Presentation to the SAIMM 4th August 2017
Building a Robust Mining Industry
DRA GROUP

Leaders in engineering design, project management, construction and contract operations for the minerals, metals, mining and energy industries
A South African Company
Founded in 1984 with skills across a wide range of commodities in the Minerals & Metals Mining Industry

A leading multi-disciplinary engineering and project management company

Global Reach over 5 continents

Main engineering & design centre in Johannesburg, South Africa

Private Company
354 Employee Shareholders
OUR BUSINESS

Mineral Processing Plants & Engineering
Mine Design, Engineering & Equipping
Infrastructure Engineering
Project & Study Management
Construction Management
Contract Operations
OUR FOCUS

Safety

Engineering Excellence

Client Success
Steven Sasson invented the first digital camera at Eastman Kodak in 1975. It weighed 8 pounds (3.6 kg) and had only 0.01 megapixels. The image was recorded onto a cassette tape and this process took 23 seconds.
DRA have developed an Operations Management Information System, called MOMS.

- MOMS 1.0 conforms to ISA 95 standard, to a high degree

**MOMS can collect all relevant data into one central data model**

- Across **multiple production sites**,
- Or a **single production site**,
- From any enterprise data source, such as:
  - SCADAs, PLCs, Laboratory Information Management Systems (LIMS),
  - Condition Monitoring Maintenance Systems (CMMS),
  - Enterprise Resources Planning (ERP) and Enterprise Asset Management (EAM) systems,
  - **Manually captured data** via desktop software like Microsoft Excel, etc.

These data are logically structured, time stamped, and archived in a dedicated process historian.

**Such data can be processed and displayed**

- in **real time** or **historic**
- in **several possible layouts**
- through **dashboards, interactive reports, and notifications**
- **to any specified user** on either his PC / Laptop / smartphone, or a smart device using HTML.

MOMS supports quicker, more informed decisions, to improve the mine site performance.
MOMS Information Flow

Data Sources
- ERP & EAM
- SCADA
- PLC
- Budgets & Plans
- Forecasts
- Excel Data
- LIMS
- CMMS

MOMS
- Real-time data
- Time-stamped with context
- Central Data Model
- Synthesis
- Analyses
- Display

Information
- Real-time Dashboards
- Operational Reports
- KPIs
- Notifications

Decisions
- Strategic
- Tactical
- Operational
# MOMS Modules

## Product Architecture

Modular design promotes:

- Structured approach
- Flexible deployment
- Faster time to market
- Increased robustness
- Adding future modules
- Industrial analytics

<table>
<thead>
<tr>
<th>Core Module</th>
<th>Financial System Interface</th>
<th>Maintenance Management Interface</th>
<th>Warehouse Management Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production Performance Module</td>
<td>Production Inventory Tracking Module</td>
<td>Downtime Analysis Module</td>
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<tr>
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<td>Product Quality Validation Module</td>
<td>Documentation Module</td>
<td>SHE Monitoring Module</td>
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<td></td>
<td>Production Planning &amp; Scheduling Module</td>
<td>Custom Modules</td>
<td>Vehicle &amp; Personnel Tracking Module</td>
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<table>
<thead>
<tr>
<th>Additional Features</th>
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<tr>
<td>Financial System Interface</td>
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<td>Warehouse Management Interface</td>
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<tr>
<td>SCADA Interface</td>
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<tr>
<td>PLC Interface</td>
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</table>

**就觉得这是一份完整的文档，包含了产品架构和模块的详细信息。**

**DRA SYSTEMS**
Core Module

**ICT Hardware**
- Servers
- Firewall
- Network Switches

**Software**
- OSIsoft PI System
- Microsoft SQL Engine & Analysis Services
- Microsoft Excel

**Asset Framework**
- Basic tree structure

**Data Interface**
- Intermediate tables
- Data connection providers
Production Performance Module

Tracks production performance in terms of KPI’s

• Equipment Utilization
• Equipment Availability
• Product Quality Yield
• Overall Equipment Effectiveness (OEE)
• 1% gain in OEE => 4-8% gain in profit – [Henderson et.al.]

Trends

• Throughput
• Scheduled Throughput

Production performance dashboards and reports

• Aggregates KPI’s and other essential measures
• Interactive
## Production Report

### 10 July 2017

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</table>

### Mill Feed vs Budget

#### Mill Load

- **Load Target**
- **Mill Load (Average) ton**

### Split

- **Tailings**
- **Slimes**

#### Split:

- **Tailings**
- **Slimes**

---

Digital Optimization
MOMS Example - Production Performance Module

**Production Performance**

**Plant OEE**

- January: 60
- February: 55
- March: 65
- April: 70
- May: 75

**Plant Throughput**

- January: 120
- February: 130
- March: 140
- April: 150
- May: 160

**Plant Availability**

- January: 90
- February: 85
- March: 95
- April: 100
- May: 105

**Plant Utilisation**

- January: 20
- February: 25
- March: 30
- April: 35
- May: 40

![Chart Image](image-url)
Production Performance Module

Display: MOMS Production Performance Dash
Asset: Primary Crusher

PRODUCTION PERFORMANCE

Overall Equipment Effectiveness (OEE)
4.8733 %

Availability 100 %
OEE 4.8733 %
Utilisation 100 %

Performance Totalisers

OEE YTD
75.331 %

OEE MTD
44.564 %

Shift Start
11/2/2016 6:00:00 AM
Shift End
11/2/2016 2:00:00 PM
Production Performance Module

Dashboard – Real time or historical

From: DRA MOMS System
Sent: 12:09:00 AM 12/09/2017
To: General Manager
Subject: Plant OEE – Month to Date

Dear Customer,
The Plant OEE has dropped below 40% for the Month

Start Time: 18:09:00 AM 01/09/2017

Notifications

Aggregated Reporting
Production Inventory Tracking Module

Tracks product-in-process from ore
- ROM Ore
- Concentrate
- Tailings

Tracks production materials and energy consumption
- Reagents
- Process Water
- Grid Power

Product mass balance (Metal Accounting)

Data exchange with ERP System
- Inventory financials
- Reorder prediction

Materials & Energy Consumption Report
- Aggregates KPI's
- Interactive
MOMS Example - Production Inventory Tracking

Dashboard – Real time or historical

Water Levels

Notifications

From: DRA MOMS System
Sent: 12:09:00 AM 12/09/2017
To: General Manager
Subject: Water Storage Levels CRITICAL

Dear Customer,

The Water Storage Level has dropped below 20%.

Start Time: 18:09:00 AM 01/11/2017

Aggregated Reporting
Downtime Analysis Module

Tracks asset downtime

Categorises failure events on immediate cause:
- Production
- Maintenance
- Quality
- Inventory
- Safety

Calculates KPI’s:
- Mean Time Between Failures (MTBF),
- Mean Time Between Repair (MTBR),
- Mean Time Between Failure Growth (MTBF Growth)

Sends running hours & availability to ERP
- Maintenance Management

Production Downtime Report
- Failure Downtime
- Reported Downtime
- Aggregate KPI’s
MOMS Example - Downtime Analysis Module

Dashboard – Real time or historical

Aggregated Reporting

Notifications

From: DRA MOMS System
Sent: 12:09:00 AM 12/09/2017
To: General Manager
Subject: Mill 01 Trip

Dear Customer,
The AG Mill 01 has tripped.
Start Time: 12:09:00 AM 12/09/2017
Product Quality Validation Module

Tracks the actual product quality vs required quality

- Set of metrics as defined by process stream
- Compares reserve expectation to quality as received at plant.

Interfaces with Laboratory Information Management System (LIMS)

Interfaces with intelligent instruments

- Online or visual analyzers

KPI’s

- Actual Product Quality / Required Product Quality

Product Quality Report

- Aggregate KPI’s
- Interactive
Product Quality Validation Module

Dashboard – Real time or historical

Notifications

From: DRA MOMS System
Sent: 12:09:00 AM 12/09/2017
To: General Manager
Subject: Crusher Product Size out of spec

Dear Customer,

The product size of the primary crusher has moved out of spec.

Start Time: 12:09:00 AM 12/09/2017

Aggregated Reporting
MOMS Documentation Modules

Documentation
- Operation Manuals,
- Maintenance Manuals,
- Critical Spares, Datasheets,
- Process Design Criteria, PFD’s PID’s
- Mechanical Equipment Lists

Documentation Control (Management System)
- Revision control
- Search functions

Documentation Archive
- Links provided in the framework structure
Reporting Audience

Executive Team Reporting
• CEO, COO, CFO

Mine Management Team Reporting
• GM, HOD’s

Operational Team Reporting
• Engineers, Operators, Foremen, Supervisors
Owners’ Benefits

- **Improved** control and management of your process plants
- Track **asset performance** for delivering maximum efficiencies
- **Right information** at the **right time** to the **right audience**
- **Real-time** reporting
- **Event-based** reporting
- **Simplify** complex data capturing
- **Improve** communication between management and staff
- **Pro-active** decision making
- Selecting of “**Golden Shifts**”
- **Mobile** platform visualization
- Reduction in **operating costs**
MOMS Reference Sites

2017 - Zimbabwe, Zimplats SMC & Ngezi

2017 - Botswana, Minopex Karowe

2017 - Lesotho, Firestone Diamonds Liqhubong

2016 - Mauritania, Kinross Gold – Tasiast

2016 - Pennsylvania, DRA Energy Operations

2015 - Liberia, Aureus Mining New Liberty Gold

2013/4 - DRC, Randgold Kibali
QUESTIONS & THANK YOU