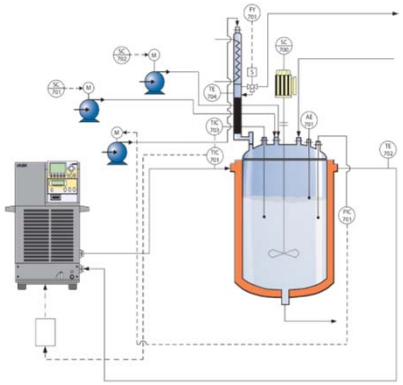
Good cooperation practice
PLIVA - University of Zagreb

Laboratory Batch Reactor Automation and Optimisation

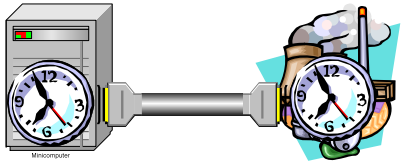


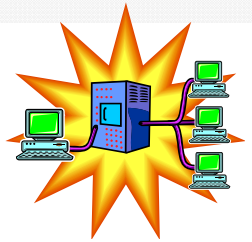
THE PURPOSE AND OBJECTIVE

- **Designing a system for easy experimentation in laboratory batch reactors.**

- **Modern process control system implementation:**

  - **Reliable and safe process control**
  - **Accuracy and repeatability of experiments**
  - **Continuous data acquisition**
  - **Analysis of experimental results**





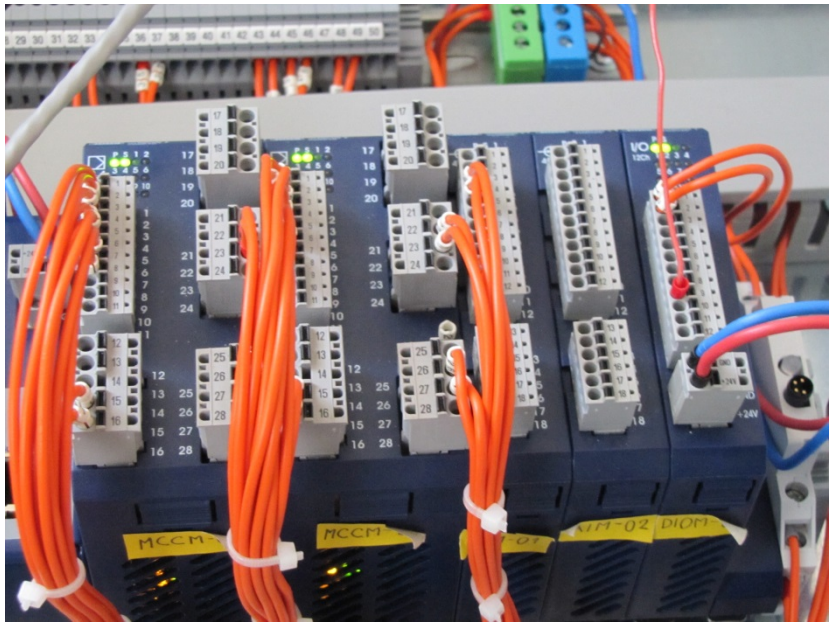
PROJECT ACTIVITIES

Group	Description
A	**Equipment supply**
1.	Supply of measuring equipment and materials
2.	Supply of computer, controller and dedicated software
3.	Calibration / validation of measuring devices
B	**System installation and configuration**
1.	Process flow (PFD) & Piping and instrumentation (P&I) diagrams
2.	Installation of measuring and control equipment
3.	Transducer configuration
4.	Control system design and configuration
5.	SCADA system instalation and configuration
6.	Technical documentation and operating instructions

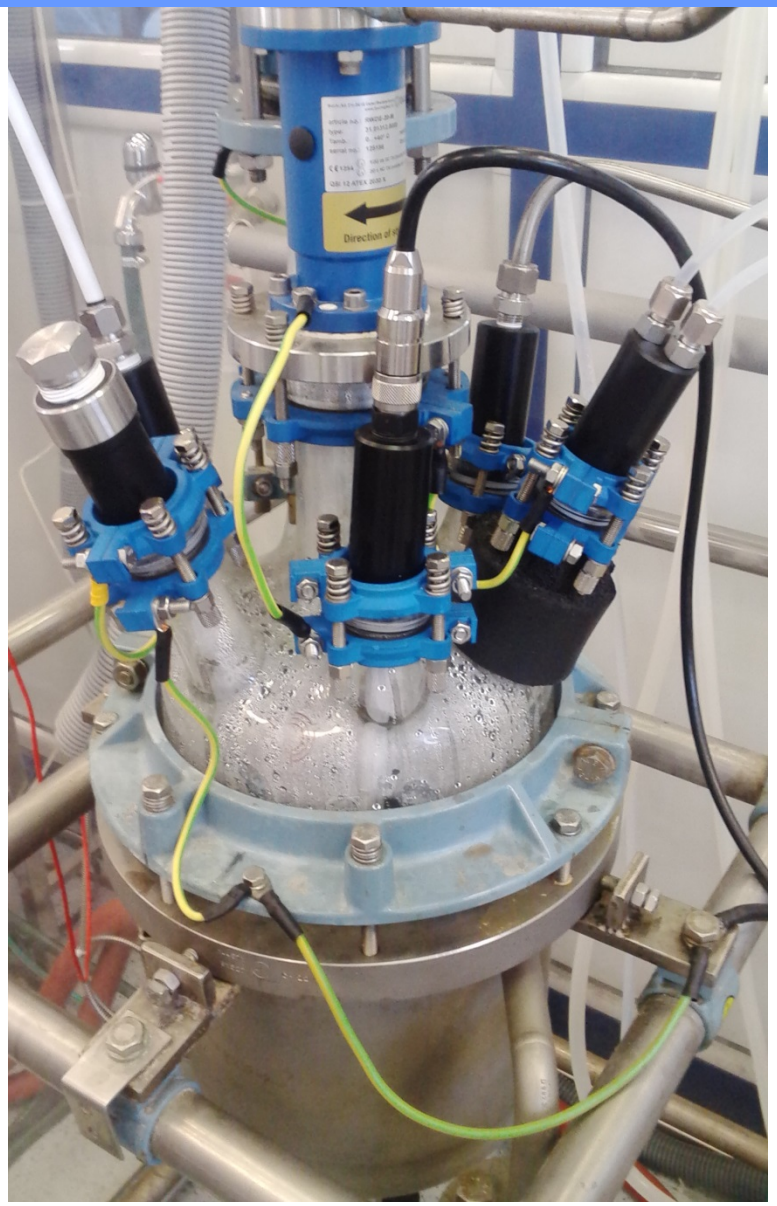
PROJECT IMPLEMENTATION

Group	Description
C	**System check and analysis**
1.	Testing of measuring equipment
2.	System start-up
D	**Control loop tuning and optimisation**
1.	Control system optimisation - Temperature control loops (heating/cooling) - Pressure/vacuum control loop - Destilate/reflux control loop
E	**System testing and commisioning**
1.	Testing and start-up
2.	Engineer and operator training

POWER INSTALLATIONS / CABINET



REACTOR/ PUMPS / THERMOSTAT

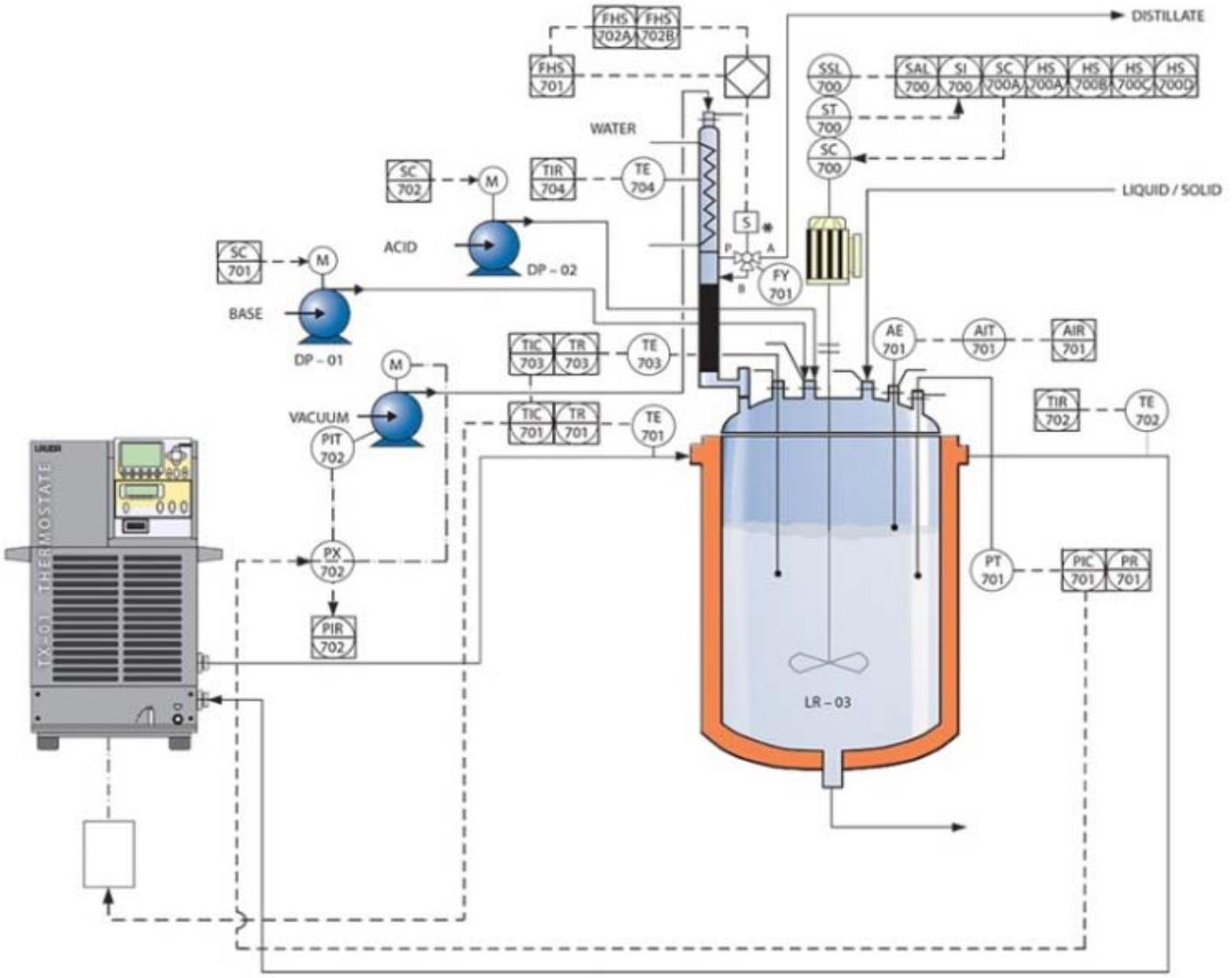


CONTROL SYSTEM CONFIGURATION

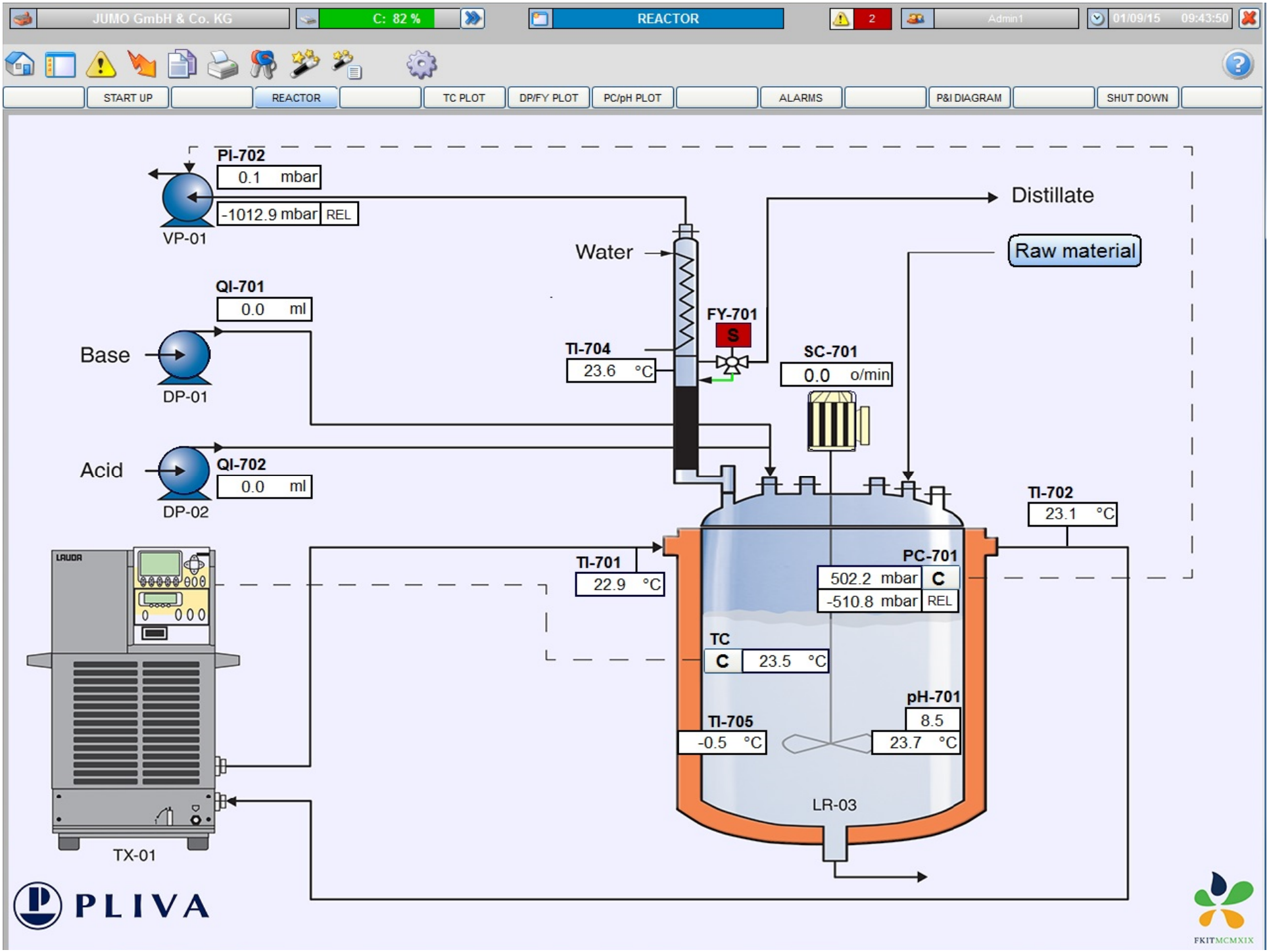
System configuration includes:

- **Inputs** and **outputs** configuration
- **Control loops** configuration
- **Sequencial logic** and programming of **sequences**
- **Alarm** configuration
- **Emergency shut down** (**EMD**) procedure
- **Operator interface** configuration
- **SCADA system** configuration

P&I DIAGRAM



TI-703	23.5	°C
TI-701	22.9	°C
TI-705	-0.5	°C
TI-702	23.1	°C
TI-704	23.6	°C
PI-701	502.2	mbar
	-510.9	mbar
PI-702	0.1	mbar
	-1012.9	mbar
pH-701	8.5	
QI-701	0.0	ml
QI-702	0.0	ml


JUMO GmbH & Co. KG
C: 82 %
REACTOR
2
Admin1
01/09/15 09:43:50
START UP
REACTOR
TC PLOT
DP/FY PLOT
PC/pH PLOT
ALARMS
P&I DIAGRAM
SHUT DOWN
PI-702
0.1 mbar
-1012.9 mbar REL
VP-01
Distillate
Water
Raw material
QI-701
0.0 ml
Base
DP-01
FY-701
S
TI-704
23.6 °C
SC-701
0.0 o/min
Acid
QI-702
0.0 ml
DP-02
TI-702
23.1 °C
TI-701
22.9 °C
PC-701
502.2 mbar C
-510.8 mbar REL
TC
C 23.5 °C
pH-701
8.5
TI-705
-0.5 °C
23.7 °C
LR-03
LAUDA
TX-01
PLIVA
FKITMCMXIX

OVERALL PROJECT ACHIEVEMENTS

- ✓ **Easy and intuitive conducting of the experiment**
- ✓ **Accurate, repeatable and reliable measurements**
- ✓ **Recording and analysis of experimental data**
- ✓ **Modern process control system application**
- ✓ **Interdisciplinary approach**
- ✓ **Reduced expences and optimal use of equipment**

PROJECT PARTICIPANTS AND STAFF

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- Ernest Meštrović
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- Igor Nežić

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- Stjepan Žigrović

INENCO d.o.o.,

- Hrvoje Zelenka

JUMO

- Martin Mohr
- Miroslav Lazar