SAP Linear Asset Management

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Introduction to Linear Asset Management

Every organization with linear assets must be able to answer these questions

1. What do I have?
2. Where is it?
3. What condition is it in?
4. What O&M and capital investment required?
5. What is the value of the asset?

In Asset Intensive Industries like Oil & Gas, Railways, Utilities and Public Sector the utilization of traditional hierarchical structure of assets to represent their production or infrastructure networks is a complex and difficult process.
SAP Linear Asset Management

Need to manage linear assets as a continuous asset with dynamic segmentation

Supporting ways to identify location information:
- Roads - Mile or km markers, lane, direction, offset, bridges, tunnels, signs…
- Rail – Mile or chain markers, track #, offset, switch, crossings, signals…
- Pipeline – Kilometer Point...

Linear aspects considered for:
- Data modeling
- Inspections processing
- Condition monitoring
- Maintenance and Repair
Optimized Asset Operations and Maintenance
Linear Asset Management and Operation Account Assignment

- **Optimized Operations and Maintenance**
- **Asset Planning and Scheduling**
  - Business Planning and Budgeting
  - Maintenance Cost Budgeting
- **Operations and Maintenance**
  - Asset and Maintenance Reporting
  - Initiating Maintenance
  - Production Planning
- **Service Procurement**
  - Demand Planning and Creation
  - Service Delivery Confirmation
- **Spare Parts Management**
  - Refurbishment Processing
  - Consumption-Driven Planning

- **Operations**
  - Technical Asset Management
  - Document Management
  - Asset Performance Management

- **Engineering**
  - Shutdown Management
  - Maintenance Planning and Scheduling

- **Maintenance**
  - Work Clearance Management
  - Preventive and Corrective Maintenance
  - Sub-contracting

- **Procurement**
  - Operational Sourcing
  - Operational Procurement

- **Service Provider**
  - Order Collaboration
  - Service Entry
  - Invoice Collaboration

- Enhancements delivered with Innovations 2010
## Optimized Linear Asset Operations and Maintenance

### Linear asset management and operation account assignment

SAP enhancements provide linear asset management functionality within the SAP Enterprise Asset Management solution:

- For assets that extend over large distances rather than following hierarchical plant structures – for example:
  - Pipelines
  - Roads
  - Power distribution lines
  - Rail tracks

- Linear modeling and asset identification by spatial attributes for condition monitoring, order management, and analytics

### Solution Enhancements

- Enhancement of technical objects functions (functional location and equipment) and classification system to support the definition of a linear asset
- Enhancement of work order processing to support linear work definition, including work orders, confirmations, and maintenance plans
- Enhancement of notifications, measurement points, counters, and measurement documents to support linear information
- Reports for all of the above
- Account assignment on work order operation level

### Key Benefits

- Comprehensive support for linear assets, which enables companies to efficiently manage additional business areas in SAP Enterprise Asset Management
- Increased asset capability and availability: low performance in any linear section can have great impact on overall throughput
- Support of work orders that involve multiple departments, work centers, and separate cost collectors
Linear Asset Management – Overall Concept

- Func. Loc. A8-100
- Equip. S02519
- Equip. S02656
- Char: thickness 35 mm
- Char: thickness 40 mm
- Char: hardness 5°
- Work order: 901961
- Operation 0010
- Operation 0020
- Work order: 901989
- Operation 0020
- Operation 0020
- Notification 1007423
- Item 001: onsite inspection
- Item 002: surface damaged
- Meas. Point: soil ph value
- Meas. Doc: 5.4%
- Meas. Doc: 5.8%
Linear Asset Management – Dynamic Segmentation
### Linear Data Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Values</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Point</td>
<td>Start point of Linear Asset</td>
<td>Distance Value in UOM</td>
<td>For point locations, the position along the Linear Asset is indicated in this field</td>
</tr>
<tr>
<td>End Point</td>
<td>End point of Linear Asset</td>
<td>Distance Value in UOM</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>Length of the Linear Asset</td>
<td>Length of Linear Asset in UOM</td>
<td></td>
</tr>
<tr>
<td>Unit of Measure (UOM)</td>
<td>Unit of measure of the Linear Asset</td>
<td>Miles, Kilometers etc.</td>
<td></td>
</tr>
<tr>
<td>Start Marker</td>
<td>Milepost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Marker</td>
<td>Milepost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance From Start Marker</td>
<td>Offset from Start Marker</td>
<td>Distance Value in UOM</td>
<td></td>
</tr>
<tr>
<td>Distance From End Marker</td>
<td>Offset from End Marker</td>
<td>Distance Value in UOM</td>
<td></td>
</tr>
<tr>
<td>Unit of Measure (UOM)</td>
<td>Unit of Measure for Marker</td>
<td>Yards, Meters</td>
<td></td>
</tr>
<tr>
<td>Offset 1</td>
<td>Perpendicular Reference</td>
<td>center line right margin left margin</td>
<td>Typically Perpendicular Offset e.g. right angles to center line</td>
</tr>
<tr>
<td>Unit of Measure (UOM)</td>
<td>Unit of measure of the offset</td>
<td>Yards, Meters; Degrees</td>
<td>e.g. Pipe defect could at 3 o’clock</td>
</tr>
<tr>
<td>Offset 2</td>
<td>Vertical Reference</td>
<td>center line ground level tunnel roof</td>
<td>Typically Vertical Offset</td>
</tr>
<tr>
<td>Unit of Measure (UOM)</td>
<td>Unit of measure of the offset</td>
<td>Yards, Meters</td>
<td></td>
</tr>
</tbody>
</table>
Linear Data in Technical Objects
Linear Data - Offsets

Offsets are used to define an exact location

- **4,75m**
- **2,15m**
- **4,62m**
- **0,80 km**
- **4,60 km**
Markers e.g. Mileposts or Well Known Locations are usually distributed uniformly along the Linear Asset to represent homogeneous distance segments (in some exceptional cases some markers have different lengths). The markers are indicated in the same unit of measure used to define the Linear Asset element (Miles, Kilometers, Meters, etc.). The basic information that a marker has is its name (identification), the absolute position from the starting point of the linear asset element, and its length.

It will be possible to derive the absolute values of the location by using the Marker and offset (if required), say for example when planning a work order.
Linear Reference Patterns for Markers

![Change Linear Reference Pattern: Master Data](image)

<table>
<thead>
<tr>
<th>Marker</th>
<th>Marker Description</th>
<th>MType</th>
<th>Start Point</th>
<th>Length</th>
<th>UoM</th>
</tr>
</thead>
<tbody>
<tr>
<td>KM1</td>
<td>Kilometer Post 1</td>
<td>M</td>
<td>0,000</td>
<td>1,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM2</td>
<td>Kilometer Post 2</td>
<td>M</td>
<td>1,000</td>
<td>2,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM3</td>
<td>Kilometer Post 3</td>
<td>M</td>
<td>2,000</td>
<td>3,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM4</td>
<td>Kilometer Post 4</td>
<td>M</td>
<td>3,000</td>
<td>4,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM5</td>
<td>Kilometer Post 5</td>
<td>M</td>
<td>4,000</td>
<td>5,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM6</td>
<td>Kilometer Post 6</td>
<td>M</td>
<td>5,000</td>
<td>6,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM7</td>
<td>Kilometer Post 7</td>
<td>M</td>
<td>6,000</td>
<td>7,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM8</td>
<td>Kilometer Post 8</td>
<td>M</td>
<td>7,000</td>
<td>8,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM9</td>
<td>Kilometer Post 9</td>
<td>M</td>
<td>8,000</td>
<td>9,000</td>
<td>KM</td>
</tr>
<tr>
<td>KM10</td>
<td>Kilometer Post 10</td>
<td>M</td>
<td>9,000</td>
<td>10,000</td>
<td>KM</td>
</tr>
</tbody>
</table>
Linear Data in Maintenance Order
## Functional Location List

### Change Functional Location: Functional Location List

<table>
<thead>
<tr>
<th>S</th>
<th>Functional location</th>
<th>Description of functional location</th>
<th>Start Point</th>
<th>End Point</th>
<th>Length</th>
<th>UoM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DF1</td>
<td>Pipeline 1</td>
<td>0,000</td>
<td>10,000</td>
<td>10,000</td>
<td>KM</td>
</tr>
<tr>
<td>2</td>
<td>DF1-1</td>
<td>Pipeline 1, Section 1</td>
<td>0,000</td>
<td>5,000</td>
<td>5,000</td>
<td>KM</td>
</tr>
<tr>
<td>3</td>
<td>DF1-1-1</td>
<td>Pipeline 1, Section 1, Sub-Section 1</td>
<td>0,000</td>
<td>2,500</td>
<td>2,500</td>
<td>KM</td>
</tr>
<tr>
<td>4</td>
<td>DF1-1-2</td>
<td>Pipeline 1, Section 1, Sub-Section 2</td>
<td>2,500</td>
<td>5,000</td>
<td>2,500</td>
<td>KM</td>
</tr>
<tr>
<td>5</td>
<td>DF1-2</td>
<td>Pipeline 1, Section 2</td>
<td>5,000</td>
<td>10,000</td>
<td>5,000</td>
<td>KM</td>
</tr>
<tr>
<td>6</td>
<td>DF1-2-1</td>
<td>Pipeline 1, Section 2, Sub-Section 1</td>
<td>5,000</td>
<td>7,500</td>
<td>2,500</td>
<td>KM</td>
</tr>
<tr>
<td>7</td>
<td>DF1-2-2</td>
<td>Pipeline 1, Section 2, Sub-Section 2</td>
<td>7,500</td>
<td>10,000</td>
<td>2,500</td>
<td>KM</td>
</tr>
<tr>
<td>8</td>
<td>DF1000</td>
<td>Compressor Station (Point Asset)</td>
<td>6,700</td>
<td>0,000</td>
<td>0,000</td>
<td>KM</td>
</tr>
</tbody>
</table>
Structure List

Functional Location Structure: Structure List

<table>
<thead>
<tr>
<th>Functional loc.</th>
<th>Description</th>
<th>Valid From</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF1</td>
<td>Pipeline 1</td>
<td>24.09.2009</td>
</tr>
</tbody>
</table>

- DF1-1
  - DF1-1-1
    - DF1-1-1
      - KM 0,00000 2,50000 2,50000
    - DF1-1-2
      - KM 2,50000 5,00000 2,50000
- DF1-2
  - DF1-2-1
    - DF1000
      - KM 16,70000 10,00000
    - DF1-2-2
      - KM 10,00000 12,50000 2,50000
- DF1-2-2
  - DF1-2-2
    - KM 12,50000 15,00000 2,50000
- DF1-2
  - KM 5,00000 10,00000 5,00000
- DF1
  - KM 0,00000 10,00000 10,00000
Multi-Level List

Multi-Level Function List: List of Function Locations

- DF1 - Pipeline 1
  - 041364 - PM01 Point Pipeline REL MMAT PRC
    - 3,256,000 - 3,256,000 KM
  - 041412 - PM01 Point Pipeline CRDT MANC MMAT PRC
    - 3,256,000 - 5,256,000 - 2,000,000 KM
  - 023 - LAY_PIPE
    - Pipe Material: Stainless Steel Cr 10%
    - Pipe Material: Stainless Steel Cr 11%
    - 0,069,000 - 19,909,000 KM
- DF1-1 - Pipeline 1, Section 1
  - 023 - LAY_PIPE
    - Pipe Material: Stainless Steel Cr 10%
    - 0,069,000 - 5,000,000 KM
- DF1-1-1 - Pipeline 1, Section 1, Sub-Section 1
  - 023 - LAY_PIPE
    - Pipe Material?
    - 0,069,000 - 2,500,000 KM
- DF1-1-2 - Pipeline 1, Section 1, Sub-Section 2
  - 023 - LAY_PIPE
    - Pipe Material?
    - 2,500,000 - 5,000,000 KM
- DF1-2 - Pipeline 1, Section 2
  - 023 - LAY_PIPE
    - Pipe Material?
    - 5,000,000 - 10,000,000 KM
- DF1-2-1 - Pipeline 1, Section 2, Sub-Section 1
  - 023 - LAY_PIPE
    - Pipe Material?
    - 5,000,000 - 7,500,000 KM
- DF1-2-2 - Pipeline 1, Section 2, Sub-Section 2
  - 023 - LAY_PIPE
    - Pipe Material?
    - 7,500,000 - 10,000,000 KM
- DF1909 - Compressor Station (Point Asset)
  - 6,769,000 KM
Business Drivers for Linear Asset Management (LAM)

Use of Linear Asset Management (LAM) can reduce master data by 30%
• Reduction in migration efforts and ongoing administration efforts

Increase data quality and value of the data by a factor of two

Maximize overall planning and worker efficiency
• Work management processes can be modeled easier and in a more efficient way
• Define exact location of infrastructure “installed”
Key Benefits

Manage continuous assets with dynamic segmentation.

Identify maintenance locations (where to work) by linear attributes like start/end point, length and offsets.

Increase assets capability and availability as low performance in any linear section can have big impact on overall throughput.

Ability to report on order costs at operation level
Thank You!

Contact information:

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