Effects of SCADA Innovation at the Riviera Berica District in Northern Italy

USCID Water Management Conference

Irrigated Agriculture Responds to Water Use Challenges — Strategies for Success

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Introduction

Agriculture in south Europe:

- up to 60% water abstractions
- 80% water consumption (evaporation, deep percolation)
- little data (irrigation sector)
- low efficiency irrigation systems
SCADA rapidly spread in the irrigation and drainage district in Italy in the past 10 years.

Districts were encouraged on doing so by pressures by the National Association of Consortia to use new funds available from the European Union and Regions.

The Irrigation and Drainage Riviera Berica District (District) was a 57,000-ha district embracing land in the Provinces of Padova, Vicenza and Verona in Northeastern Italy.

The District became part of the larger Irrigation and Drainage District Alta Pianura Veneta in 2010 (about 170,000 ha), as result of a general effort of the Italian Government to improve efficiency in the agriculture sector.

It was established in 1978, when many small Districts were merged together. These were mostly originated with the Repubblica Veneta but some are even older. We have information for the ex Consorzio Ottoville since 1100, owners working together to reclaim their land from floods. The ex Consorzio Ottoville is believed to be the oldest District in Italy. In the X century the Benedictines started most of the reclamation of the Veneto Region lands that were abandoned by the Romans due to Barbarians invasions.
General information

“Riviera Berica” Drainage and Irrigation District

- latitude 45°27’00”
- longitude 11°35’00”
- Total area 57,000 ha
- Total irrigated area: 13,000 ha (12,000 sprinkler, 600 flood irrigation, 400 micro-irrigation)
- Total water right flow rate: 5 m³/s
(area badino sotteso 169 km²)
Most of water is supplied through the Second Degree Irrigation District Lessinio Euganeo Berico (L.E.B.) by gravity
L’idea che ha ispirato la realizzazione del canale Pedemontano, ribadita nel progetto di massima del 1982, era quella di alimentare con le acque del fiume Adige tutti i corsi d’acqua compresi fra il Guà, il Bisatto ed il Bacchiglione, utilizzando al contempo la rete idraulica come principale struttura per l’irrigazione e la vivificazione dei corsi.

Il progetto generale del canale adduttore fra Guà e Bacchiglione per l’irrigazione ed il riordino idraulico della pianura del Veneto centrale fu presentato ed approvato dal Consorzio nel 1983.

Il progetto veniva così schematizzato in due interventi:
1. costruzione di un canale interrato in pressione, della lunghezza di 18,65 km, dal fiume Guà, a Cologna Veneta (VR), al canale Bisatto, a barbarano (VT), per una portata di 22,5 mc/s;
2. costruzione di un canale sotterraneo in pressione, della lunghezza di 9,063 km, dal canale Bisatto al Fiume Bacchiglione, a Cervarese S.ta Croce (PD), per una portata di 15 mc/s.

Montaggio cassaformà mobile interna  Gabbia armature  Manufatto sul canale Bisatto

Settimana nazionale della bonifica, 10-18 maggio 2008, Università di Padova, 16 maggio
<table>
<thead>
<tr>
<th><strong>Second degree Irrigation District Lessinio Euganeo Berico (L.E.B.)</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total surface (ha)</td>
<td>172,342</td>
</tr>
<tr>
<td>Irrigated surface (ha)</td>
<td>140,475</td>
</tr>
<tr>
<td>Associated Districts</td>
<td>5</td>
</tr>
<tr>
<td>Municipalities</td>
<td>103</td>
</tr>
<tr>
<td>Provinces</td>
<td>4</td>
</tr>
<tr>
<td><strong>Length:</strong></td>
<td></td>
</tr>
<tr>
<td>• Open canal from the Adige River to the Guà River (km)</td>
<td>16.2</td>
</tr>
<tr>
<td>• Pipe from the Gua’ River to the Bacchiglione River (km)</td>
<td>30</td>
</tr>
<tr>
<td>Diversions</td>
<td>38</td>
</tr>
<tr>
<td><strong>Water right:</strong></td>
<td></td>
</tr>
<tr>
<td>• Allocated (mc/s)</td>
<td>17</td>
</tr>
<tr>
<td>• Potential flow rate (mc/s)</td>
<td>50</td>
</tr>
</tbody>
</table>
SCADA is installed in 2004 in key points of the District area (on/off, flow, ultrasonic water level, gate position, monitoring and remote control)

- 3 irrigation pump stations
- 5 buster pumps
- 2 irrigation wells
- 1 irrigation diversion gate system
- About 70 electric valves
- About 300 farm outlets (about 60 are equipped to become electric valves)
- 2 control gate systems
- 4 drainage pump stations
DATA MANAGEMENT

• Used in real time for daily management
  • reduced losses
  • reduced risk of floods
  • organization of personnel
• Is not posted online
• Is not integrated with other databases (it can be used with GIS if downloaded manually)
Pre SCADA
• Management based on experience and carried out with field visit and use of radios among personnel
• Flow rate based on staff gages and meters at pump stations (manual reading)
• Inefficient irrigation and use of groundwater, which has high quality and high cost (private wells that go up to 200 m of depth)

Post SCADA
• Management in real time from the office of main structures (gates, pumps)
• Personnel go personally to these structures only in case of failure or flood conditions
• Flow rate known in real time for some key structures
• Reduction of errors in structures management and water losses
• More stable flow and pressure
Post SCADA (2004) – continue

• Reduction of field labor (alarms, “validated” farmers’ calls, specific areas)
• Personnel though is still busy in learning how to use new technology, implementing new operations routines, and managing new areas reached by irrigation thanks to the SCADA system
• Water managed more efficiently → yield more stable, better quality
• In particular, reduction of groundwater use (too high quality for farming), and increase of surface water use
• Smaller gates (control, diversion) are more expensive to connect: expensive to connect with electricity remote areas, wireless is considered unreliable (some test were done for water quality control stations only)
• Personnel happy and promoting further expansion of SCADA
• Easier to comply with old and new regulation (ex. revision of water rights, respect of “minimum vital flux” in canals)
ISSUES

• Data was not in a ready to use and understandable format (partially solved by involving contractors)

• Mistakes in operations

• Personnel sometime is frustrated with new type of problems
CONCLUSIONS
• Important step in the direction of monitoring flow rates and levels in large portions of the District

• 2011 District was merged to other two, within a Regional effort to rationalize water agencies. This was possible also because of the more efficient and standardized management of the distribution network using SCADA, which has been implemented in most Districts in the Veneto Region