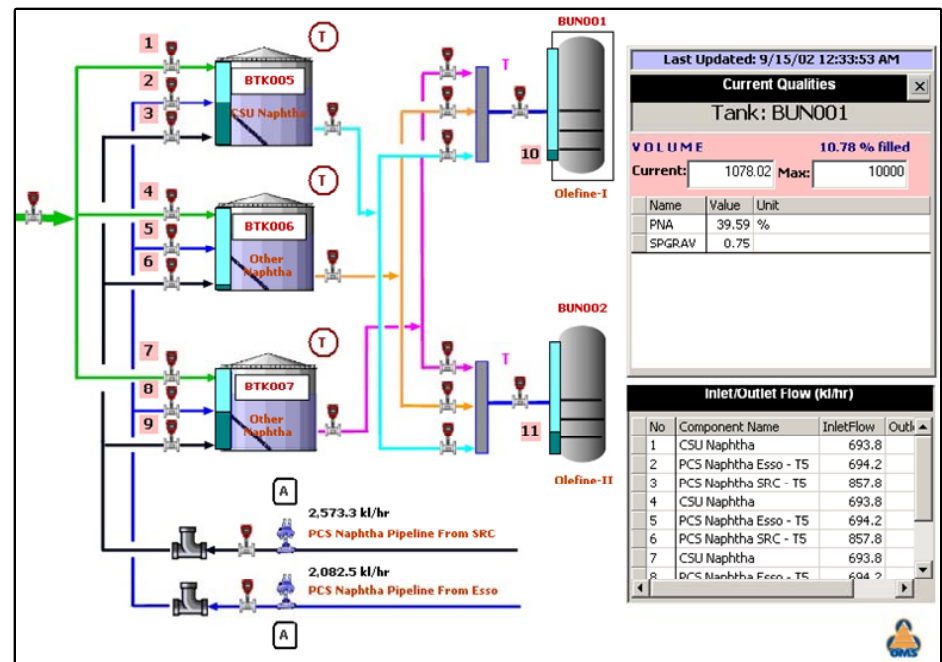
- It has moving batch tank
- Requires less number of pipings and valves
- Reduced labour requirement
- Better quality control

# Naphtha Blending



- Blending of feed tanks to produce a feed of constant density.

- Blending of feed tanks to produce a feed of constant density to process units.



# Summary

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- **Products blending is an important part of refining industry**
- **It offers flexibility to use stocks efficiently to meet product specs**
- **Gasoline blending is complex compared to others.**
- **Lube blending is characterized by large number of batches, formulations and smaller batch size, complex piping and valves**