RJWCS
Oil & Gas Down Stream

An opportunity to fulfill the dynamic Oil and Gas Industry needs

Oil & Gas Down Stream

Economies of Downstream Oil & Gas

Upstream	Midstream	Refining	Primary Distribution	Secondary Distribution	Service Station & Convenience Retailing

Solution scope - mySAP Oil&Gas
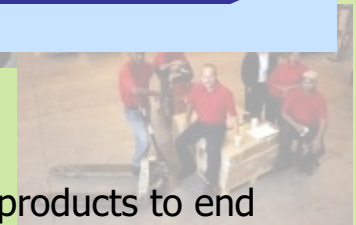
Crude

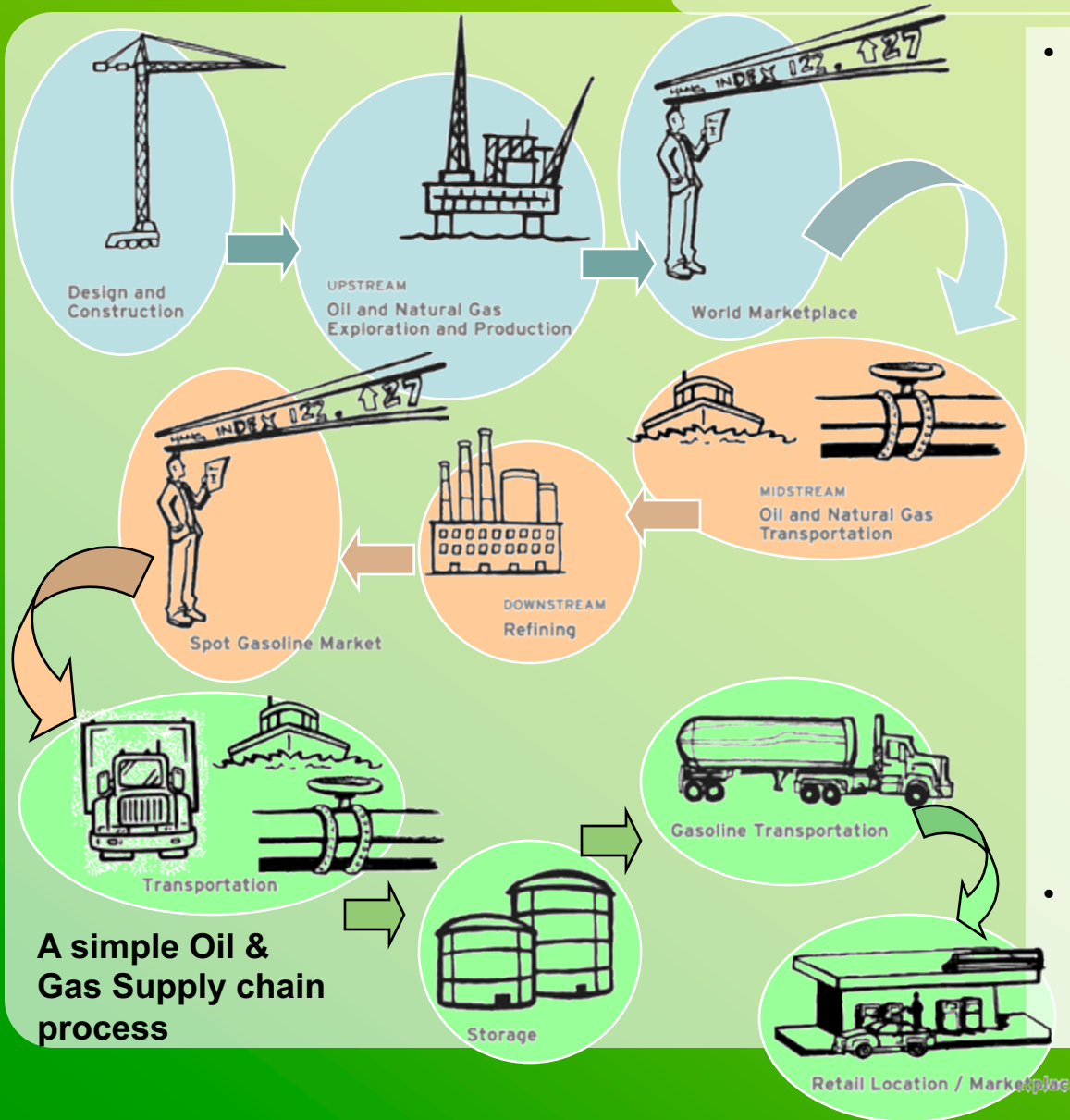**Refined Products & LPG**

Lubes

Natural Gas

Chemicals

- Stretches from major crude oil lifting across the globe and delivering finished products to end consumer
- Includes refining, transportation, storage, trading & distribution activities of the SCM
- Segments include Retail, Aviation, Refining, Lubricants, Fuels, IST, Gas, NGLs & Petrochemicals
- Business functions include HR, Corporate Finance, Legal, Engineering and Admin

Oil & Gas Down Stream

Oil & Gas Supply chain

Design and Construction → **UPSTREAM Oil and Natural Gas Exploration and Production** → **World Marketplace**

Spot Gasoline Market ← **DOWNSTREAM Refining** ← **MIDSTREAM Oil and Natural Gas Transportation**

Transportation → **Storage** → **Gasoline Transportation** → **Retail Location / Marketplace**
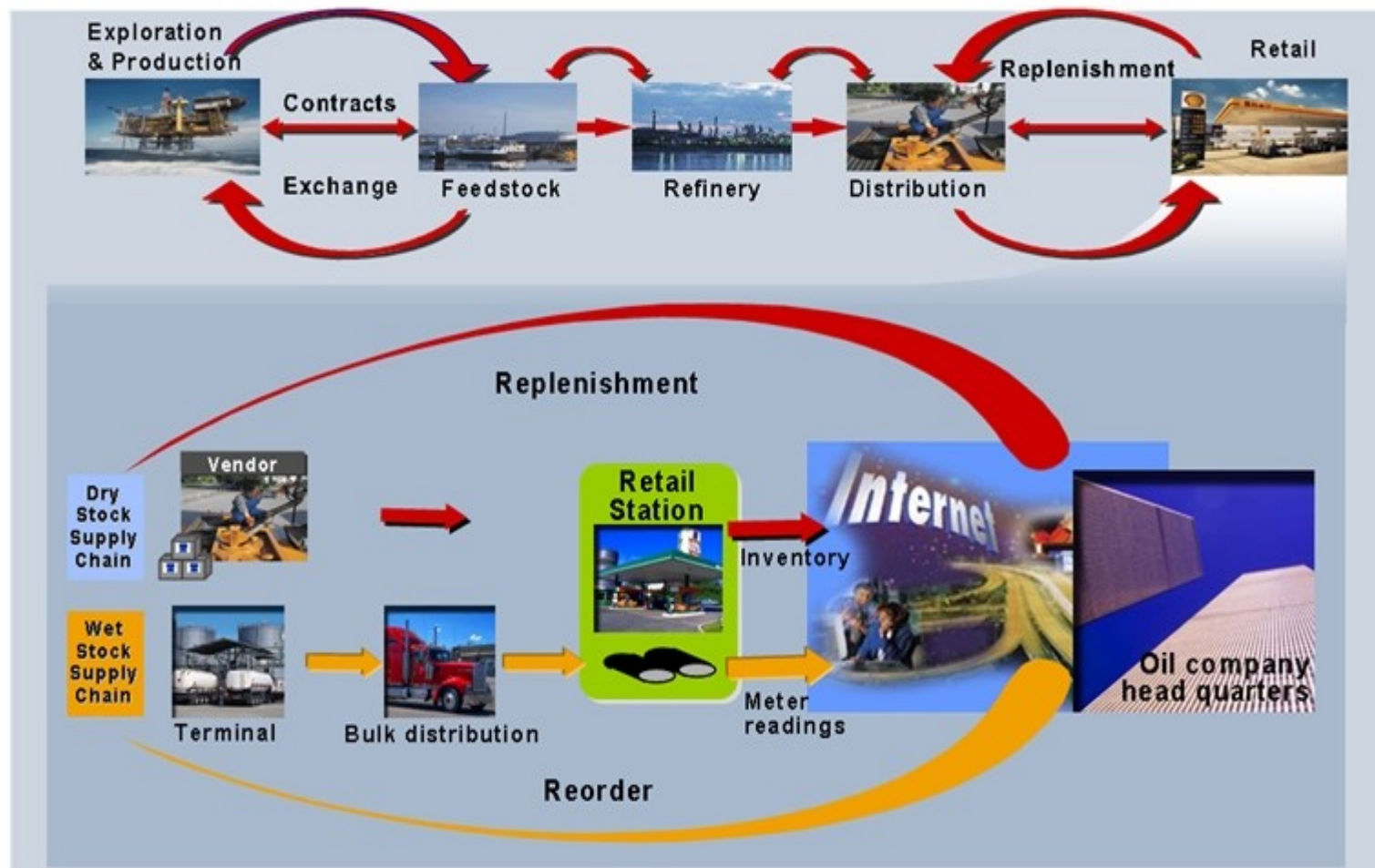
A simple Oil & Gas Supply chain process

- It is the petroleum supply chain that gets your gas to the pumps. Like any supply chain, it has the same source, create and deliver model. But unlike others, the petroleum business involves huge amounts of liquid of varying grades that must be contained and transported to highly involved and interdependent operations that start with raw oil and end with the delivery of numerous finished products -- only one of which is the gasoline that runs your automobile. And in the middle, there's an incredibly complex manufacturing process. Long Supply Chain Unlike Long Supply Chain. Other Parameters:
  - Deciding which crude to buy for refinery
    - Depends on Cost to transport it
    - Products refinery is configured to produce
    - Prevailing volumes and price for product(s) in retail
  - How much it will cost to get the refined product(s) to market
    - Option for trading, swapping and exchanging crude, intermediate products through out the chain
- The situation is exacerbated by a proliferation of regional product specifications, a volatile market, increasing stringent environmental regulations, and constantly changing supply and demand pattern

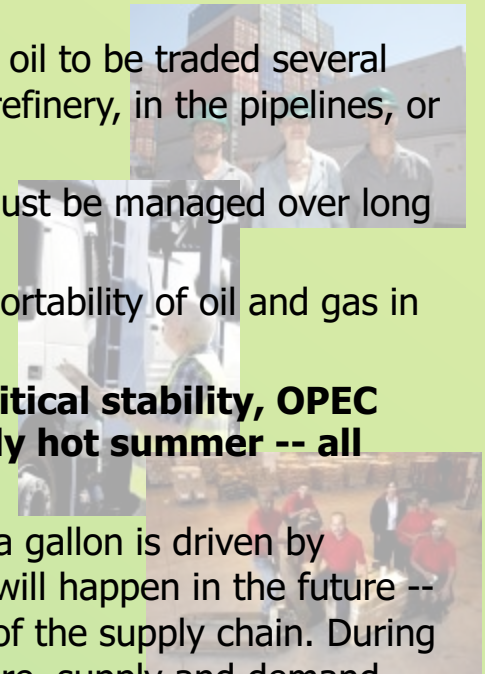## How Oil Industry Supply Chains Drive Gas Pump Prices

Long Supply Chain

Constant Optimizing

Consumer Impacts

Business Constraints

» the price of gas has to do with the costs and profitability of the supply chain, as well as the fact the oil and gas are traded at almost any point throughout it.

» E.g.. It's not unusual for a tanker of unprocessed oil to be traded several times on the ocean. It can also be traded at the refinery, in the pipelines, or at the distribution terminals

» the linkages between raw crude and consumer must be managed over long times -- usually many weeks.

» Despite the oil industry's long supply chain, the portability of oil and gas in effect makes for a shorter supply chain

» This means that **trading considerations -- political stability, OPEC rulings, terrorism, or expecting an unusually hot summer -- all affect the price significantly.**

» In turbulent times about one-third of the cost of a gallon is driven by trading considerations -- or what traders believe will happen in the future -- and two-thirds by the normal costs and margins of the supply chain. During less turbulent times, with a more predictable future, supply and demand trading considerations become much less influential on price
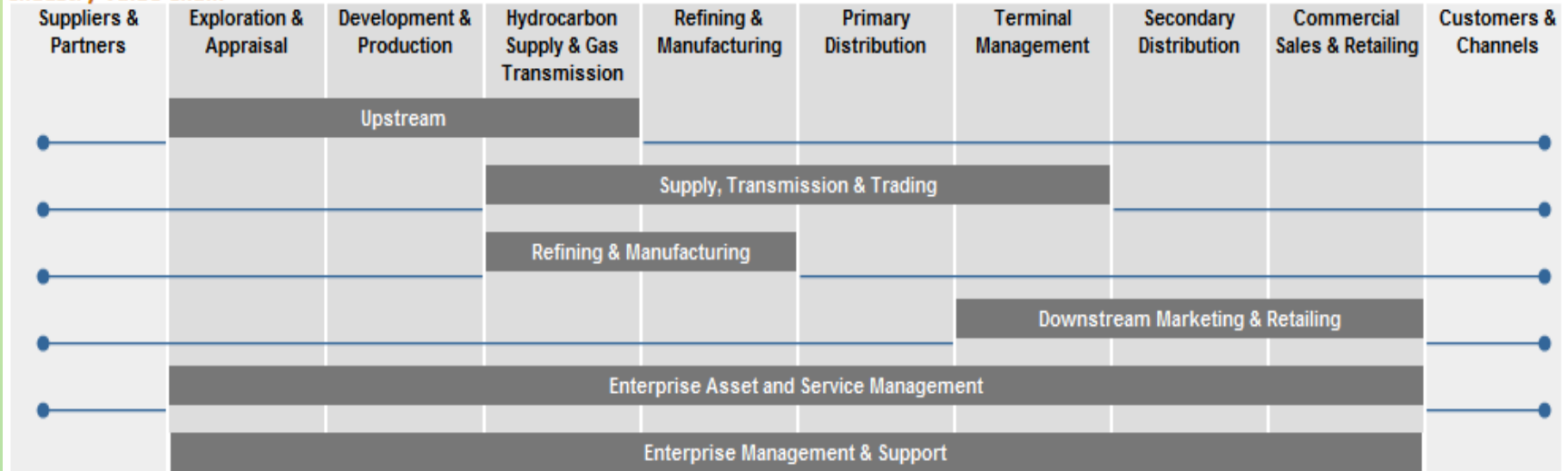
SAP Oil & Gas Solution Map Edition 2007

Industry Value Chain

Suppliers & Partners	Exploration & Appraisal	Development & Production	Hydrocarbon Supply & Gas Transmission	Refining & Manufacturing	Primary Distribution	Terminal Management	Secondary Distribution	Commercial Sales & Retailing	Customers & Channels

Upstream

Supply, Transmission & Trading

Refining & Manufacturing

Downstream Marketing & Retailing
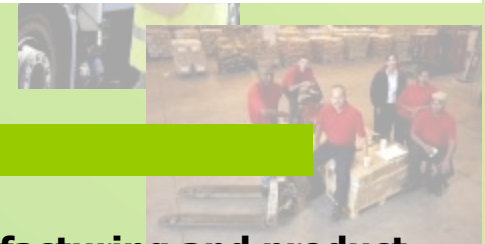
Enterprise Asset and Service Management

Enterprise Management & Support

Raw Material Supply

Manufacturing & Product Optimization

Supply and Distribution

Oil supply chain has three basic areas: **raw materials supply; manufacturing and product optimization; and supply and distribution**. E.g. a Gulf Coast refinery purchasing a tanker for raw crude from Saudi Arabia may wait as long as two months as it crosses the Atlantic. Along the way, companies make production decisions based upon the quality of the resource and the shifting economics of production. <u>SCM helps with the logistics, scheduling and making decisions to buy, sell or trade the cargo.</u>

- **Constant Optimizing**
  - Optimizing the process is not a single event but an ongoing process to continually evaluate the raw materials coming and determining how the fluctuating economics impact the margins for the refinery and others along the supply chain
  - During the manufacturing phase, the value of the materials can change quickly -- requiring decisions to be made about which products can provide the best margin
  - The supply-and-distribution phase is simpler because it is more about scheduling and having the products in the right place at the right time.
- **Consumer Impact**
  - Because the oil business deals with a nonrenewable resource it is ruled by two things -- the classic economic laws of supply and demand and the many physical constraints placed upon it. To be successful, integrated systems, business processes, and collaboration supply-chain-management systems are essential.
- **Business Constraints**
  - The oil business also operates under physical constraints. One of the constraints is that North America refineries have a limited capacity, and it is uncommon that capacity is met, so oil must be bought someplace else to make up the difference.
  - Another constraint is that many more things are made from raw crude than gasoline.
  - Managing these constraints can be made easier through deployment of SCM techniques.
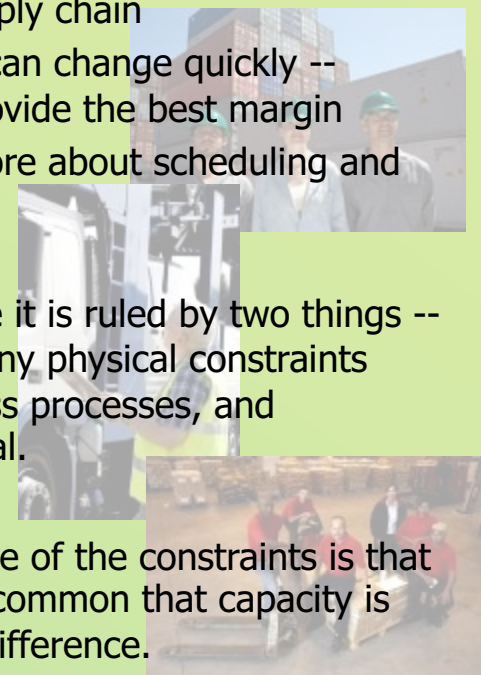
» The emphasis of companies has changed from **cost control** to **margin improvements**

Legend:
- Margin Improvements
- Cost Control

Past   **Present**   **Future**
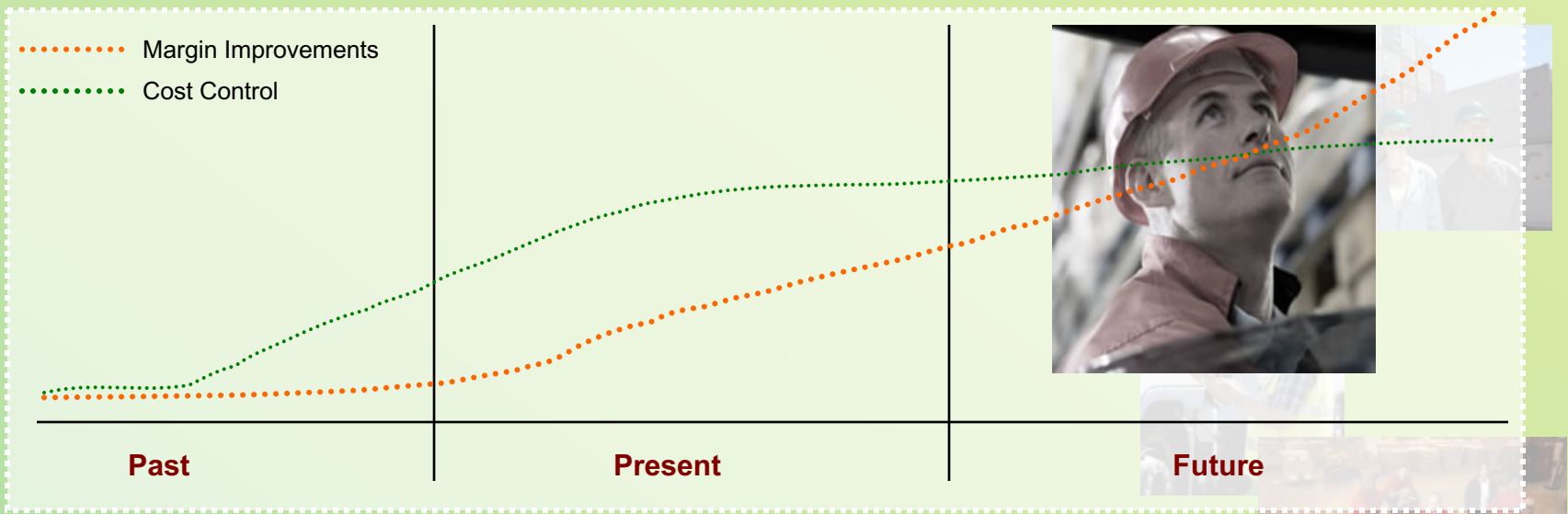
- Capital investment needs remain high to meet tighter product quality specifications
- Margins remain inadequate to support major investment in new grassroots facilities
- Fuel retailing margins have been less volatile, but vary significantly from country to country, depending on the local competitive dynamics
- Crude price fluctuations and availability become more dynamic in the recent past
- Asian countries growing at 8 % compared to less than 2 % in developed nations
- Oil Sands and other marine sources become viable due to increase in crude prices

Success Factors in Refining…

» Refining Competitiveness Criteria

PARAMETERS   → KEY OBJECTIVES
•Size   → To capture economy of scale
•Complexity   → Upgrade low value products
•Location   → Access to local deficit markets
•Integration   → Synergies with Adjacent Facilities

- Access to Feedstock Dynamics and Feedstock dynamics
  - » Refining, Size and complexity help, but good Location is essential
  - » Golden rule applies.. He who has "low-cost" feedstock makes profit
  - » Trading of Crude and NGLs with other E&P partners
  - » Inventory of feed-stock at Refineries & demand management
  - » Overall efficiency of the Supply chain plays a major role in meeting the continuous Demand
- Access to Technology
  - » Profit opportunities exist for companies who can…

    …Make effective buy vs. make vs. trade decisions

    …Can leverage market dynamics by using their physical asset (refineries, terminals, pipelines, trucks, ships and barges) to effectively seize market opportunities.
  - » The result of the dynamic market patterns and the cited requirements is a tightening of the integration among refining operations, engineering, supply, trading, distribution and marketing functions within an Oil company which can be achieved through technology
- Access to (Right) Market
  - » In a global context, market coverage becomes increasingly important

    …The leaders have significant market and product coverage

    …Companies with narrow global focus are at a disadvantage

POSITIONING
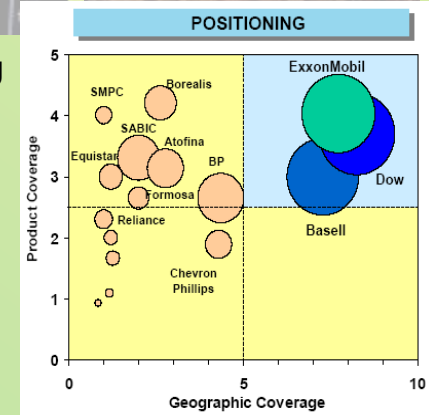
RJWCS
Oil Industry domain specialists

RJWCS's panel of consultants involvement with key players in the Oil industry sector
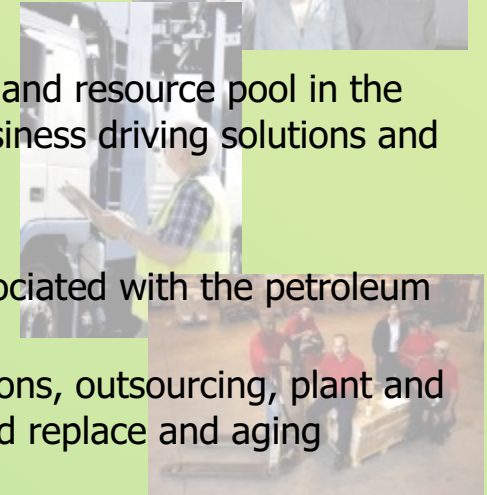
- Who are we?
  - We represent RJWCS's initiative to leverage expertise, knowledge and resource pool in the Industry, to identify where this domain is headed and develop business driving solutions and capabilities.
- Our Focus is:
  - Provide operational excellence and improving work processes associated with the petroleum supply chain
  - Support cost reduction strategies (including mergers and acquisitions, outsourcing, plant and asset sales and closures, distribution center consolidation etc.) and replace and aging population of obsolete finance, accounting and HR systems.
- Oil & Gas Domain
  - Over 60+ Trained and working practitioners available in India
  - We are getting to further expanding the resource pool within this domain

Oil & Gas Template

RJWCS's initiative to create a demo/template structure as proof of concept

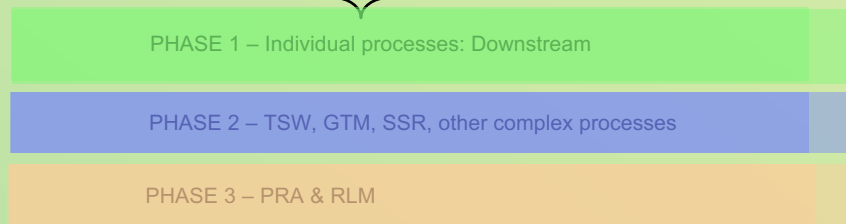| Upstream | Midstream | Refining | Primary Distribution Network | Secondary Distribution Network | Service Station Retailing |

PHASE 1 – Individual processes: Downstream

PHASE 2 – TSW, GTM, SSR, other complex processes

PHASE 3 – PRA & RLM

May'07 Jun'07 Jul'07 Aug'07 Sept'07 Oct'07 Nov'07

PHASE 1   PHASE 2   PHASE 3

Upstream		TSW/GTM		IS-OIL	
Prod. Rev Acc.	Remote Logistics Management	Inventory planning	Ticketing, Allocations and Events	Financials (MAP)	Movements
Joint Venture Accounting		Supply/Demand Balancing	Interfaces to partner Systems (e.g. Trading)	Exchanges and Terminalling	Transport & Distribution
		Movement and Capacity Scheduling	Acquire Trade and Sell	Contracts / Orders MCOE	Taxes and Duties (TDP)
		Full nomination process handling		Inventory (HPM, SILO, QCI)	Cross Application components

▪ ▪ ▪ ▪ ▪ Standard IS-Oil Functionality

Oil & Gas Down Stream

Phase 2

Upstream	TSW/GTM	IS-OIL

Upstream:
- Prod. Rev Acc.
- Remote Logistics Management
- Joint Venture Accounting

TSW/GTM:
- Inventory planning
- Ticketing, Allocations and Events
- Supply/Demand Balancing
- Interfaces to partner Systems (e.g. Trading)
- Movement and Capacity Scheduling
- Acquire Trade and Sell
- Full nomination process handling

IS-OIL:
- Financials (MAP)
- Movements
- Exchanges and Terminalling
- Transport & Distribution
- Contracts / Orders MCOE
- Taxes and Duties (TDP)
- Inventory (HPM, SILO, QCI)
- Cross Application components
- Service Station & Convenience Retailing
- Standard SAP PM
- Standard SAP QM

▪ ▪ ▪ ▪ ▪ Implement TSW/GTM/IS Oil SSR Module

Upstream		TSW/GTM		IS-OIL	
Prod. Rev Acc.	Remote Logistics Management	Inventory planning	Ticketing, Allocations and Events	Financials (MAP)	Movements
Joint Venture Accounting		Supply/Demand Balancing	Interfaces to partner Systems (e.g. Trading)	Exchanges and Terminalling	Transport & Distribution
		Movement and Capacity Scheduling	Acquire Trade and Sell	Contracts / Orders MCOE	Taxes and Duties (TDP)
		Full nomination process handling		Inventory (HPM, SILO, QCI)	Cross Application components

Service Station & Convenience Retailing

Standard SAP PM

Standard SAP QM

Integrated end-to-end Is oil Template for a small scale oil industry

Oil & Gas Down Stream

Process Overview - Supply

Upstream	Acquire, Trade & Sell (GTM)	Exchange & Throughput Handling	Scheduling (TSW)	Inventory Management	Primary Distribution & Transport	Secondary Distribution & Transportation
T B D	Inquiry/Quotation Management	Exchange Agreements	Nomination Management	Inventory Valuation & Transfer Pricing	Deliveries to Partners	Terminal Management
	Purchase & Acquisition	Terminalling / Throughput Agreements Handling	Freight Contract Management	Oil/Gas Quantity Conversions	Location Receipts	Terminal Automation Systems
	Sales	Processing Agreements	Bulk Scheduling	In-Transit Stock Handling	Terminal Automation Systems	Balance Vehicles/Compartment Allocation
	Pricing		Transport Availability and Compatibility	Consignment Stock	Carrier Performance Tracking	Vehicle/ Compartment Optimization
	Spot Trades	Fee Handling/ Repricing	Compartment Planning	Accounting for Commingled Stock	Handling of Transit & Regulatory Documentation	Re-branding & Blending
	Deal Capture	Exchange Balance Reporting	What-If Scheduling Simulations and Proposals	Accounting for Losses & Gains	Freight Cost Handling	Oil/Gas Quantity Conversions
	Open Position Reporting	Exchange Transaction Notification	Partner Schedule & Nomination Handling and Tracking	Silo/Tank Management	Export Handling	Gain & Loss Handling
	Contract History Tracking	Settlement/Netting of Exchange Agreements & Reconciliation	Berth / Dock Scheduling		Ticket Processing & Forwarding	Dispatch & Route Planning & Optimization
	Taxes & Tax Reporting		Contract Scheduling and Allocation		Ticket Quantity Allocation	Freight Cost Handling
	Third Party Trading System		Pipeline Batch Scheduling	Inventory Planning and Scheduling	Measurement Comparison	Fleet Management
			Scheduler Worklist	Location Balancing	Laytime Calculation and Demurrage Assessment	Handling of Transit & Regulatory Documentation
					Transport Performance Tracking	Replenishment Planning
						Export Handling

Index
- **Phase 1** (green)
- **Phase 2** (blue/purple)
- **Phase 3** (peach)
- **Not used** (yellow)
- **In Progress** (pink)

Upstream	Manufacturing Process	Batch Manufacturing	Blending & Packaging	Product Quality Management
T B D	Process Control and Advanced Process Control	Batch Management	Re-branding	Product Quality Standards & Testing Procedures
	Equipment Performance - Monitoring not implement PM and QM)	Recipe Management	Blending	Sample & Analyze Products
	Turnaround Planning	Material Management	Packaging – not dealt with LPG	Maintain Documentation & History
	Yield Monitoring – Development through ABAP .	Manufacturing Execution	Formula maintenance & Optimization	
	Refinery Financial Accounting & Analysis – Part of PRA module	Lot Sizing– not using refining and marketing company will not use		
	Material Movement Control (Tank Farm Management)			

Process Overview Service Station & Convenience Retailing

Convenience Retailing	Fuels Management	Site & Headquarter Accounting	Business Analysis & Reporting

Index

- Phase 1
- Phase 2
- Phase 3
- Not used
- In Progress

- **Refining, Marketing & Supply**
  - Crude procurement using TD
  - Inventory Management & SILO Management
  - Sale of finished goods
    - » Time Pricing
    - » FA Pricing
    - » G/N rule Pricing
    - » DRC Pricing
    - » Invoice Cycles
  - Bulk Transport & Shipment Costing
  - Exchanges - B/S,B/L and Terminalling
  - Stock Transfer from Plant to Plant
  - Online Blending Scenarios using TD
  - Manufacturing
    - » Crude receipt with Automatic Batch Valuation
    - » Crude & Finished Goods issue
    - » Blending Using CO Production Order
    - » BOM & Recipe management (implementation in process)
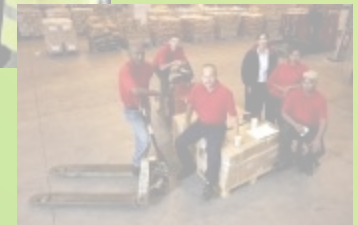
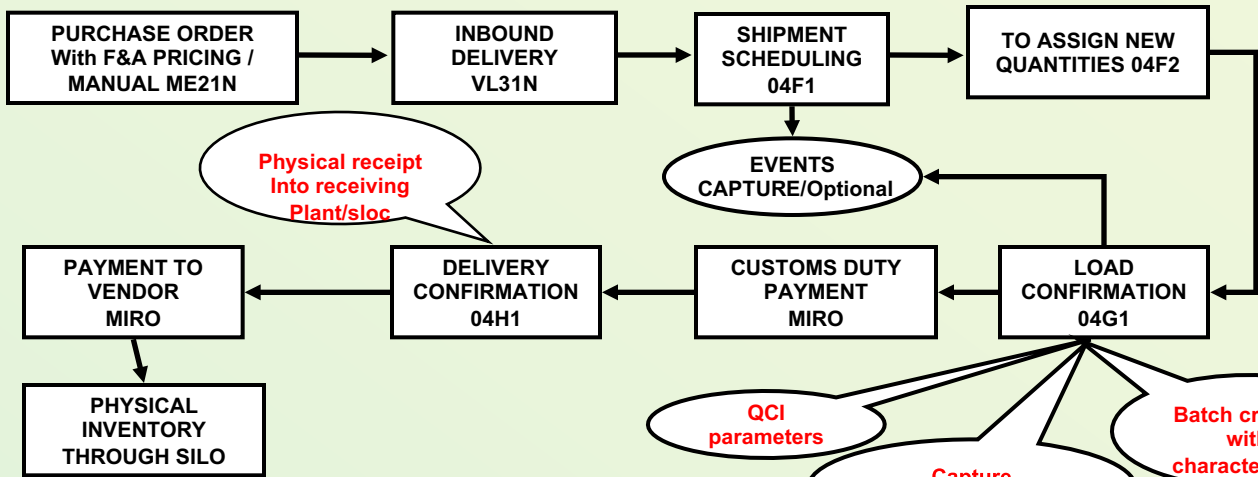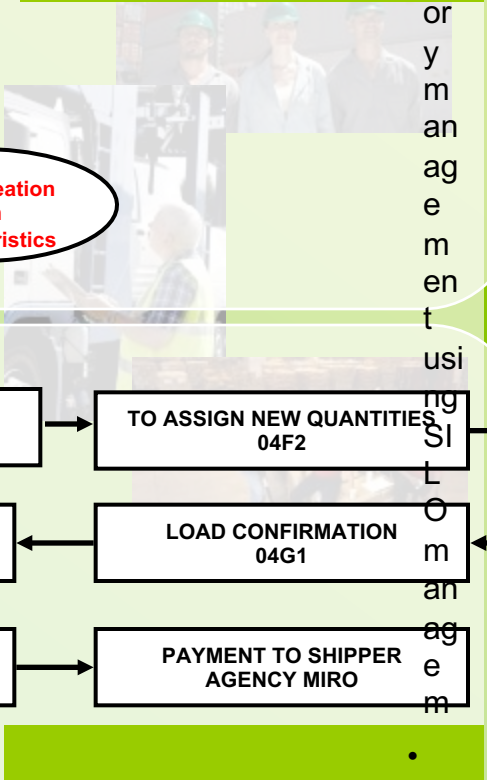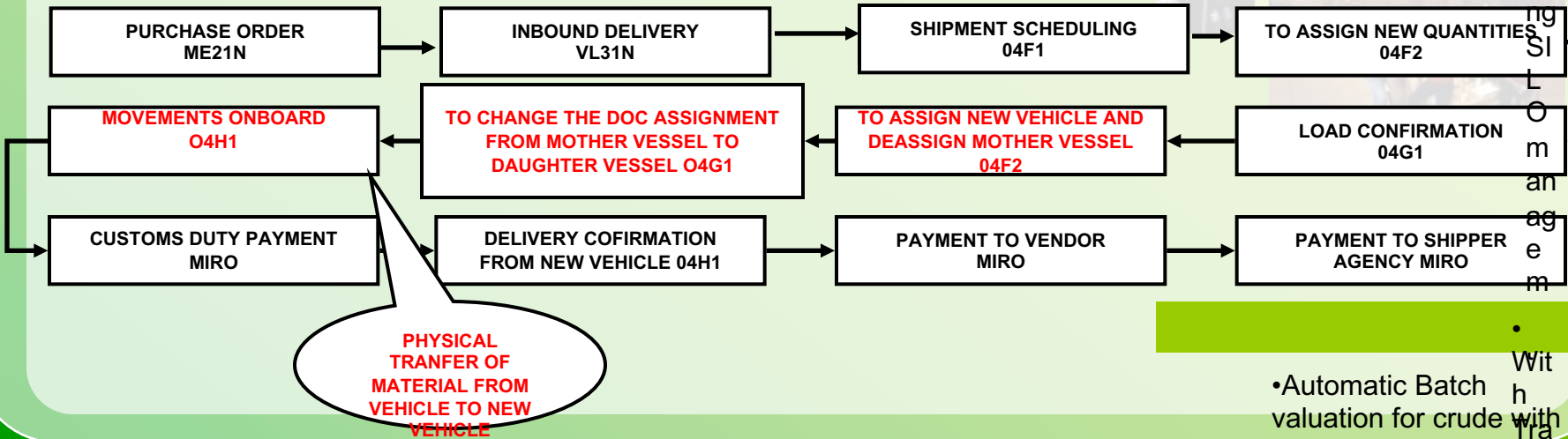- **Special Processes Covered**
  - Trans-shipment : Trans-shipment of Cargo from mother vessel to daughter vessel
  - Measurement Capturing : From loading storage location gauge to tank gauge as well as ship/vessel gauge
  - Automatic Batch valuation : for crude with Classification (demo)
  - Use of Business Add-ins and BAPIs : In SILO Management to capture of Tank Inventory Management activities.

Oil & Gas Down Stream

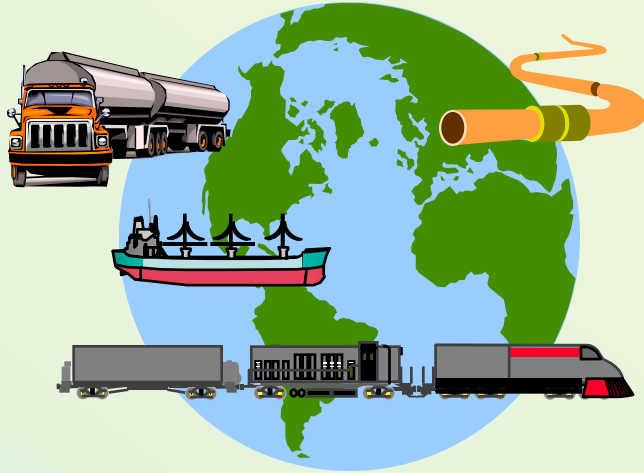## Crude Procurement cycle from Purchase order to Invoice verification using TD

PURCHASE ORDER With F&A PRICING / MANUAL ME21N → INBOUND DELIVERY VL31N → SHIPMENT SCHEDULING 04F1 → TO ASSIGN NEW QUANTITIES 04F2

SHIPMENT SCHEDULING 04F1 → EVENTS CAPTURE/Optional

Physical receipt Into receiving Plant/sloc

PAYMENT TO VENDOR MIRO ← DELIVERY CONFIRMATION 04H1 ← CUSTOMS DUTY PAYMENT MIRO ← LOAD CONFIRMATION 04G1

PAYMENT TO VENDOR MIRO → PHYSICAL INVENTORY THROUGH SILO

QCI parameters

Capture measurements (Optional)

Batch creation with characteristics

PURCHASE ORDER ME21N → INBOUND DELIVERY VL31N → SHIPMENT SCHEDULING 04F1 → TO ASSIGN NEW QUANTITIES 04F2

MOVEMENTS ONBOARD O4H1 ← TO CHANGE THE DOC ASSIGNMENT FROM MOTHER VESSEL TO DAUGHTER VESSEL O4G1 ← TO ASSIGN NEW VEHICLE AND DEASSIGN MOTHER VESSEL 04F2 ← LOAD CONFIRMATION 04G1

CUSTOMS DUTY PAYMENT MIRO → DELIVERY COFIRMATION FROM NEW VEHICLE 04H1 → PAYMENT TO VENDOR MIRO → PAYMENT TO SHIPPER AGENCY MIRO

PHYSICAL TRANFER OF MATERIAL FROM VEHICLE TO NEW VEHICLE

- Inventory management using SILO management
- With Transshipme

•Automatic Batch valuation for crude with Classification

Bulk transportation processing refers to the shipment of materials ...

From vendor to plant ➡ **inbound shipments**

From plant to customer ➡ **outbound shipments**

From plant to plant ➡ **shipments for transfers**
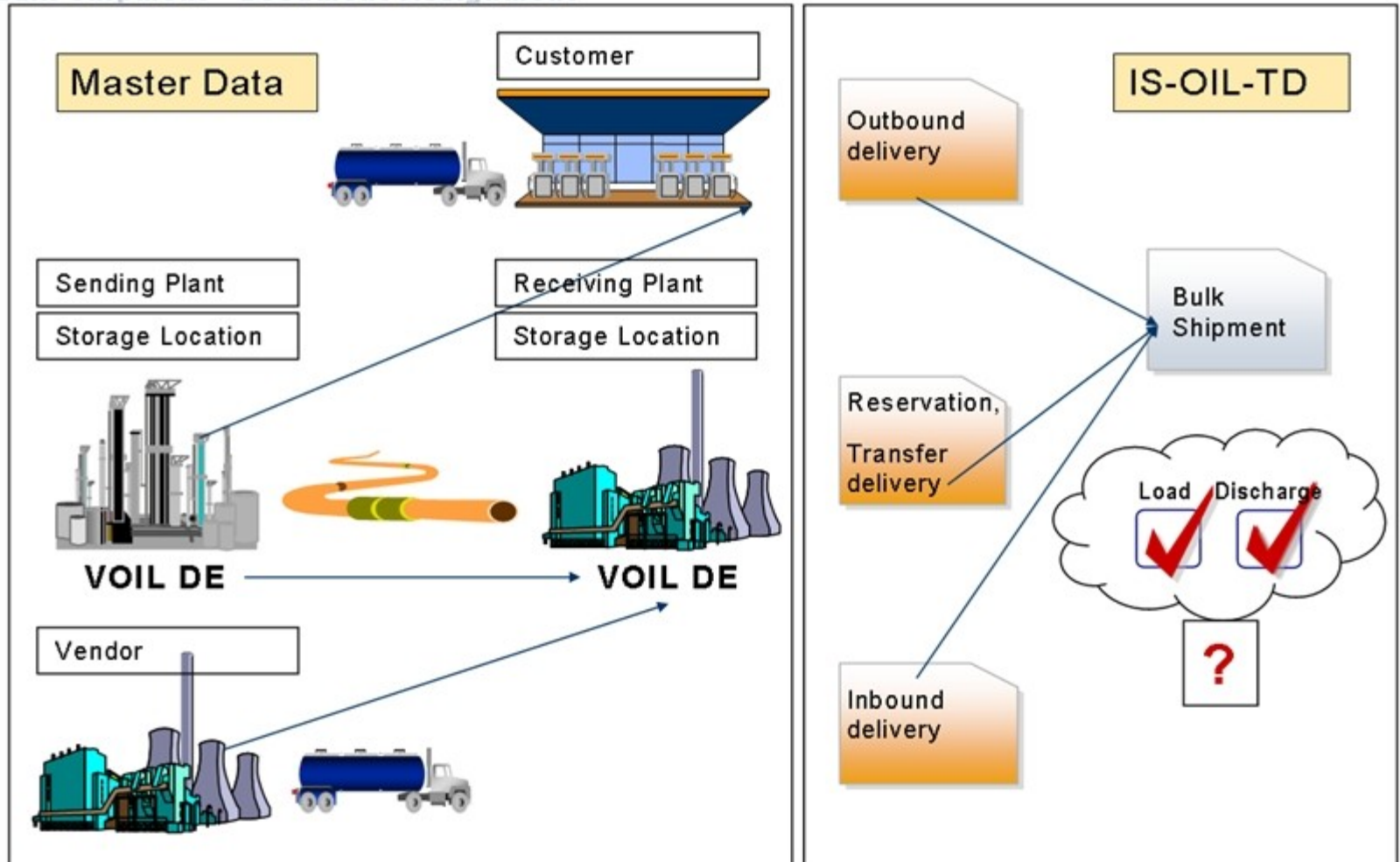
From plant or vendor to ... from ... to ... ➡ **combined shipments**

Bulk Shipment

Oil & Gas Down Stream

Bulk shipment - Flow

Scheduling

Loading

Delivery

Deliveries Shipping Notifications, or Reservations

Assign underlying documents to vehicles

Load vehicles from schedules

Record delivery of shipment

Vehicle / Ship

Route

(Confirmation)

(Confirmation)

Bulk Shipment

Carrier

Bulk Shipment – Compartment Planning

Load   **Discharge**

Outbound delivery

Regular   12000 l
Super   4000 l
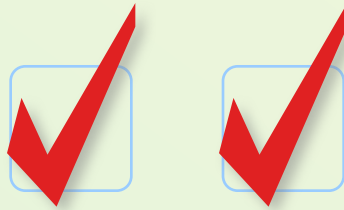
6000 l Regular   **6000 l Regular**   **4000 l Super**

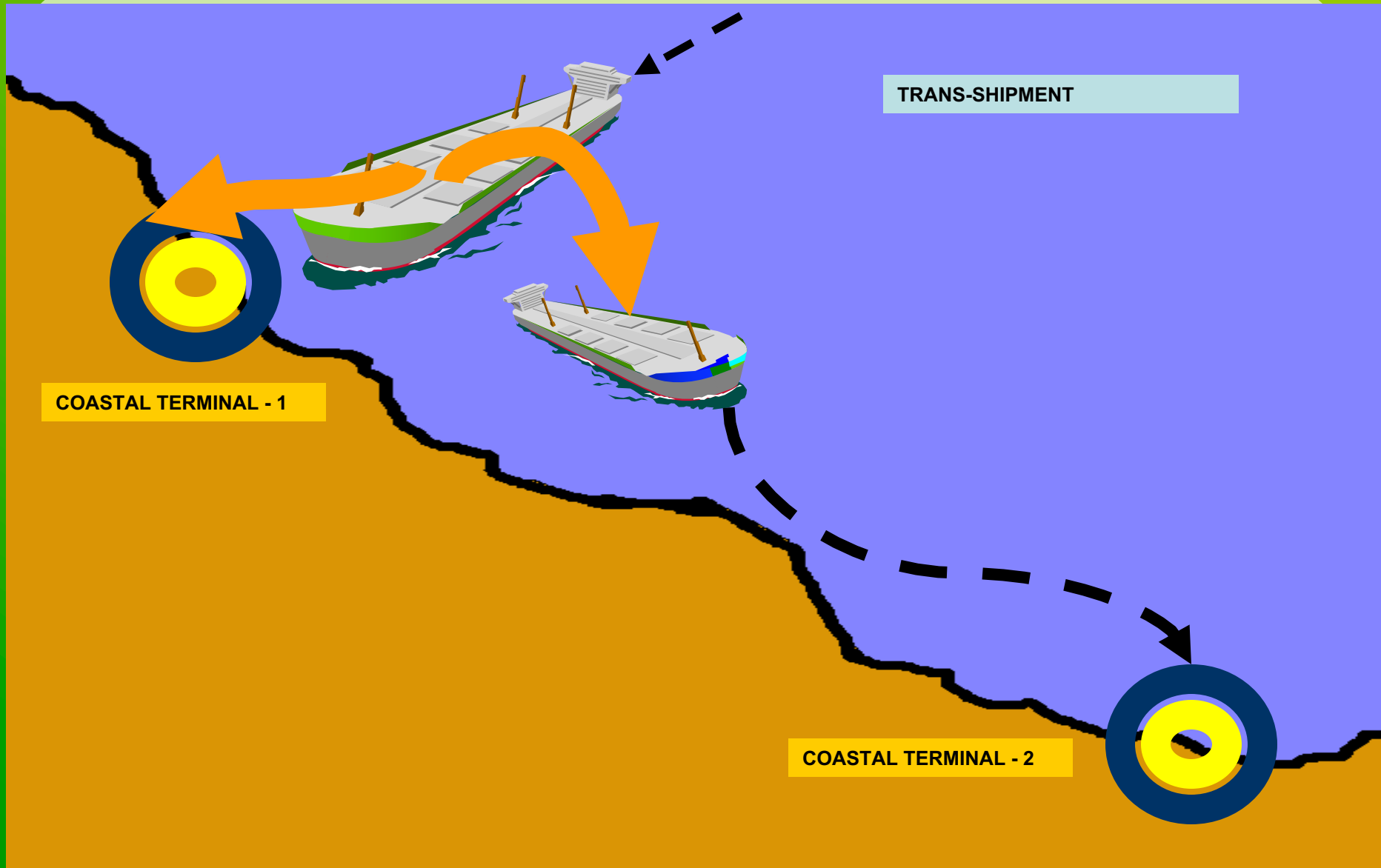**Compatible?**

Checks:

- **Minimum volume compartment?**
- **Maximum volume compartment?**
- **Maximum weight transport unit?**
- **Maximum weight vehicle?**
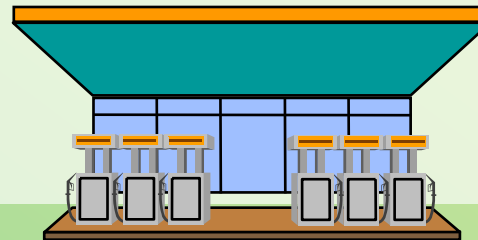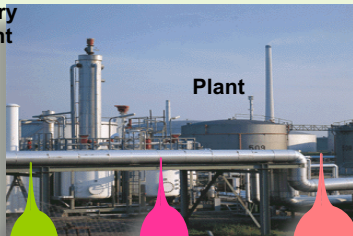
Compatible?

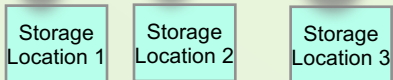Oil & Gas Down Stream — Transshipment

TRANS-SHIPMENT

COASTAL TERMINAL - 1

COASTAL TERMINAL - 2

R/3 Inventory Management

Plant

Diesel   **Gasolin**   **SKO**

1. Take Dip Reading
2. Enter Tank Dip Reading
3. Strapping Table/Linear to Volume

| Storage Location 1 | Storage Location 2 | Storage Location 3 |

| TAXED | UNTAXED | OWNED | OMC |

Assignment of Material Stock to Silo/Tank

Tank A   Tank B   Tank C   Tank D

Tape

Insulation

Ullage/ Outage

Tank courses

Floating   Roof

Product dip height

Product Volume

Innage

Unpumpable Quantity
Water dip height
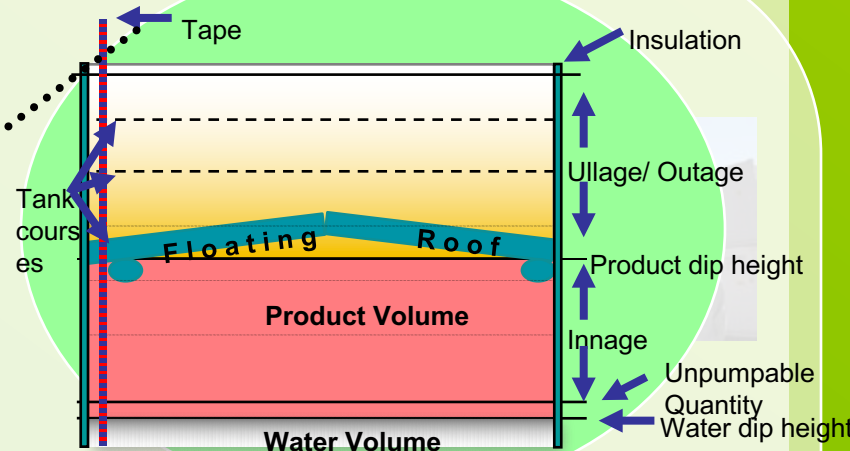
Water Volume

Strapping Table/Linear to Volume

Height	Volume per height	Volume at height
(mm)	(L/mm)	(L)
		124.085
10	1.596,500	140.050
250	1.631,279	531.557
400	1.641,140	777.728
...	...	...

Total volume   **Water volume**

Analysis Report

Gain/Loss Analysis

Pl...	St..	Seq no.	Date	Time	Uni	DipDiff	MvmtDiff	TotMvmtDipDiff
GP05	G5L	Tank 128	01.06.2003	00:09:00	L15	0	0	0
			. . .					
			. . .					
			30.06.2003	21:09:05	L15	3.884.444	4.024.800	140.356
			30.06.2003	23:59:00	L15	140.356-		0

- During order creation one can specify, if over-delivery or under-delivery is allowed and if so, by what percentages. Within this tolerance the dispatcher can decide to deliver more or less of the specified product to the customer.
- Within TD the additional capability exists to change quantities during scheduling, loading and delivery confirmation.
- Check is present to ensure the delivery is within the specified tolerance.

Sales and Distribution (SD)

Transport and Distribution (TD)

Sales
- Inquiry
- Quotation
- Sales Order
- Pricing
- Availability Check

Shipping
- Delivery
- Picking
- Packing

Transport
- Transport
- Bulk Transport

Scheduling

Loading Confirmation

Delivery Confirmation

Inquiry → Quotation → Contract

Contract → Sales Order → Delivery

Delivery → Shipment [Scheduling]

Shipment [Scheduling] → Print Filling Advice Note / TAS Interface

TD Cycle is used for all Bulk products and has the following functionalities:

- Shipment forms a part of the cycle where in shipment costs can be calculated.
- Facilitates compartment planning.
- Checks the vehicle capacity and compatibility.
- Checks the mode of transport to Shipment type.

Shipment [Scheduling] → Load Confirmation

Load Confirmation → Delivery Confirmation

Load Confirmation → Billing Document

Delivery Confirmation → Shipment Cost

Transportation Payments

Shipment Cost

Inventory Updation

Inventory Updation

Billing Document → Output

Exchange Operations - Introduction

Exchange Agreement

Exch. Partner — VOIL

Exch. Partner — Vendor&Customer
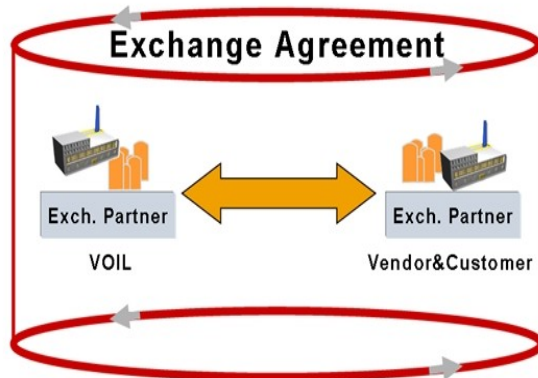
Exchange Scenario for Deliveries

VOIL — Exchange agreement — Exchange partner — Goods receipt

Physical goods flow — Sales contract

Customer of exchange partner — Order — Delivery — Goods issue
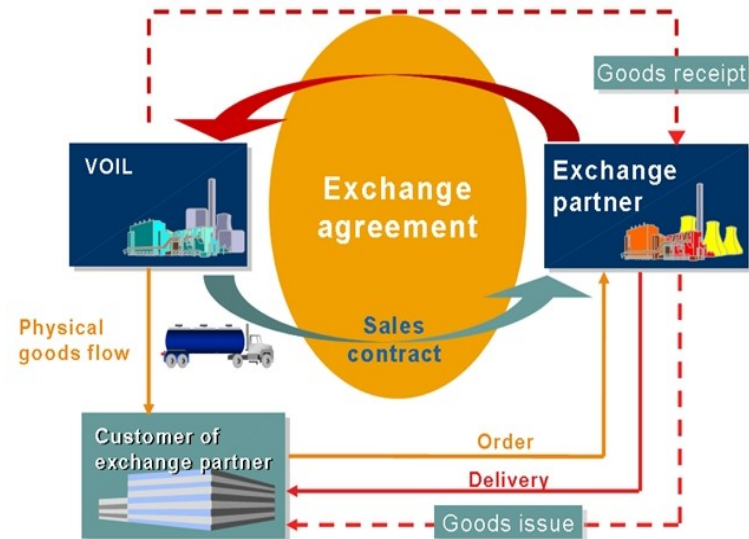
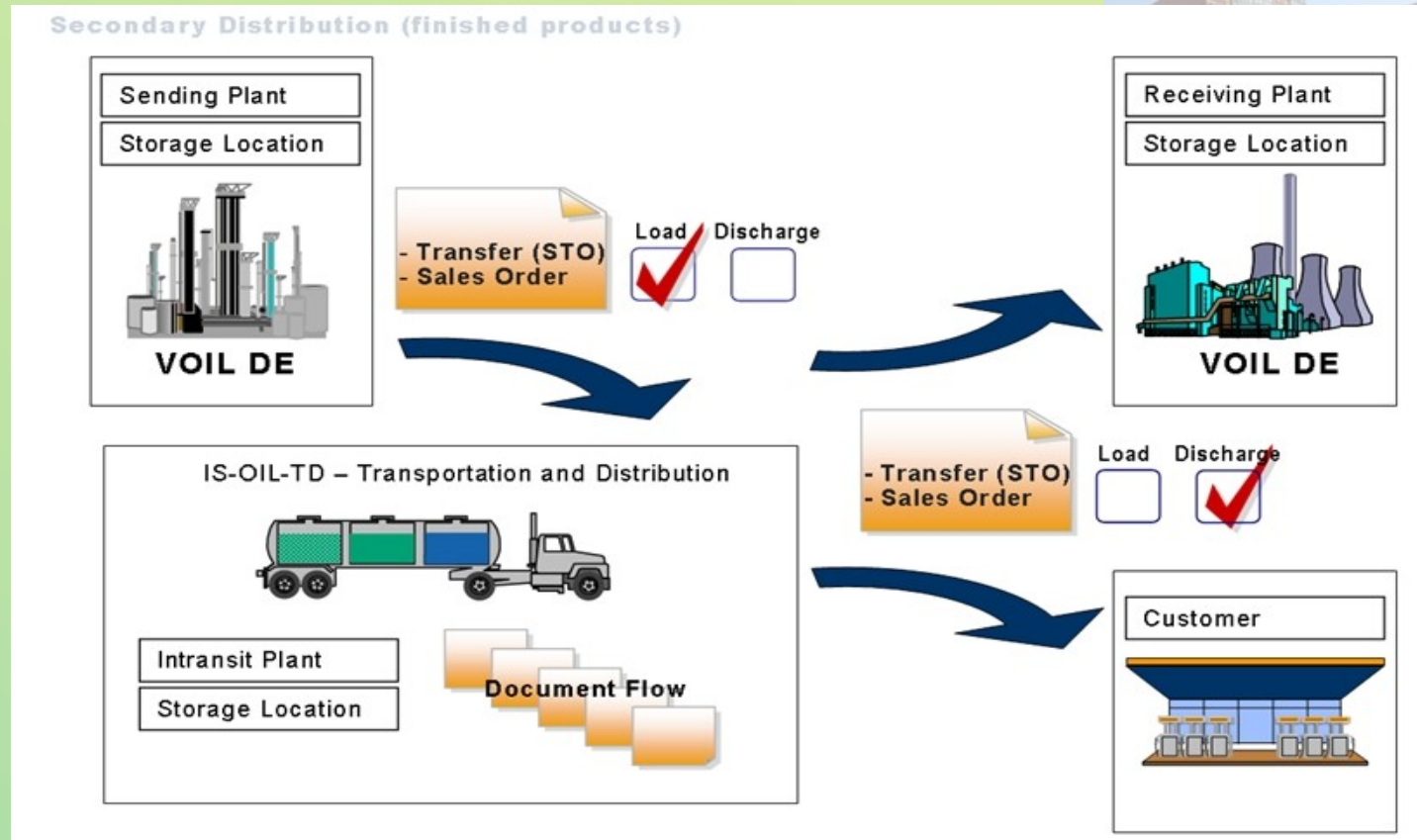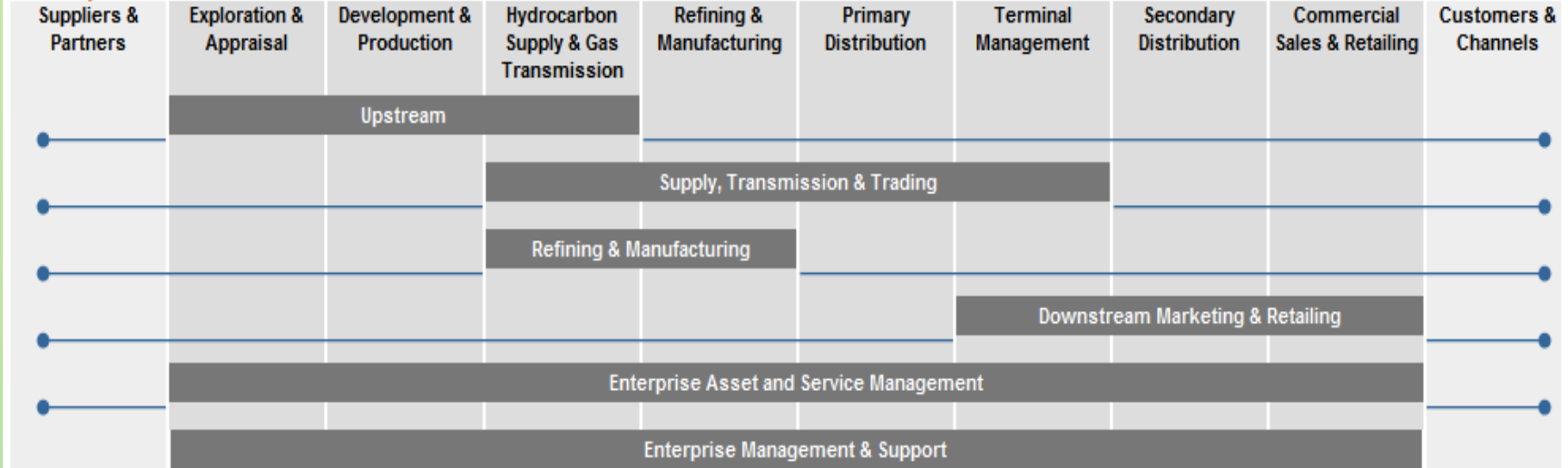**Business Constraint :** The oil business also operates under physical constraints. One of the constraints is that North America refineries have a limited capacity, and it is uncommon that capacity is met, so oil must be bought someplace else to make up the difference.

Solution : Use Exchange Functionality

Secondary Distribution (Finished Products)

The supply-and-distribution phase is more about scheduling and having the products in the right place at the right time.

Industry Value Chain

Suppliers & Partners	Exploration & Appraisal	Development & Production	Hydrocarbon Supply & Gas Transmission	Refining & Manufacturing	Primary Distribution	Terminal Management	Secondary Distribution	Commercial Sales & Retailing	Customers & Channels
	Upstream								
			Supply, Transmission & Trading						
		Refining & Manufacturing							
							Downstream Marketing & Retailing		
	Enterprise Asset and Service Management								
	Enterprise Management & Support								

Raw Material Supply
- Crude procurement Cycle with and without Transshipment
  ‣ Inventory management using SILO management
  ‣ Automatic Batch valuation for crude with Classification

Manufacturing & Product Optimization
- Silo Management

Supply and Distribution
- TD Cycle
  ‣ Shipment
  ‣ Facility Compartment Planning

Venaktesh Etta Govindharajulu and Aldrin Babu
IS Oil domain consultant, SAP.SD, Global business services

Highlights: Total 14 yrs of Domain experience. 9 yrs in SAP and 4 yrs in IS Oil. Worked as Functional Consultant and Independently handled Depot and Terminal Operations in IOCL. Supported 8 Countries for Shell Oil Products (SOPE), Good knowledge in IS OIL Downstream process. In Depth Knowledge of Business Process like Depot sale , Terminal sale and Refinery.