Operational & Planning System for Murrumbidgee Irrigation Area

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1. ADASA

Betting on open innovation for a sustainable future

- 25 Years’ Experience
- Water & Environment Expertise
- Intense Technical Specialisation
- Comsa Emte group. Founded 1891
  8,600 professionals. Sales (2013): 1.575 M€
Vision: Achieving a sustainable water management by providing technological and innovative solutions

- A multi-disciplinary approach
- New scenario. Involvement of all actors: Governance bodies, public administrations, water operators, water industries and end-users
- Solutions oriented to water needs
  - Solutions and products to preserve & protect waters and ecosystems
  - ICT-enabled solutions for operational water management
  - Resource-efficient solutions for strategic sectors: agriculture, water treatment, water industries, …

Adasa promotes R&D and innovation activities by reinvesting more than 8% of its turnover
2. Murrumbidgee Irrigation Ltd

Murrumbidgee Irrigation Limited in numbers:

- Australia’s largest private rural water utility
- Unlisted public company
- 167 staff
- 2,600 customers
- 3,200 farms/9 towns
- 5,000 km of channels/pipes
- $500M infrastructure assets
- $50M turnover (approx.)
- $2.5B water entitlements
2. Murrumbidgee Irrigation Ltd

- 660,000 Ha serviced
  - 250,000 Ha stock and domestic supplies
  - 120,000 Ha irrigated annually on average
- 950 larger annual cropping farms (rice, cereals)
- 1,150 horticulture farms (vines, citrus, nuts, olives)
- 1,100 small holdings (mainly lifestyle blocks)
## Change in management

### Objectives
- Short project delivery timeframes
- Integrate Services across business units
- Develop and implement new business processes
- Identify and address skill gaps
- Provide operational and planning tools
- Build confidence in decision making

### Achievements
- Quick ownership and delivery
- Early wins
- Building from other experiences
- Centralisation and Integration of Data
- Quality Outputs
- Information for Customers
3. System Key Drivers

- Optimum performance, reliable and fit business requirements
- Easy to use
- Making change easy
- Avoid vendor lock-in. Be autonomous
4. Operational Features

- **Simulation**
  - Real time
  - Short term forecast (7 days)
  - Climatic events (rainfall, evapotranspiration, …)
  - Water orders and regulators scheduling
  - Thresholds (flood warnings for internal management, …)
  - Evaluate losses in the network (source and amount)

- Operational short-term (7 days) water demand assessment
- Storage and capture opportunities
- Capacity of the system vs. water demand
- Automatic operation rescheduling
5. Planning Features

- System performance indicators (Asset optimisation, Water delivery optimisation, ….)
- Retrieve past scenario conditions to analyse decision taking
- Evaluate retention storage performance
- Operation strategy (rules for storages)
- Simulate changes in irrigation scheme (increasing channel or asset capacity, introducing new assets, scheme modernization proposals…)
- Delivery Entitlement (DE) trading impact
6. Conceptual Design

Other tools:

- DE Assessment

INPUT DATA:

- Meteorological Data
- Crop Evapotranspiration
- Real Time Hydrometric Data
- Operation Procedures
- Water Demand

FEWS

Hydrological Model

Hydrodynamic Model
7. Components Design

Data integration

- AQUARIUS
- Citect
- SCADA
- CSIRO
- MI
- BoM
- IPMG
- State Water
- MIKE 11 + MIKE NAM

Hydraulic & Hydrological Data
Discharge + u/s level (boundary condition)
Running Sheets & Water Orders
Rainfall forecast
Kc
Weather Stations
Weather Stations
Weather stations, Gauging stations and Delivery Entitlement
Assets time series
Time series
Operational Planning System for Murrumbidgee Irrigation Area
7. Components Design

Delft FEWS

- User Interface GUI. (Displays, synoptics, time series, shp, rasters, …)
- Data integration (SCADA, Weather stations, water orders, …)
- Pre and Post data processing (parameters, indicators, …)
- Reporting
- Models Integration (MIKE 11, MIKE NAM)
- External modules running (tools)
- Data validation and data gap filling
- Managing User Privileges and Roles
7. Components Design

Hydrodynamic Model: MIKE 11

- Represents flow behavior through Supply and Drainage Channels
- Considers forecast runoff estimated by hydrological model and abstractions from Water Demand.
- Use Real Time Hydrometric data to perform Real Time simulations.
- Simulates response of the system of channels to the gate operation
- Connected with hydrological model through irrigation abstractions and runoff inputs
7. Components Design

Hydrological Model: MIKE NAM

- Represents hydrological processes: Rainfall, Surface flow, subsurface flow, evapotranspiration, evaporation, infiltration, etc...
- Runoff estimation from natural basins and properties.
- Determining property water requirements, based on weather forecast, crop requirements and previous irrigation orders.
- All in real time and forecast up to seven days
7. Components Design

Other tools:

- DE assessment tool
- Operation scheduling tool
- Operation strategy evaluation tool
- Scheme performance assessment tool
- Irrigation scheme modifications tool
- …
### 8. System Achievements

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scattered and heterogenic data</td>
<td>Data integrated into single framework</td>
</tr>
<tr>
<td>Limited data access</td>
<td>Data access from single framework</td>
</tr>
<tr>
<td>Limited real-time scheme data coverage</td>
<td>Increase scheme coverage with simulated data</td>
</tr>
<tr>
<td>Few historical data records</td>
<td>All data is recorded</td>
</tr>
<tr>
<td>Decisions primary based on staff experience</td>
<td>Decisions based on staff experience + simulation models</td>
</tr>
<tr>
<td>Decisions lack of transparency</td>
<td>Decisions quantification</td>
</tr>
<tr>
<td>Daily manual routines</td>
<td>Methodology defined + Automatic procedures</td>
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<tr>
<td>Vendor lock-in solutions</td>
<td>Open and Scalable solution</td>
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</tbody>
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