Predictive Analysis to improve asset availability and reduce maintenance cost

Hemant Rathod – SAP Labs LLC
List 1-3 key points that attendees will take away from your session
What We Will Cover

SAP HANA Overview
Suite on HANA – EAM Applications
Key Points to Take Home
Questions
THEN

Willis Tower

442 m

NOW

Burj Khalifa on 23 December 2009

828 m

New benchmark for future...
Business Data is Exploding!

Operations
- Sensor data
- Work Orders
- Quality analysis
- Explorations
- Predictive analytics

Profitability
- Reserves
- Root-Cause
- Reliability
- Liquidity
- Delay accounting

Asset Data
- Supply Chain Data
- Production Statistics
- Maintenance

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Why an In-Memory Solution?

Groundbreaking In-Memory and Hardware Innovations

Faster Analytics

Speed

Scale

Flexibility

Real-Time Access to Transactional Data

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Why Is This So Difficult?

30 Year-Old Database Design Principles

- Slow Disks & CPUs
- I/O Bottleneck
- Expensive Memory
- Optimized for Transactions
- BI is an Afterthought
Old Way
Traditional Data Analytics Technology

- Decision-maker obtaining business intelligence
- Calculation Engine
- Query Results
- Aggregates
- Indexes
- Data Warehouse
- Operational Data Store
- Data in enterprise business applications

- Latency between data creation and analytics usage
- Expensive and infrastructure intensive
- Duplicative and slow

New Way
In-memory Data Analytics Technology

- Decision-maker obtaining business intelligence
- In-memory analytics

- Up to 1,000x faster
- No optimizations required
- More data in less space
- Faster business intelligence

Data in enterprise business applications

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How our customers are using HANA

Analytics & Operational Reporting

Accelerate ECC Transactions

HANA Based Applications

RDS: Benefit from fixed cost and scope solutions for more predictability and quicker time-to-value

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Eliminate Relational DB under BW

Easy to Migrate

In-memory calculation & planning

Example: SAP NetWeaver BW In-Memory

SAP NetWeaver BW

Data Modeling

Analytical / Planning Engine

Data Management

Relational Database

Data Storage

SAP NetWeaver BW

Data Modeling

Analytical / Planning Engine

Data Management

HANA

Data Storage
HANA In-Memory Computing
Technology Impact:

Velocity, Volume, Value

- 1,125x
  - Faster reporting speed (Project variance report run time from 15 hours to 48 seconds)

- Millions of
  - Records on 140,000 materials calculated, planned and analyzed in minutes

- User Sat
  - IT Support Benchmark increased from 50% to 95% with HANA

Global Steel & Mining Company
Global Natural Resources Company
Fab Metals company

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In-Memory Analytics

- Flexible real-time analysis of operations at non-aggregated level
- Fastest analytical platform

Next-Gen Applications

- SAP Application platform - BW, BPC, and other applications running on HANA
- Real-Time operational planning and simulation capabilities – linked to execution
- Custom Applications

One Store for Data & Analytics

- Business Suite on HANA, optimized for in-memory
- Reduced landscape complexity
- Value chain transformation

The SAP HANA Journey

Where we have been and what is possible today!

“Renovation”
SAP HANA 1.0

“Innovation”

“Transformation”
Suite on HANA
Released January 2013!

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The Most Modern Business Platform for Innovation Without Disruption
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Unifying OLAP and OLTP: From vision to reality
EAM on HANA: What is New and What is Coming

Accelerated ECC transactions
- Improved scheduling of maintenance plans
- Real Time material planning
- Maximize productivity of complex projects

HANA analytics and reporting
- Provide views and query for most Plant maintenance objects
- Queries and calculation views for Online reporting / analysis
- Improved Asset Analytics with BW on HANA
- Condition Based Maintenance to collect real time shop floor data for analysis on HANA

HANA-based applications
- Use Predictive Analysis for forecast of cost and spare parts
- Predictive maintenance to forecast potential failure based on real time data
- Predict cost of maintaining assets and prepare CAPEX and OPEX budgets
- Energy and Environmental Resource Management (EERM) with HANA analytics to manage your most important invisible asset - energy
Increase Accuracy of planning

Maximize Usage of preventive maintenance

Up-to-Date scheduling information on maintenance operations

Current Situation
- High number of maintenance plans which need to be scheduled frequently
- Maintenance scheduling consumes a great deal of time
- Potentially missing necessary objects for maintenance calls

Key Innovations
- Faster response times leads to more accurate maintenance scheduling
- Accelerated mass transactions

Business Process Transformation
- Planning several times a day (instead of once a week) results in up-to-date scheduling information in maintenance operations
- Schedule all existing maintenance plans within a specific timeframe
- Instant analysis on top of transactions

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Current Situation

- Decisions often based on periodic Material Requirement Planning (MRP) runs and outdated information
- Inability to re-plan quickly if conditions change due to long run times
- No holistic production planning across all relevant production sites

Key Innovations

- 50% reduction in MRP runtime with high-speed reads
- Increased usage of stored procedures to accelerate calculations such as Stock Requirements List and where used lists
- Rapid BOM Explosion with stored procedures and fast read

Business Process Transformation

- Faster re-planning allowing more frequent MRP runs in shorter cycles
- Simulation of different ‘what if’ scenarios in real-time
- Global cross-plant planning

Reduce

out of stocks

Decrease

inventory and safety stocks

Limit

bullwhip-effect
**Current Situation**
- Time consuming project analysis and progress monitoring due to high volume of data for complex long-lasting projects
- Deviations in costs, time, resources, or quality detected too late in the process
- Inability to monitor all aspects of a project

**Key Innovations**
- Improved run time
- Real-time access to large volumes of data
- On the fly analysis and calculation

**Business Process Transformation**
- Faster maintenance, monitoring, and analysis of large projects and programs
- Complete progress monitoring along the project lifecycle
- Combined analysis of financials and logistics data

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**Increase**
- efficiency

**Decrease**
- lead time from development to delivery of product

**Reduce**
- costs for claims and problem-solving

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HANA-Based Analysis for EAM

- Provide views and queries for most of the Plant maintenance objects
- Native integration to merge Real time data and create reports
- Improved Asset Analytics with BW on HANA

- There are 3 different layers of views: Private view, re-use view, Query View
- Bottom layer, Physical table contains only the Suite tables necessary for reporting.
- Middle layer, Re-use view consists of reuse views. They are used to transform the cryptic and difficult to understand Suite table and column names into intuitive and easily consumable data provisioning views which form the third layer.
- Top layer, Data Provisioning View are the virtual data model for analytics. Several data consumption layers can be built on top to enable different views of the data, for example specific data model for various industries, customers, and partners.
HANA-Based Analysis Content:
Real-time insight into asset performance

**Manufacturer & Object class**
Key figures for maintenance notifications and orders related to object class, construction material, manufacturer and assembly. With/without cost

**Object statistic**
Key figures for technical objects related to object class, construction material, manufacturer and assembly year

**Location & Planner group**
Key figures for maintenance notifications and orders related to different PM organizational areas, equipment and functional location with/without cost

**Object breakdowns**
Key figures for object breakdowns (Effective Breakdown, TBR, TTR) related to object class, equipment and functional location

**Object damage**
Key figures for damages, causes and activities related to their classification, notification type, functional location and equipment

**Maintenance order**
Key figures for maintenance orders related to object class, construction material, manufacturer and assembly year. Estimated, internal and external costs (wage, service, material and personnel) related to object class, construction material, manufacturer and assembly year

[Link to Documentation]
Preconfigured content within MII
- to receive machine data in HANA
- Information can flow from
  - Shop floor system
  - Data collected by SAP operator rounds
- Data collected by inspector manually
- Preconfigured content to set Alerts and Warning based on real time data
- Creation of maintenance notifications based on set up of alerts
- Long term trend analysis using HANA to gain better visibility

SAP Condition-Based Maintenance Rapid Deployment Solution
Intuitively design complex predictive models
Read and write from data stored in HANA
Visualize, discover, and share hidden insights
Drag-and-drop visual interface for data
Predictive library (with R integration)
Visualize, discover, and share hidden insights

Link to documentation for predictive analysis library
Platform for Forecasting Machine Performance

There are two mayor perspectives on maintenance and service. We approach the market from the OEMs’ perspective but key capabilities of predictive maintenance based on HANA support both views.

**OEM**

... is focused on services for sold products.

- 3 – Automotive Specific Data
- 5 – Warranty Claims Analysis
- 5 – Spare Parts Forecast

**Owner**

... is focused on health and costs of own assets.

- 3 – Utilities Specific Data
- 3 – Manufacturing Specific Data
- 6 – Notification System
- 7 – Business Suite Integration

1 & 2 – Data Import

3 – Unified Data Model

4 – Prediction Engine

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Predictive Maintenance and Service Building Blocks

Flexible Data Modeling
Visual Rules Designer
Predictive Analysis

SAP Business Suite

1. Manufacturing Data Import
2. Telemetry Data Import
3. Unified Data Model
4. Analysis and Exploration
5. Prediction Engine
6. User Interface
7. Notification Server
8. Business Process Integration

- Product Data – BoM
- Serial Number - Warranties
- Telemetry – GPS – SLA – Maintenance
- History – Alarms – Events

- monitor asset
- predict health
- create actionable insights

- prediction
- notification
- publish/subscribe – mail – alerts – notifications – triggers – reports...

- R&D engineer
- warranty manager
- spare parts manager
- sales representative
- service engineer
- Asset / fleet manager
- Operator/driver

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Key Points to Take Home

Questions
Key Points to Take Home
SAP HANA Value Drivers

1. Make Decisions in Real-time
2. Accelerate Business Performance
3. Unlock New Insights
4. Increase Business Productivity
5. Improve IT Efficiency and Agility

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Thursday, May 16
3:00 p.m. – 4:00 p.m.