Dynamic Vessel Monitoring System

Presented by
Pradeep Gupta
Adani Ports and SEZ Limited
## Contents

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adani Group</td>
</tr>
<tr>
<td>2</td>
<td>PIMS</td>
</tr>
<tr>
<td>3</td>
<td>Dynamic Vessel Monitoring System (DVMS)</td>
</tr>
</tbody>
</table>
The Adani Group

Leading Business Conglomerate with interest in diversified sectors...

Resources

Sourcing hydrocarbons from around the world to fuel India’s growth

Logistics

Owning a large network of ports, railways, ships and operate various facilities around our ports

Energy

Leading player in private sector power generation

- Coal Mining
- Oil & Gas Exploration
- Coal Trading
- Multi Modal Logistics
- Ports
- Special Economic Zones
- Gas Distribution
- Power
- Bunkering
- Grain Silos & Fruits
- Edible Oil
Adani Group has 3 listed companies:

- Adani Enterprises Limited (AEL)
- Adani Power Limited (APL)
- Adani Ports & SEZ Limited (APSEZ)
Helping India build Port Capacity

- Adani initially started its first port at Mundra location. Later on it has aggressively added new Indian & Overseas ports to its portfolio.
- Adani Ports is targeting to achieve the mammoth figure of 200 million MT per annum Indian cargo handling by 2020
- In the last fin year Adani Ports (India) handled over 90 Million MT of cargo

<table>
<thead>
<tr>
<th>Indian Ports &amp; Terminals</th>
<th>Location</th>
<th>Year of Operations (expected)</th>
<th>Existing Capacity</th>
<th>Planned Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adani Mundra Port</td>
<td>Mundra, Gujarat</td>
<td>1998</td>
<td>165</td>
<td>240</td>
</tr>
<tr>
<td>Adani Petronet (Dahej) Port Pvt. Ltd</td>
<td>Dahej, Gujarat</td>
<td>2010</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Adani Abbot Point Terminal Pty Ltd</td>
<td>Australia</td>
<td>2011</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Adani Hazira Port Private Ltd.</td>
<td>Hazira, Gujarat</td>
<td>2012</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Adani Mormugoa Coal Terminal Pvt. Ltd.</td>
<td>Goa</td>
<td>(2013)</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Adani Vizag Coal Terminal Pvt. Ltd.</td>
<td>Vizag, Andhra Pradesh</td>
<td>(2013)</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Adani Kandla Bulk Terminal Private Ltd.</td>
<td>Kandla, Gujarat</td>
<td>(2014)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td><strong>Total Capacity (Million MT)</strong></td>
<td></td>
<td></td>
<td><strong>260</strong></td>
<td><strong>469</strong></td>
</tr>
</tbody>
</table>
APSEZ: Unparallel Operational Expertise

**Pilotage & Towage**
- 20 tugs & master mariners
- 13 Dredgers for Capital Dredging across ports

**Internal Transportation**
- >580 kms of Conveyor Systems
- >120 kms of private roads
- >80 kms Railway Sidings

**Berthing**
- 22 Bulk Berths
- 8 Container Berths
- 2 Single Point Moorings

**Storage**
- 1 mn sq. mtrs of Warehouses
- 400 mega liters Liquid Tank Farms
- 12.5 Hectares of Back up yard for containers

**Cargo Handling**
- Bulk Handling: 185 MTPA
- Containers: 5.25 MnTEUs
- Crude Handling: 50 MTPA
- Fully Mechanized Cargo handling terminals

**Evacuation**
- 150 kms of private railway line
- Pipelines over >1,000 kms
- 3km airstrip at Mundra
Today and 2020

- **Coal Mining**
  - 2020: 200 MMT
  - 2012: 2 MMT

- **Coal Trading**
  - 2020: 100 MMT
  - 2012: 36 MMT

- **Power Generation & Transmission**
  - 2020: 20000 MW
  - Current: 4620 MW

- **Ports & Logistics**
  - 2020: 200 MMT
  - 2012: 78 MMT

- **Integrated Business Model**
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<th></th>
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Introduction to PIMS

• PIMS is a tool to achieve ‘Operational excellence’ by optimizing production in real time
• Integration of applications like Oracle, SQL server based and intelligent automation systems onboard Conveyors & Cranes
• PIMS allows the evaluation of system and operator performance
• Provide client tools for better trending, handling complex calculations
• PIMS will be consisting of two main areas:-
  ✓ Integration of equipment information
  ✓ Reports / dashboards
PI Components used in PIMS

- PI Asset Framework
- PI Clients- PI Combo (PI Processbook & PI Datalink)
- PI RDBMS Interface
- PI OPC Interface
- PI Notification
- PI Web Clients
- PI Modbus Serial Interface
- PI ACE
- PI PSA
## Project comprised integration of

- Coal conveyor system
- Hopper system
- Bagging system
- Mobile harbor and yard cranes
- Fuel management system
- GPS

- Liquid terminal automation
- LOCO
- Stacker / reclaimer
- Wagon and truck loading system
- SAP reports integration
- Reports using SSRS

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![Diagram](image)

1. **Data Source**
2. **Interface Node**
3. **PI Server**
4. **Client PC**
High level system architecture
## Contents

1. Adani Group
2. PIMS
3. Dynamic Vessel Monitoring System (DVMS)
Need for DVMS

To face lot of challenges in today’s market with increase in customer expectations, stiff competition and reduced margins. On top of that, there are some complex operations, which need of a robust Supply Chain Management (SCM) solution which will help Adani Ports to

- Real time control of multi-cargo port operation
- Enhanced visualization: To bring hidden delays on surface in entire supply chain process
- Reduce the port operating cost by usage of optimum resource as per productivity needs
- Advanced analysis platform for performance comparison
Objective

• To provide holistic visualization of the entire supply chain in Dry bulk and break bulk operations, which indicates the overall process, key resources involved and productivity / discharge rate
• Area of weakness in the supply chain can be identified on real time basis
• To reduce resources in the stronger links with an aim to reduce the operating cost
• DVMS system integrated with PI system and other applications like APMS, GPS and FMS system
Integrated Central Control Objective

Plan
1. Planning and scheduling
2. Resource allocation

Actual (Do)
1. Real-time operational data
2. Operation monitoring

Integrate Central Control (Check)

Data Based Decision Making (Act)
1. Real time Analysis Planned vs actual
2. By productivity, Schedule & cost

Real-time Data Capture During Operations
- Vessel
- Stevedoring
- Jetty-storage (internal transit)
- Storage
- Storage to rake
- Rake operation
- Evacuation
Integrated Central Control Objective

Real-time Variance Analysis
- Planned vs. actual
- Estimate future productivity to completion vs. actual trending earned productivity to completion
- Estimate future cost vs actual trending cost to budgeted cost at completion

Data Based Decision making
- Rectify actual operation within the planned threshold, by schedule, Productivity & cost
- Perform the role of portfolio management to port vessels operations
- Rebalance vessel supply chain line by allocation of resources (Equipment + labor)
Dynamic Vessel Monitoring System

Basic Architectural Design of DVMS Operates at 2 Levels

Control System Layer
- PLC Data
- HMI Data
- PI Historian
- OPC Server

Operational System Layer
- APMS
- Biz Talk Server
- PIMS
- GPS
DVMS System architecture
Dynamic Vessel Monitoring System

DVMS is an integrated tool for monitoring the overall vessel and for balancing the line of supply chain. The supply chain in a dry cargo operation comprises of the Shore cranes / vessel cranes, Hopper, Dumpers / Trailers / Conveyors and Back up equipments.

**Crane**
- It shows active number of system
- Crane data – productivity, reflect

**Hatch**
- Hatch number along with
- DVMS will show number of that of a vessel

**Resources**
- The total number of shown beneath the figure

**Dumper**
- Number of dumpers and total along with last hour productivity

**Conveyor**
- In case, supply chain has a conveyor belt will be visible
- Productivity per hour reflect placed on it

**Yard**
- As per the allocation the back the system
- Number of available back up
Scenarios Overview

**Bulk Cargo**

- Case 1: Vessel -> Shore Crane -> Hopper -> Dumper -> Yard -> Excavators & Loaders

- Case 2: Vessel -> Shore Crane -> Hopper -> Jetty -> Loader -> Dumper -> Yard -> Excavators & Loaders

- Case 3: Vessel -> Shore Crane -> Hopper -> Conveyor -> Dumping Point -> Loaders -> Dumper -> Yard
Dynamic Vessel Monitoring System

**Case 1:** Vessel → Shore Crane → Hopper → Dumper → Yard → Excavators & Loaders

Vessel Name: MV CENTRANS LUCKY
Capacity: 64500.1700
Cargo: COAL

Total Operation Hours: 15

16/06/2013 15:42:31

![Diagram of vessel and shore crane operations](image-url)
Dynamic Vessel Monitoring System

Case 2: Vessel -> Shore Crane -> Hopper -> Jetty -> Loader -> Dumper -> Yard -> Excavators & Loaders
Case 3: Vessel > Shore Crane > Hopper > Conveyor > Dumping Point > Loaders > Dumper > Yard
Benefits: Dynamic Vessel Monitoring System

- Better Vessel Planning, Equipment Allocation as well as Yard Planning to increase in profit margin
- Actual Vs Plan productivity in real time basis to Identification of process bottlenecks
- Optimum equipment deployment based on the per ton handling cost
- Advanced analysis platform and enhanced visualization for decision making
- Consolidated data availability of each vessel in entire port and base for Inter port Knowledge sharing for cost optimization
THANK YOU