Case Study: Chemical Dosing Precision Retrofit (Europe)

GIBES INOV – SCADA, PLC Retrofitting, and Industrial Process Optimization

Industry Overview

European water treatment facilities are bound by stringent EU directives such as the Water Framework Directive (WFD) and Urban Waste Water Treatment Directive (UWWTD). These regulations require high precision in chemical dosing for pH correction, coagulation, and disinfection processes. A dosing variance of even 2–3% can cause:

- Regulatory non-compliance penalties
- Excess chemical waste and high operational cost
- Suboptimal purification quality

Legacy PLCs, especially from the 1990s era, struggle to meet current precision and reporting requirements.

Client Background

A municipal water treatment plant in Europe relied on aging Allen-Bradley SLC 5/03 controllers. Their system suffered from:

- Unstable chemical dosing (up to $\pm 5\%$ variance)
- High chemical consumption cost
- Limited data logging capability
- High manual intervention by operators

The management sought to modernize their chemical injection system to achieve compliance-grade accuracy and automated reporting.

Key Metrics

Metric	Before GIBES INOV	After GIBES INOV	Result (KPI
Chemical Dosing Accuracy	±5% Variance	$< \pm 0.5\%$	90% Improveme
Chemical Consumption Cost	High	Reduced	35% Waste Reduc
Operator Intervention	Frequent	Near Zero	Autonomous Oper

Challenges & Constraints

The facility faced several constraints:

- Old SLC PLCs with slow scan times and limited analog precision.
- No historical logging or automatic reporting.
- A requirement for continuous plant operation, permitting only phased shutdowns.
- Flow variation due to demand cycles, making precise dosing more difficult.

GIBES INOV Solution Architecture

Hardware Retrofit

GIBES INOV performed a complete hardware upgrade featuring:

- Siemens S7-1500 PLC with high-speed analog modules.
- Integration with electromagnetic flowmeters capable of millisecond response.
- WinCC SCADA installation with redundant server architecture.

This enabled real-time, high-resolution measurement and reliable system uptime.

Advanced Control Logic

To achieve sub-percent dosing accuracy, GIBES INOV implemented:

- Feed-forward control based on instantaneous flow rates.
- Feedback PID loops tuned for chemical pump response.
- Adaptive correction algorithms to compensate for:
  - Temperature-induced viscosity changes

  - Flow fluctuations
  - Pump wear over time
- Auto-calibration routines triggered by daily plant cycles.

These measures ensured a stable dosing accuracy of better than ±0.5%.

SCADA & Data Layer

The new WinCC supervisory interface included:

- Live dosing graphs and flow trends
- Automatic anomaly detection and alarm routing
- 1-year rolling historical data storage
- Automated compliance reporting for regulatory agencies

Operators gained full visibility into chemical consumption trends, enabling more efficient planning.

Deliverables

- Replacement of obsolete SLC PLCs with Siemens S7-1500.
- Deployment of WinCC SCADA licensing and historian.
- Commissioning of high-speed flow and chemical dosing modules.
- 30-day performance validation with documented results.

Implementation Timeline

- **Week 1–3:** Site survey, electrical redesign, migration plan.
- **Week 4–8:** Hardware installation, flowmeter/PLC interfacing.
- **Week 9–12:** SCADA development, testing, tuning.
- **Week 13–14:** Phased commissioning, 30-day performance verification.

Results & Impact

The retrofit produced substantial improvements:

- Substantially increased chemical dosing accuracy ($< \pm 0.5\%$).
- Reduced chemical waste by 35%, lowering operational costs.
- Nearly eliminated manual intervention, increasing autonomy.
- Brought plant operations into compliance with EU water-quality directives.

The success of this project led the municipality to approve expansion of the upgraded system to additional treatment lines.

About GIBES INOV

GIBES INOV specializes in SCADA modernization, precision PLC retrofitting, IoT integration, and industrial process control for clients across Pakistan and Europe. Our engineering teams prioritize reliability, compliance, and long-term operational excellence.