Digital Trunked Radio Communication System for the Refinery Complex of Reliance Industries Ltd at Jamnagar, INDIA

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Agenda

• Introduction to Reliance
• Telecommunication Usage at Reliance Refinery
• Choosing the Technology
  – Why TETRA was chosen?
• Way Forward
Introduction - Reliance (Petrochemicals)

EXPLORATION & PRODUCTION | OIL | GAS | PETRO-CHEMICALS | LOGISTIC & MARITIME | RESEARCH & TECHNOLOGY

Upstream
Exploration - Production
- Drilling Platforms
- Offshore / Onshore wellheads

Midstream
Transport and Process
- Pipelines / Transportation

Downstream
Refining, Marketing, Distribution
- Petro-Chemical Plants

OTHER Companies
• Reliance Retail
• Reliance Life Science
• Reliance Textiles

Reliance Group
The Reliance Group, founded by Dhirubhai H. Ambani (1932-2002), is India's largest private sector enterprise, with businesses in the energy and materials value chain. Group's annual revenues are in excess of US$ 58 billion. The flagship company, Reliance Industries Limited, is a Fortune Global 500 company and is the largest private sector company in India.
Typical Oil & Gas Operations and Activities

* Exploration & development
* Drilling/Extraction
* Production
* Transportation
* Refining
* Storage
* Distribution

Exploration | Treatment | Distribution | Consumption
---|---|---|---

Pipe for Gas
40 - 100 km (typical)
Pipe for Oil

Separation

Wellhead Site

Wellhead

Storage

Oil level

Typical Oil & Gas Operations and Activities
# A Complete Oil & Gas Communication Solution

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<th>Requirement</th>
<th>Example</th>
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<td>Flexible and scalable</td>
<td>To meet varying upstream, midstream and downstream communications requirements</td>
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<td>Efficient communications</td>
<td>Efficient group call capabilities required for maintenance, control room, production, safety and security staff</td>
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<td>Reliability &amp; system availability</td>
<td>Always available communications enhances staff safety. High resiliency, reliability and availability are key factors for communication</td>
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<td>Data communications</td>
<td>Integrated voice &amp; data. Remote wellhead, reservoir and pipeline monitoring as well as people and vehicle location tracking</td>
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<td>User environment &amp; interface</td>
<td>Need for rugged, intrinsically safe devices to work in hazardous working environments</td>
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<td>Operations and maintenance</td>
<td>Cost effective solutions to manage the network and minimise downtime during upgrades</td>
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Requirement of Voice Communication that Enables Efficient Operations

**Group Call**
Highly efficient one-to-many conversation, fast call set-up by pressing talk button only

**Individual Call**
GSM like one-to-one full duplex conversation

**Telephone Call**
Enabling full duplex communication with landline or cellular phones - usage can be configured individually

**Emergency Call**
Easy accessible emergency button - emergency calls have highest priority

**Priority Call**
Range of features to ensure the success of key, priority calls

**Announcement Call**
Enabling calls to be made to multiple groups
Typical Radio Communication in Reliance Refinery

• Radio communications is typically around 3-5 km radius wide area. Most are using VHF analog radios dating back to the early 90’s.

• Radio communications used for communication between different plant operation teams

• Radio communications used for communication between Refinery control room, plant control room and plant on-field teams

• Radio communications used for communication between Jetty operation team and control room/plant operation teams
Getting Started

• In 2008, Reliance Industries Limited initiated migration towards digital radio network in place of the conventional analogue radio communication system for its refinery and petrochemical complexes located at
  – Jamnagar, Dahej, Hazira, Nagothane and Patalganga.

• Planned to have 13 base stations in total and more than 3,500 terminals.
Selection of Technology

• After a careful review, Reliance selected TETRA technology since it provides the best spectral efficiency compared to other trunk radio systems.

• TETRA is an open standard defined by ETSI to satisfy the requirements of professional radio users.

• The interoperability certificates (IOP) assure that different infrastructure and terminals manufacturers can operate together in every TETRA network without problem.

• Operates in 380-400 MHz band as per Indian Telecom regulator requirements.

• It is an evolving standard and therefore future-proof.
The TETRA system incorporates the next generation features:

- 100% internal structure based on Ethernet/IP technology, with a software switching matrix.

- Multiple alternatives for synchronous and asynchronous links between the MTS and the MSO.

- Fast Call set-up time for Group communication and Call Queuing as per critical communication requirements.

- Offers Voice & Data capabilities in the same system.

- Offers Patching to existing conventional analog radios and PABX.
Scope of Work

• Reliance Jamnagar Manufacturing Division located in Gujarat state of India being largest greenfield refinery complex in world and comprising two no’s of refinery complex’s located adjacent to each other was selected as first location to be upgraded on TETRA.

• In phase one of Jamnagar complex three no’s of BTS(MTS4) and 1141 no’s of radio terminals were installed and commissioned in 2008 and have been in operation till date.

• In Phase two of Jamnagar complex three no’s of BTS(MTS4) and 1000 no’s of radio terminals are ordered.

• Other installations are in planning stage.
**Over All Scope Jamnagar Manufacturing Division:**
15000 Acers of Coverage area including Refinery Complex, Ports and Residential Township.
Jamnagar Refinery Complex
PHASE 1 System Configuration

- Three-Site Scaleable UHF Dimetra IP System, which comprises of the following:
  - **1 X Mobile Switching Office (MSO)**
    - Zone Controller in Redundant Configuration
    - Network Management System
    - Network Switching Components in Redundant Configuration
    - Telephone Interconnect Gateway
    - Short Data Router
    - Packet Data Gateway
    - Conventional Gateway
    - VPN Gateway
  
  - **1 x Control Center**
    - One (1) Dispatch Console
    - One (1) Network Management Terminal with One (1) Laser Printer
Jamnagar Refinery Complex

PHASE 1 System Configuration

- **3 x Base Station Sites in 380-400Mhz band.**
  (One no’s as indoor with IBS and two no’s as outdoor with extension cabinets)
  - 12 no’s of Carriers
  - 3 no’s of Control Channels and 45 no’s of Voice & Data Channels
  - Redundant Site Controllers
  - Dual Diversity Antenna System

- **1138 Subscriber Radios**
  - 98 fixed stations
  - 20 mobile radios
  - 1020 portable radio (850 no’s of FM MTP750, 130 no’s ATEX MTP850Ex and 40 no’s MTP850 Normal)

- **Targeted Users:**
  - Refinery Control Room Operators, Plant field operators and General Management.
The Refinery Control room building is a blast proof concrete building. It was observed that the outdoor base station signal may not penetrate the control room for enabling Tetra coverage inside the control room.

Refinery control room being heart of control for refinery operations, required communications at all times so as to be reachable by plant teams and reach the plant teams.

With a large group of users working 24x7 inside control room, separate In-Building solution has been designed and deployed for the control room.
Deployed System Architecture

Scalable Dimetra IP System is a TETRA fully compliant digital trunked radio system using IP-based architecture.
**Jamnagar Refinery Complex**

**PHASE 2 System Configuration**

- 3 x Base Station Sites
  - Redundant Site Controllers
  - Dual Diversity Antenna System

- 1000+ Subscriber Radios
  - 80+ fixed stations (MTM800E)
  - 100+ mobile radios (MTM800E)
  - 850+ portable radio (ATEX /MTP 850)

- Targeted Users:
  - Refinery Control Room Operators, Plant field operators, Security Services, Fire Services, Medical Services, Port Operations, Utility services and General Management.
Dimetra-IP Dispatch Console GUI

- Console Priority Call
- Emergency Alarm / Ruthless Pre-emption
- Hot Microphone with Emergency
- Ambience Listening
- Multi-Agency Super Group Call
- Multi-Agency Broadcast Call
- Dynamic Regrouping - Over the air regrouping
Status of radio in operation
Network Management System - GUI

- System and Zone level fault capabilities
- Current Alerts and Alarms for System Components
- Alarm History of System Components
- Diagnostics
- Fire and Intrusion Alarms (if any) from the base station sites

Standard Simple Network Management Protocol (SNMP)

OpenView trap-forwarding to connect to Enterprise NMS

User Friendly GUI

FCAPS Based

- System and Zone level fault capabilities
- Current Alerts and Alarms for System Components
- Alarm History of System Components
- Diagnostics
- Fire and Intrusion Alarms (if any) from the base station sites
Real Time Active user load on System
Way Forward

• To expand coverage to Old refinery complex at Jamnagar so as to have comprehensive coverage in entire Jamnagar Petrochemical complex of Refinery, Township and Jetty

• To deploy base stations at other plants to extend Tetra coverage by connecting them to central MSO at Jamnagar using IP links, enabling better control and coordination between plants

• Explore the possibility to expand the use of TETRA to offshore platforms

• Utilize TETRA coverage to acquire data from field devices (sensors, hand terminals, SCADA, etc)
THANK YOU