

Using the PI System in Chemical Engineering Education and Research

Željka Ujević Andrijić & Nenad Bolf
University of Zagreb, Faculty of Chem.Eng. & Tech., Croatia



FKITMCMXIX



Content

- University of Zagreb, Faculty of Chemical Engineering 
- Laboratory for Automation and Measurement (**LAM**) 
- PI application in **chemical engineers education** 
- On-going **cooperation** with the **process industry** 
 - Heat Exchanger Monitoring example
 - Soft sensors application for product quality prediction
- Our further development and vision



University of Zagreb, Croatia



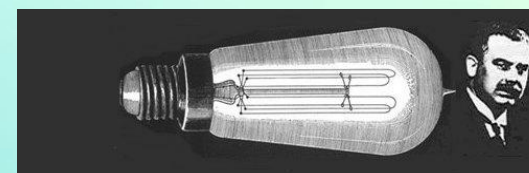
University of Zagreb (1669-) >60.000 students
the oldest and biggest university in South-Eastern Europe.

Faculty of Chemical Engineering & Technology, Zagreb



Research, investigation and education in the fields of chemical engineering and chemistry

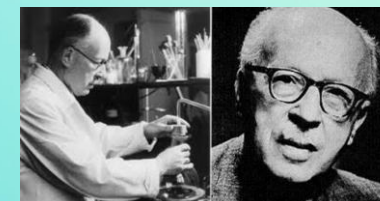
Franjo Hanaman (1878–1941)
professor of inorganic chemistry
inventor of tungsten filament in light bulb



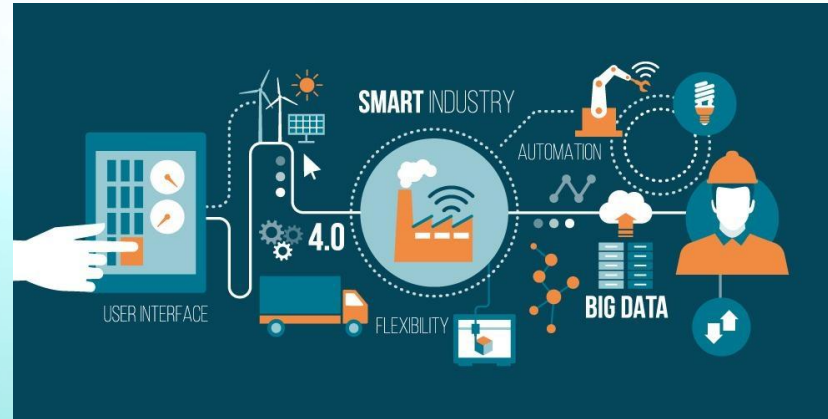
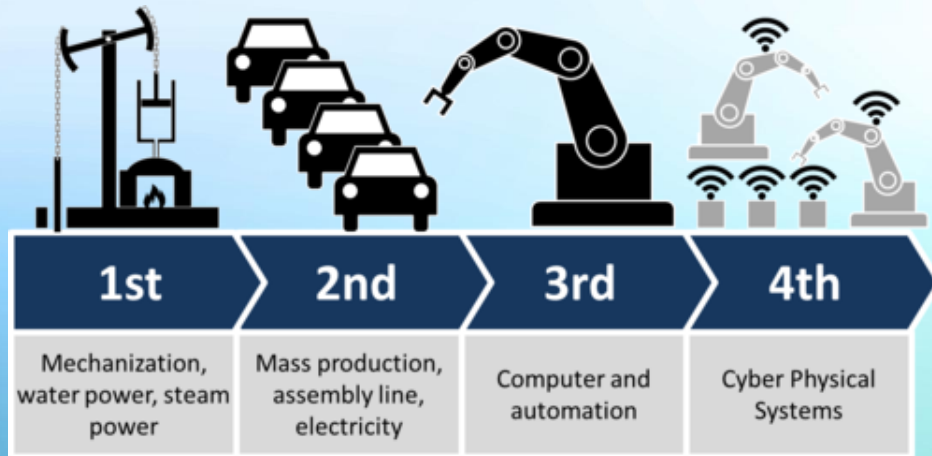
Vladimir Prelog (1906–1998)
professor of organic chemistry
1975 Nobel Prize winner



Lavoslav Ružička (1887–1976)
professor of organic chemistry
1939 Nobel Prize winner



Challenges in industry, science and education

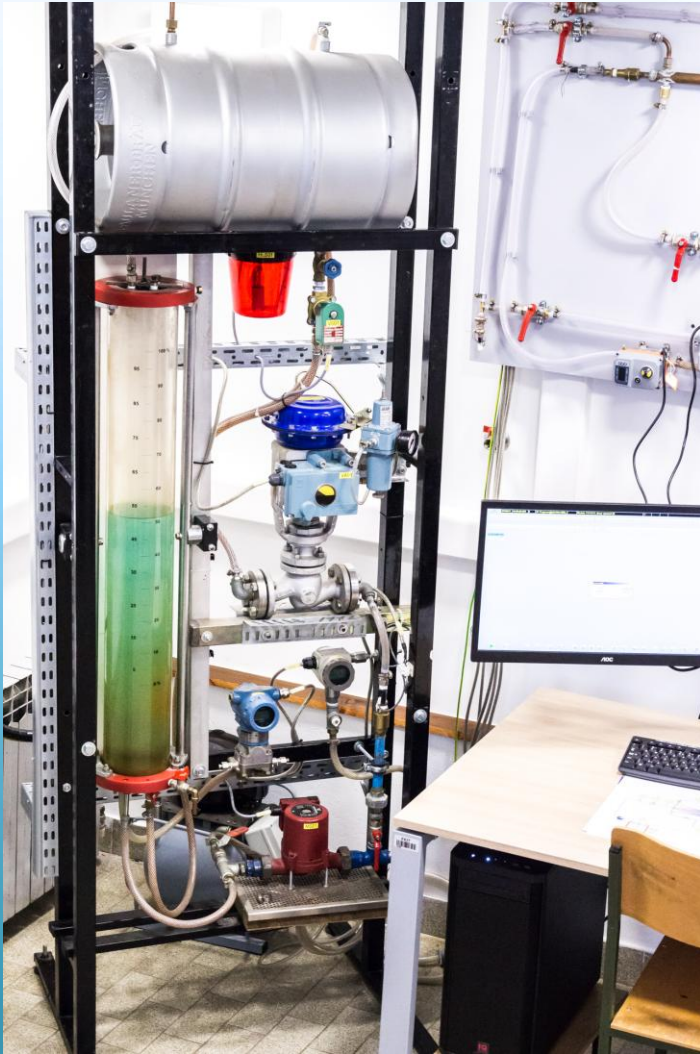


Laboratory for Automation & Measurements

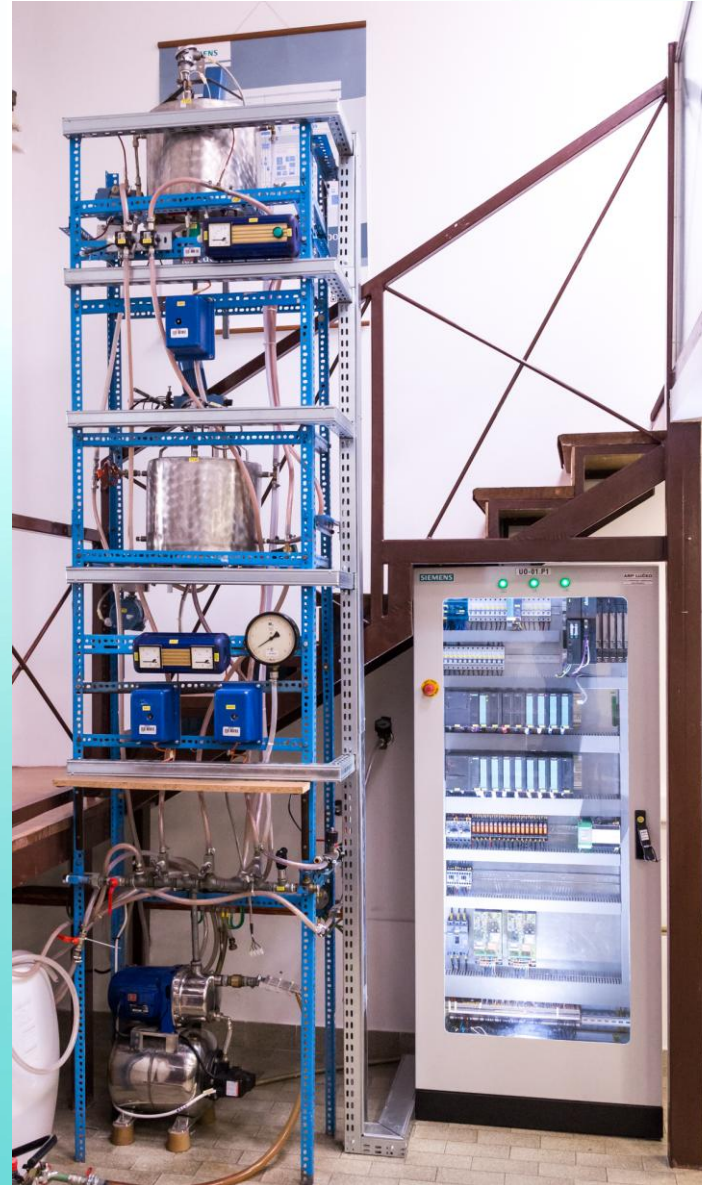


- Process control equipment, the-state-of-the-art industrial control system and PI software
- Intended for student education in process measurement and control
- Support for industrial stuff training, operator training and life-long education
- Basic and advanced process control methods
- Monitoring, diagnostics and predictive maintenance

Laboratory set-up



Level control, dynamics analysis & controller tuning



Serial CST reactors / heat exchangers



Controller cabinet

Laboratory set-up



Tubular heat exchanger



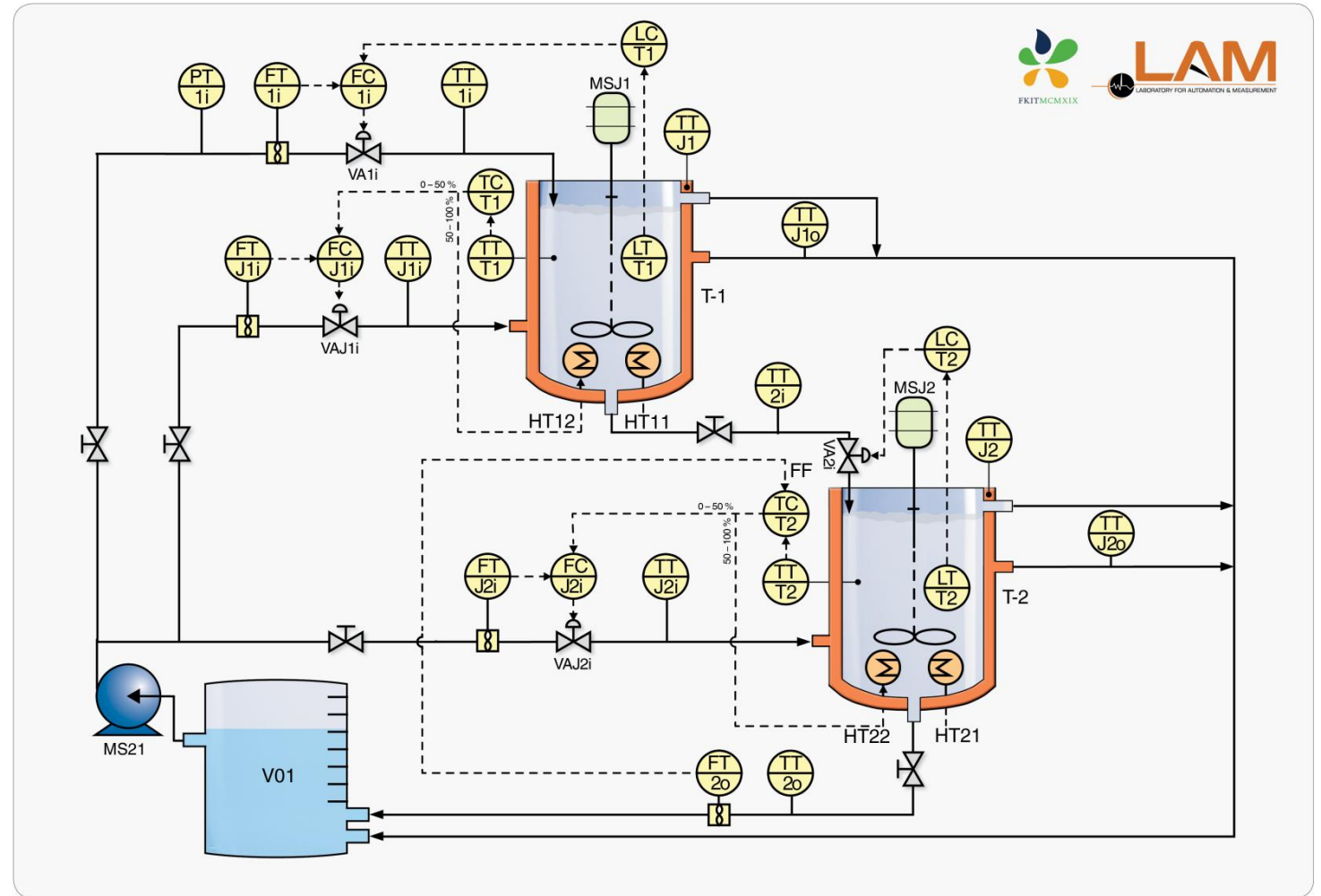
Batch distillation process



Batch reactor

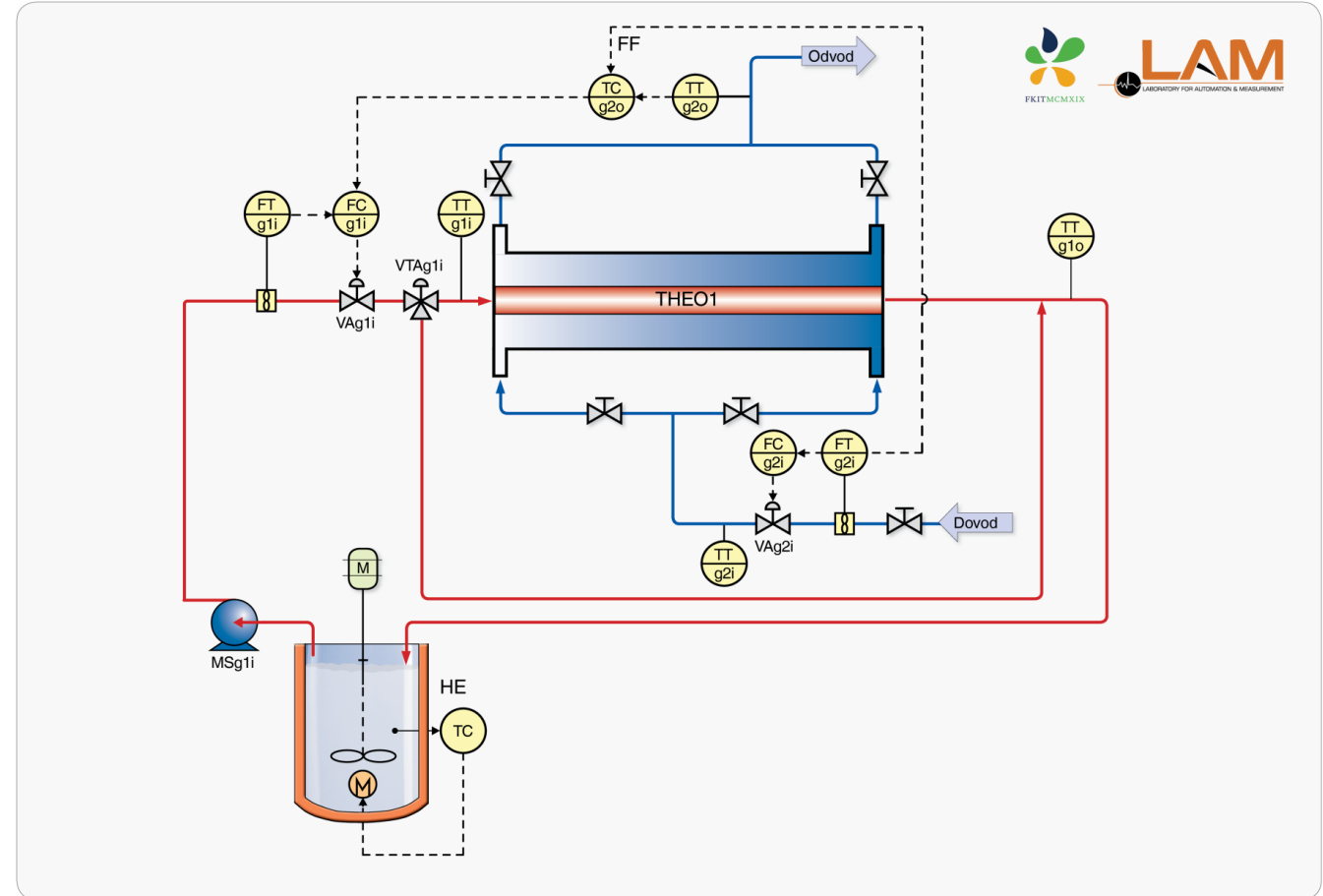
Process control - Basic and advanced concepts

- Feedback & feedforward control strategy
 - Cascade control
 - Split control
 - Override control
 - Gain scheduling
- and
- **Typical industrial process control problems**
 - **Advanced topics**
 - Helps to bridge the gap....!



Process control – Advanced topics, monitoring & diagnostics

- HE control
 - Parallel / Concurrent flow
 - Dead time compensation
 - Model-based control
 - Feedforward control
 - HE monitoring & diagnostics
-
- From **basic concepts** to **advanced process control and diagnostics**

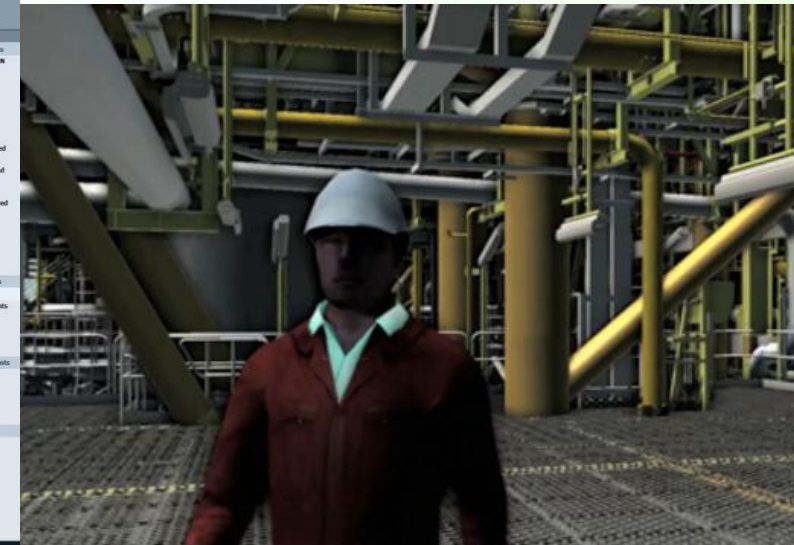
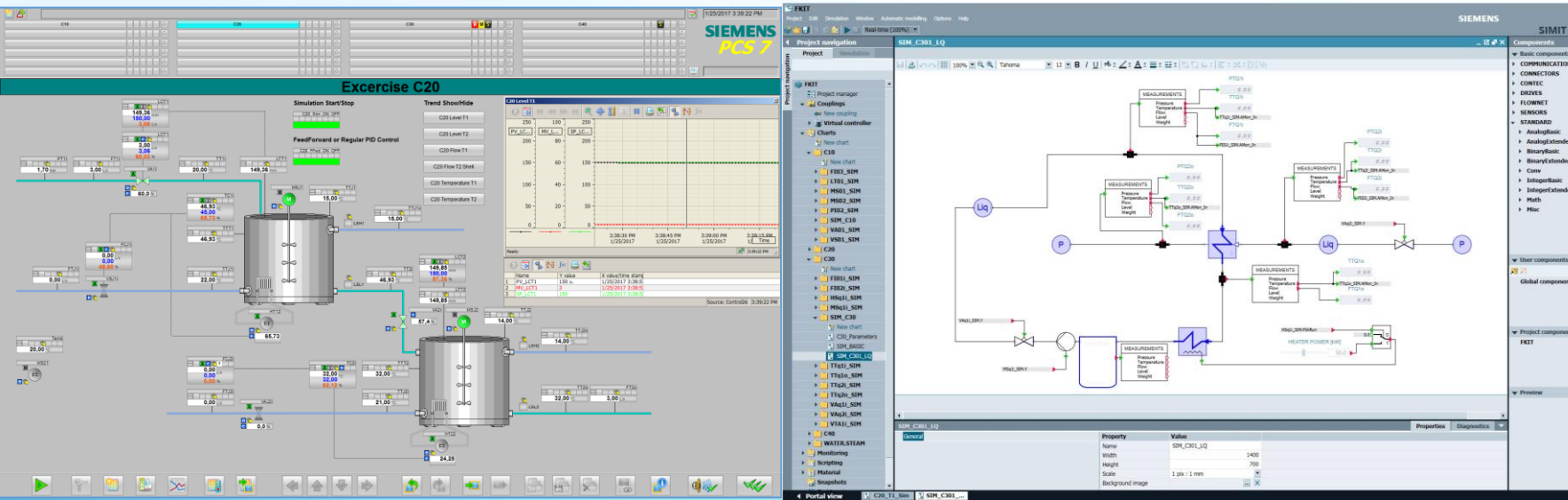


Control system & software support



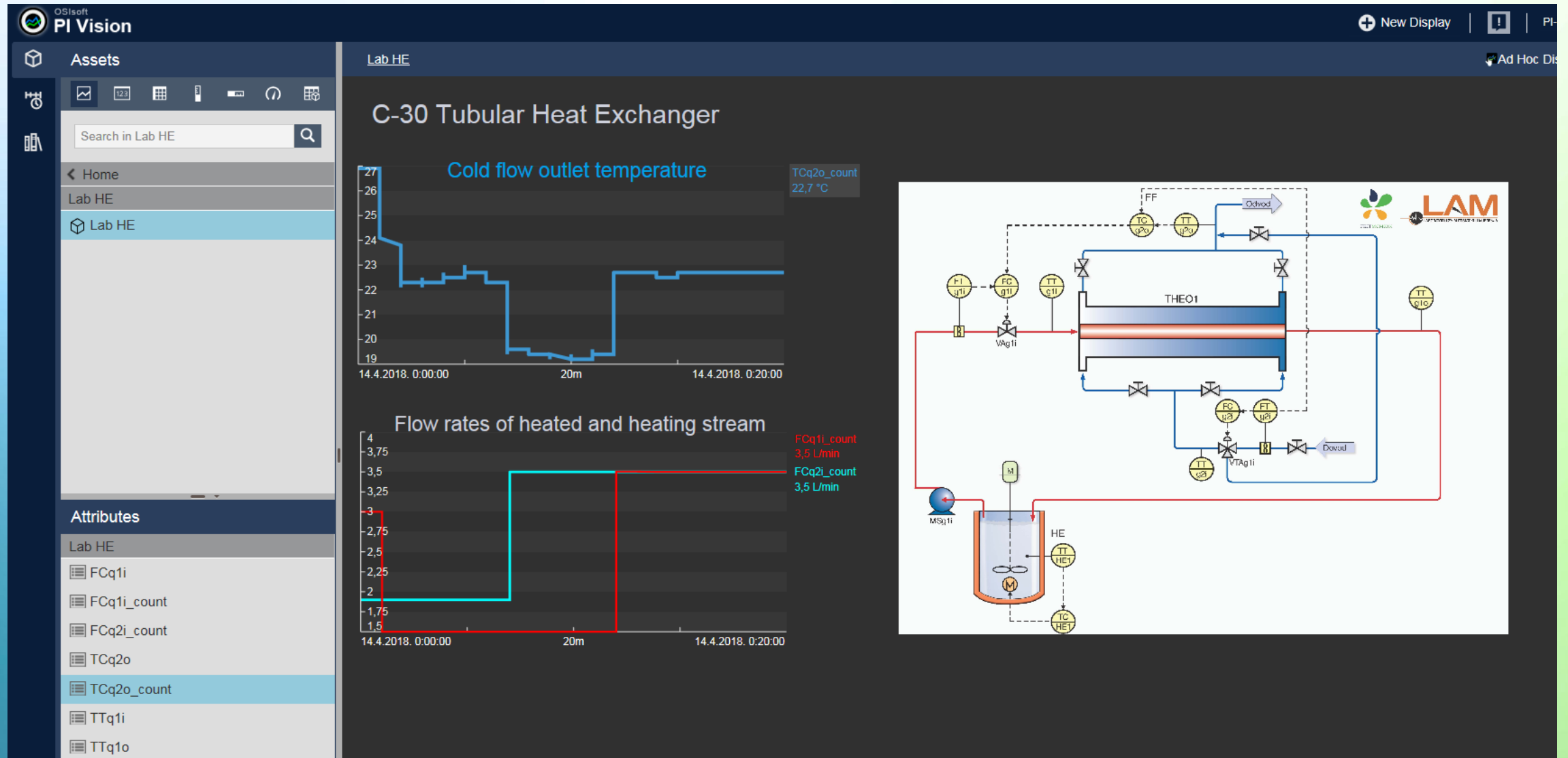
- Supported by the latest generation SIMATIC PCS7 system
- Enables **continuous experimentation** and later **data analysis**
- SCADA Win CC system emulating **real control room** environment

SCADA system & simulation

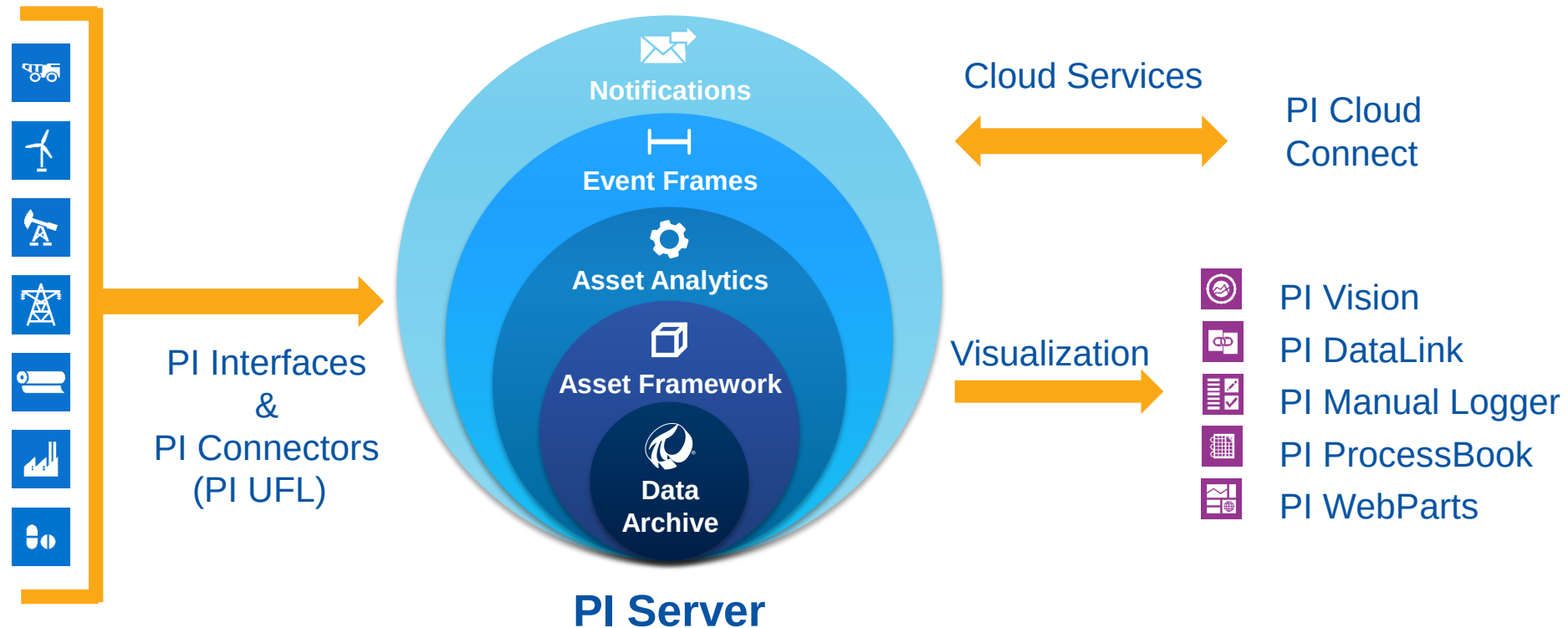


- Operator interface
- Simulation package Siemens SIMIT
- Virtual controller
- **Walk-inside** 3D plant visualisation
- Virtual commissioning for industry

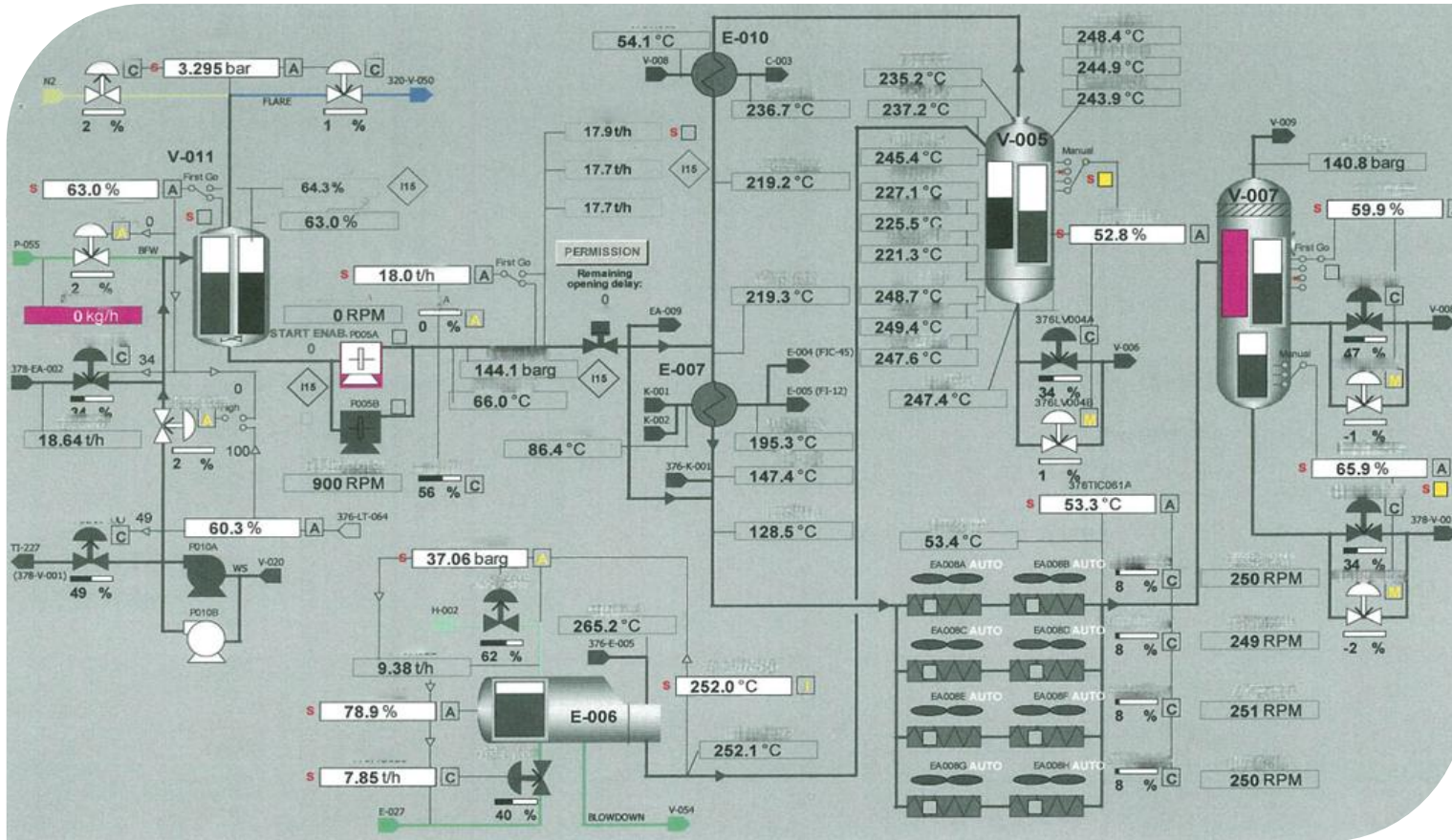
PI Vision display in the laboratory



PI system components at FKIT



Heat exchanger monitoring in hydrocracker plant

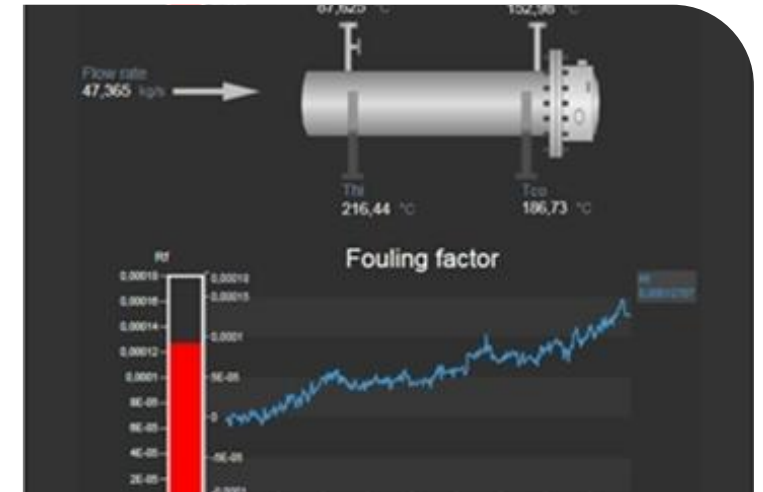




FKITMCMXIX



Heat exchanger performance monitoring at INA/MOL Refinery Rijeka Croatia



CHALLENGE

Predictive maintenance for improving **heat transfer efficiency** and reducing operating costs:

- Fouling impacts on thermal and mechanical performance of heat exchangers
- Operation stability, change of operating conditions.

SOLUTION

Data-driven models for on-line monitoring of heat transfer efficiency by monitoring of:

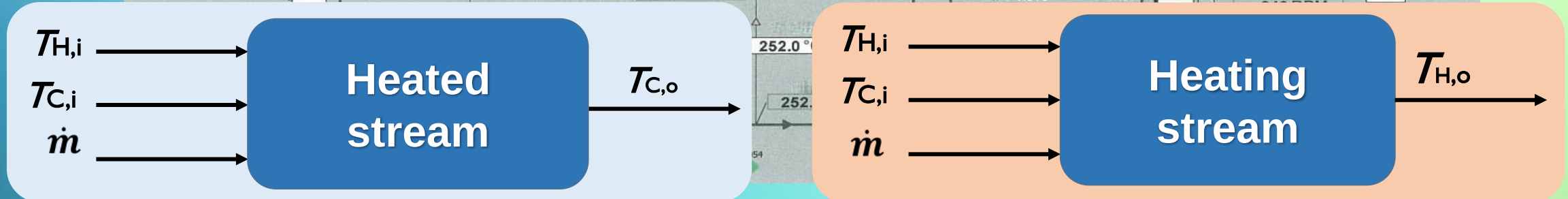
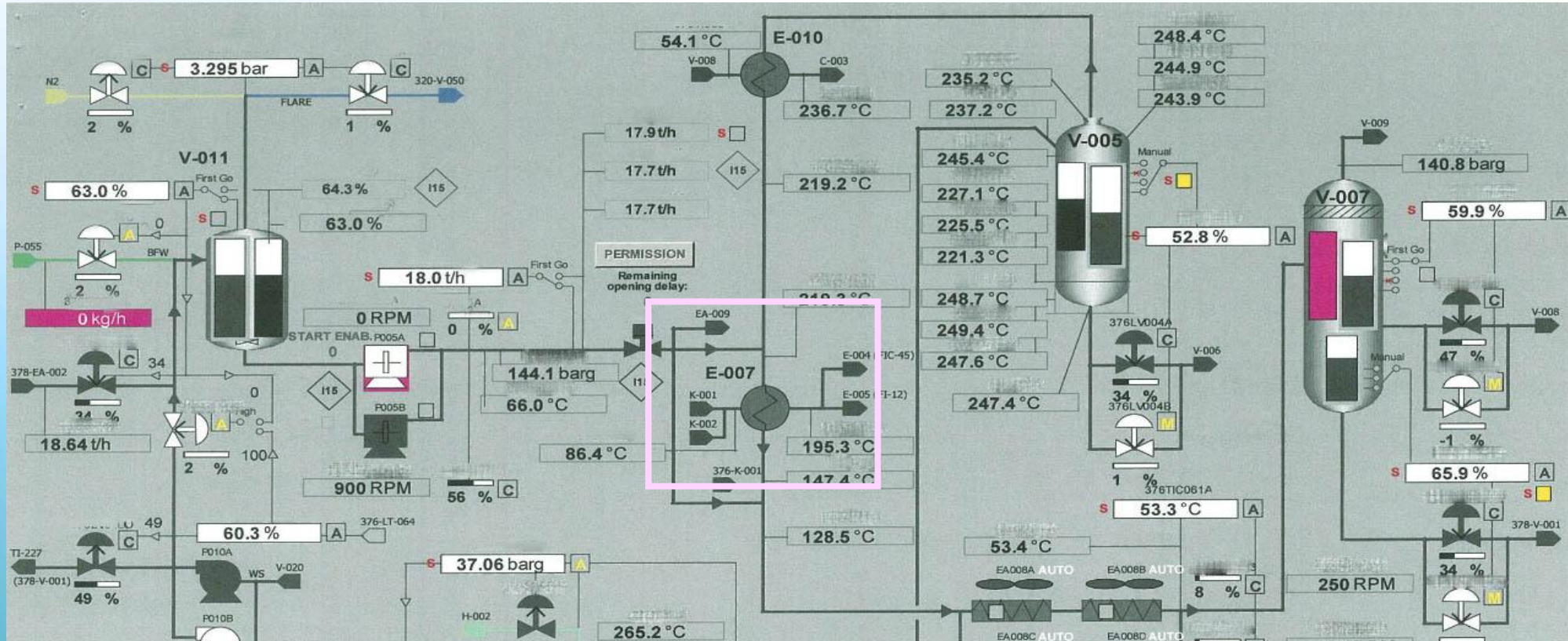
- Heat exchanger duty, heat coefficient, fouling coefficient
- Calculations in PI Asset Analytics
- Continuous monitoring in PI Vision.

RESULTS

Continuous monitoring of heat exchanger performance and fouling formation:

- Enables preventive maintenance programme
- More stable plant operation and significant operating savings

Hydrocracker plant – Heat exchanger



Creating heat exchanger asset in PI System Explorer

Heat Exchanger E-007

Category: Calculations

Name	Value
delT1	29,70497 delta °C
delT2	65,35562 delta °C
delTshell	99,10873 delta °C
delTtube	63,45808 delta °C
Hc	9883,981 W
Hh	21746,32 kW
Rf	0,000127066582
Tco_pred	192,249 °C
Tco_residual	5,515305 delta °C
Tho_pred	149,2918 °C
Ucc	2357,863 W/(m2K)
Ufc	1814,291 W/(m2K)

Category: Process Variables

Name	Value
flow rate 1	47,36488 kg/s
flow rate 2	0,6528734 kg/s
Tci	87,62497 °C
Tco	186,7337 °C
Thi	216,4387 °C
Tho	152,9806 °C

Category: Properties

Name	Value
A	389 m2
cp	7025 J/(kg K)
F	1
Hydrocrac...	n/a

Time Series Data

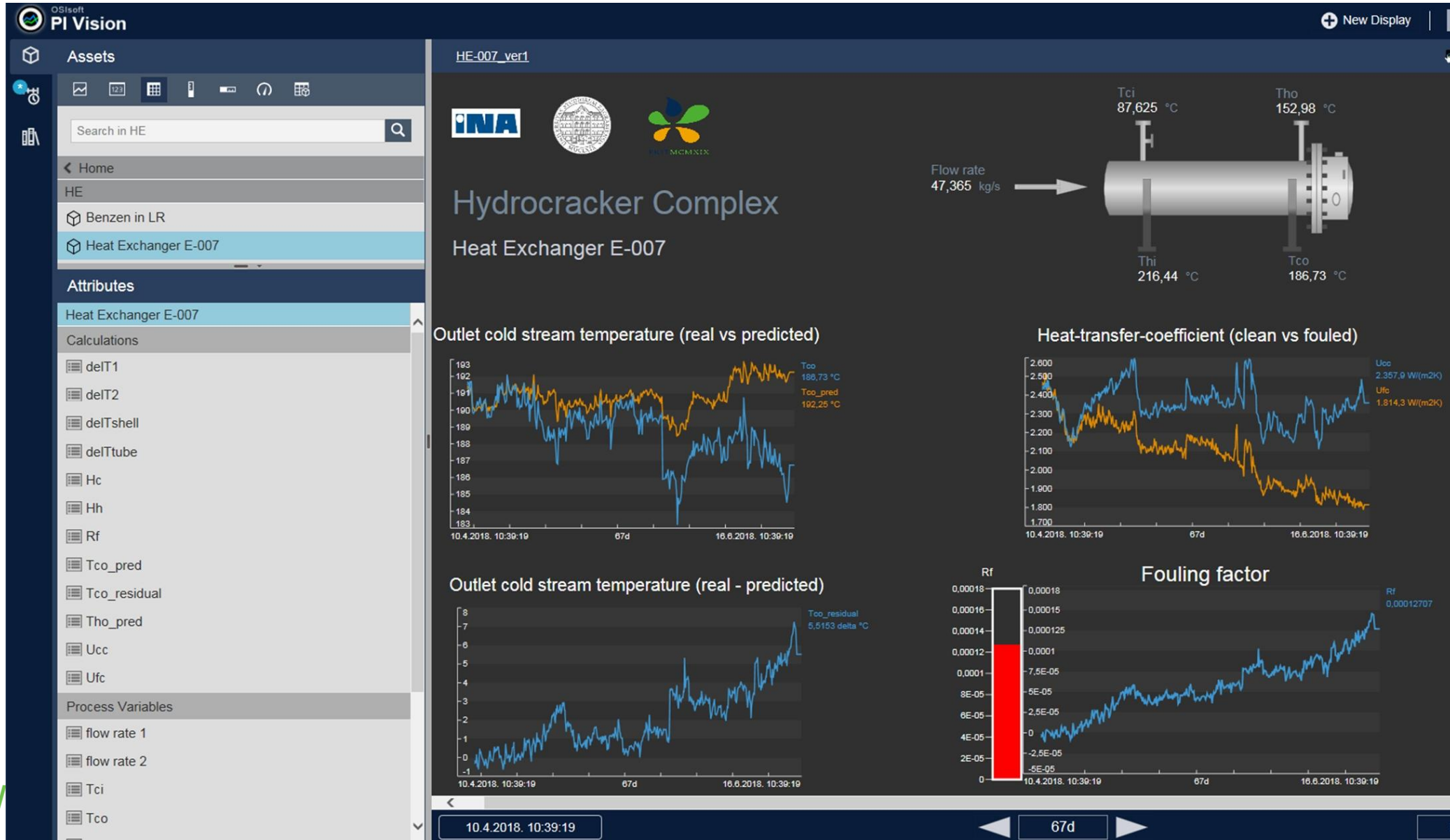
Attribute: Ufc
Start Time: 14.4.2018. 00:00:00
End Time: 5.2018. 23:30:41
Retrieval Type: Time Range
Boundary Type: Inside
Filter:
Show Filtered: ☐
Reset Refresh

Time Stamp	Value
14.4.2018. 0:00:00	2460,6328125 W/(m2K)
14.4.2018. 0:01:00	2460,48583984375 W/(m2K)
14.4.2018. 0:02:00	2460,34057617188 W/(m2K)
14.4.2018. 0:03:00	2460,19677734375 W/(m2K)
14.4.2018. 0:04:00	2460,05444335938 W/(m2K)
14.4.2018. 0:05:00	2459,9140625 W/(m2K)
14.4.2018. 0:06:00	2459,77514648438 W/(m2K)
14.4.2018. 0:07:00	2459,63818359375 W/(m2K)
14.4.2018. 0:08:00	2459,50341796875 W/(m2K)
14.4.2018. 0:09:00	2459,37036132813 W/(m2K)

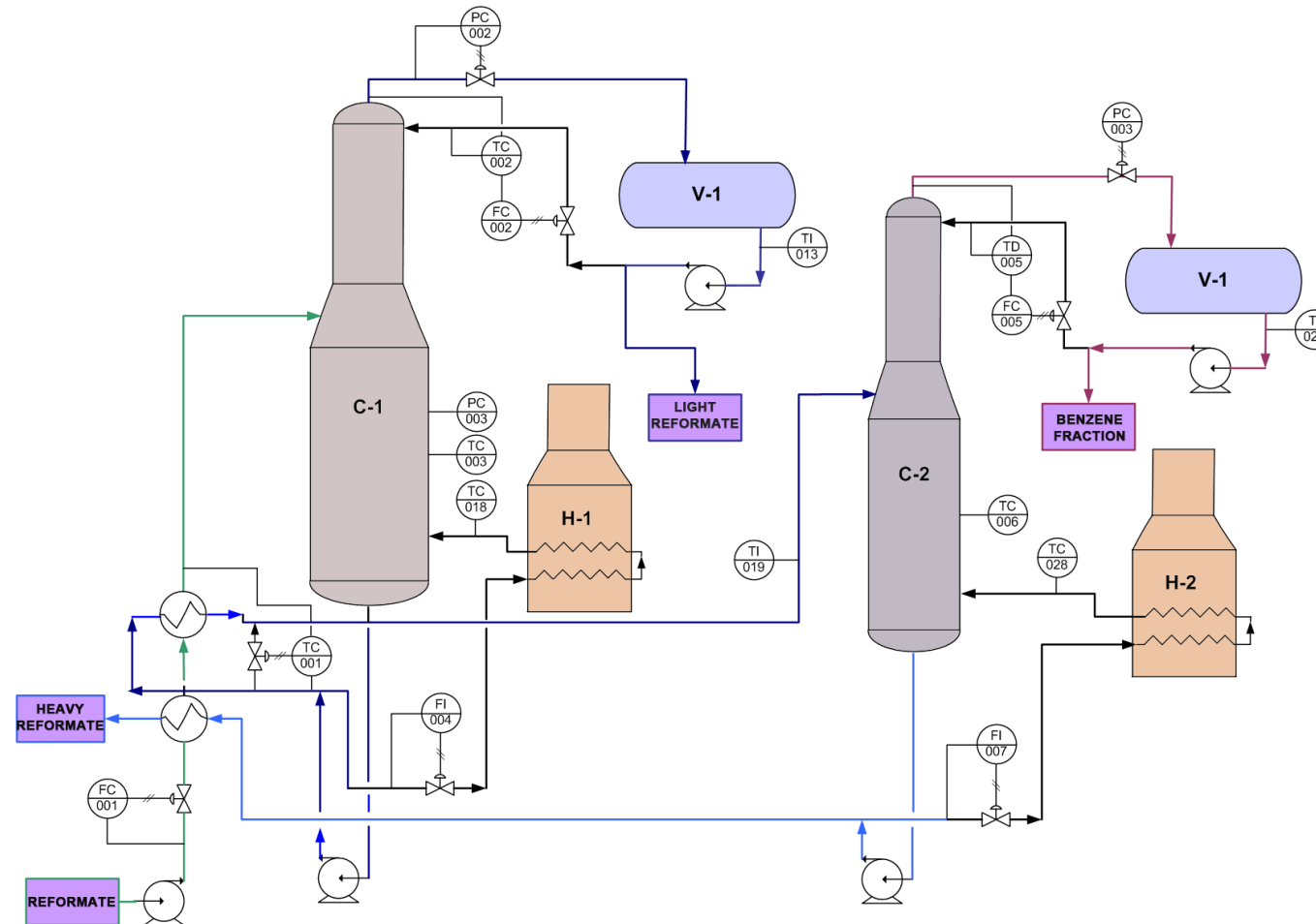
Trend

2161,73
2150
2140
2130
2120
2110
2100
2090
2080
2070
2060
2050
2040
2030
2020
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
1850
1840
1830
1820
1810
1800
1790
1780
1770
1760
1750
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
1580
1570
1560
1550
1540
1530
1520
1510
1500
1490
1480
1470
1460
1450
1440
1430
1420
1410
1400
1390
1380
1370
1360
1350
1340
1330
1320
1310
1300
1290
1280
1270
1260
1250
1240
1230
1220
1210
1200
1190
1180
1170
1160
1150
1140
1130
1120
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
980
970
960
950
940
930
920
910
900
890
880
870
860
850
840
830
820
810
800
790
780
770
760
750
740
730
720
710
700
690
680
670
660
650
640
630
620
610
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
-210
-220
-230
-240
-250
-260
-270
-280
-290
-300
-310
-320
-330
-340
-350
-360
-370
-380
-390
-400
-410
-420
-430
-440
-450
-460
-470
-480
-490
-500
-510
-520
-530
-540
-550
-560
-570
-580
-590
-600
-610
-620
-630
-640
-650
-660
-670
-680
-690
-700
-710
-720
-730
-740
-750
-760
-770
-780
-790
-800
-810
-820
-830
-840
-850
-860
-870
-880
-890
-900
-910
-920
-930
-940
-950
-960
-970
-980
-990
-1000
-1010
-1020
-1030
-1040
-1050
-1060
-1070
-1080
-1090
-1100
-1110
-1120
-1130
-1140
-1150
-1160
-1170
-1180
-1190
-1200
-1210
-1220
-1230
-1240
-1250
-1260
-1270
-1280
-1290
-1300
-1310
-1320
-1330
-1340
-1350
-1360
-1370
-1380
-1390
-1400
-1410
-1420
-1430
-1440
-1450
-1460
-1470
-1480
-1490
-1500
-1510
-1520
-1530
-1540
-1550
-1560
-1570
-1580
-1590
-1600
-1610
-1620
-1630
-1640
-1650
-1660
-1670
-1680
-1690
-1700
-1710
-1720
-1730
-1740
-1750
-1760
-1770
-1780
-1790
-1800
-1810
-1820
-1830
-1840
-1850
-1860
-1870
-1880
-1890
-1900
-1910
-1920
-1930
-1940
-1950
-1960
-1970
-1980
-1990
-2000
-2010
-2020
-2030
-2040
-2050
-2060
-2070
-2080
-2090
-2100
-2110
-2120
-2130
-2140
-2150
-2160
-2170
-2180
-2190
-2200
-2210
-2220
-2230
-2240
-2250
-2260
-2270
-2280
-2290
-2300
-2310
-2320
-2330
-2340
-2350
-2360
-2370
-2380
-2390
-2400
-2410
-2420
-2430
-2440
-2450
-2460
-2470
-2480
-2490
-2500
-2510
-2520
-2530
-2540
-2550
-2560
-2570
-2580
-2590
-2600
-2610
-2620
-2630
-2640
-2650
-2660
-2670
-2680
-2690
-2700
-2710
-2720
-2730
-2740
-2750
-2760
-2770
-2780
-2790
-2800
-2810
-2820
-2830
-2840
-2850
-2860
-2870
-2880
-2890
-2900
-2910
-2920
-2930
-2940
-2950
-2960
-2970
-2980
-2990
-3000
-3010
-3020
-3030
-3040
-3050
-3060
-3070
-3080
-3090
-3100
-3110
-3120
-3130
-3140
-3150
-3160
-3170
-3180
-3190
-3200
-3210
-3220
-3230
-3240
-3250
-3260
-3270
-3280
-3290
-3300
-3310
-3320
-3330
-3340
-3350
-3360
-3370
-3380
-3390
-3400
-3410
-3420
-3430
-3440
-3450
-3460
-3470
-3480
-3490
-3500
-3510
-3520
-3530
-3540
-3550
-3560
-3570
-3580
-3590
-3600
-3610
-3620
-3630
-3640
-3650
-3660
-3670
-3680
-3690
-3700
-3710
-3720
-3730
-3740
-3750
-3760
-3770
-3780
-3790
-3800
-3810
-3820
-3830
-3840
-3850
-3860
-3870
-3880
-3890
-3900
-3910
-3920
-3930
-3940
-3950
-3960
-3970
-3980
-3990
-4000
-4010
-4020
-4030
-4040
-4050
-4060
-4070
-4080
-4090
-4100
-4110
-4120
-4130
-4140
-4150
-4160
-4170
-4180
-4190
-4200
-4210
-4220
-4230
-4240
-4250
-4260
-4270
-4280
-4290
-4300
-4310
-4320
-4330
-4340
-4350
-4360
-4370
-4380
-4390
-4400
-4410
-4420
-4430
-4440
-4450
-4460
-4470
-4480
-4490
-4500
-4510
-4520
-4530
-4540
-4550
-4560
-4570
-4580
-4590
-4600
-4610
-4620
-4630
-4640
-4650
-4660
-4670
-4680
-4690
-4700
-4710
-4720
-4730
-4740
-4750
-4760
-4770
-4780
-4790
-4800
-4810
-4820
-4830
-4840
-4850
-4860
-4870
-4880
-4890
-4900
-4910
-4920
-4930
-4940
-4950
-4960
-4970
-4980
-4990
-5000
-5010
-5020
-5030
-5040
-5050
-5060
-5070
-5080
-5090
-5100
-5110
-5120
-5130
-5140
-5150
-5160
-5170
-5180
-5190
-5200
-5210
-5220
-5230
-5240
-5250
-5260
-5270
-5280
-5290
-5300
-5310
-5320
-5330
-5340
-5350
-5360
-5370
-5380
-5390
-5400
-5410
-5420
-5430
-5440
-5450
-5460
-5470
-5480
-5490
-5500
-5510
-5520
-5530
-5540
-5550
-5560
-5570
-5580
-5590
-5600
-5610
-5620
-5630
-5640
-5650
-5660
-5670
-5680
-5690
-5700
-5710
-5720
-5730
-5740
-5750
-5760
-5770
-5780
-5790
-5800
-5810
-5820
-5830
-5840
-5850
-5860
-5870
-5880
-5890
-5900
-5910
-5920
-5930
-5940
-5950
-5960
-5970
-5980
-5990
-6000
-6010
-6020
-6030
-6040
-6050
-6060
-6070
-6080
-6090
-6100
-6110
-6120
-6130
-6140
-6150
-6160
-6170
-6180
-6190
-6200
-6210
-6220
-6230
-6240
-6250
-6260
-6270
-6280
-6290
-6300
-6310
-6320
-6330
-6340
-6350
-6360
-6370
-6380
-6390
-6400
-6410
-6420
-6430
-6440
-6450
-6460
-6470
-6480
-6490
-6500
-6510
-6520
-6530
-6540
-6550
-6560
-6570
-6580
-6590
-6600
-6610
-6620
-6630
-6640
-6650
-6660
-6670
-6680
-6690
-6700
-6710
-6720
-6730
-6740
-6750
-6760
-6770
-6780
-6790
-6800
-6810
-6820
-6830
-6840
-6850
-6860
-6870
-6880
-6890
-6900
-6910
-6920
-6930
-6940
-6950
-6960
-6970
-6980
-6990
-7000
-7010
-7020
-7030
-7040
-7050
-7060
-7070
-7080
-7090
-7100
-7110
-7120
-7130
-7140
-7150
-7160
-7170
-7180
-7190
-7200
-7210
-7220
-7230
-7240
-7250
-7260
-7270
-7280
-7290
-7300
-7310
-7320
-7330
-7340
-7350
-7360
-7370
-7380
-7390
-7400
-7410
-7420
-7430
-7440
-7450
-7460
-7470
-7480
-7490
-7500
-7510
-7520
-7530
-7540
-7550
-7560
-7570
-7580
-7590
-7600
-7610
-7620
-7630
-7640
-7650
-7660
-7670
-7680
-7690
-7700
-7710
-7720
-7730
-7740
-7750
-7760
-7770
-7780
-7790
-7800
-7810
-7820
-7830
-7840
-7850
-7860
-7870
-7880
-7890
-7900
-7910
-7920
-7930
-7940
-7950
-7960
-7970
-7980
-7990
-8000
-8010
-8020
-8030
-8040
-8050
-8060
-8070
-8080
-8090
-8100
-8110
-8120
-8130
-8140
-8150
-8160
-8170
-8180
-8190
-8200
-8210
-8220
-8230
-8240
-8250
-8260
-8270
-8280
-8290
-8300
-8310
-8320
-8330
-8340
-8350
-8360
-8370
-8380
-8390
-8400
-8410
-8420
-8430
-8440
-8450
-8460
-8470
-8480
-8490
-8500
-8510
-8520
-8530
-8540
-8550
-8560
-8570
-8580
-8590
-8600
-8610
-8620
-8630
-8640
-8650
-8660
-8670
-8680
-8690
-8700
-8710
-8720
-8730
-8740
-8750
-8760
-8770
-8780
-8790
-8800
-8810
-8820
-8830
-8840
-8850
-8860
-8870
-8880
-8890
-8900
-8910
-8920
-8930
-8940
-8950
-8960
-8970
-8980
-8990
-9000
-9010
-9020
-9030
-9040
-9050
-9060
-9070
-9080
-9090
-9100
-9110
-9120
-9130
-9140
-9150
-9160
-9170
-9180
-9190
-9200
-9210
-9220
-9230
-9240
-9250
-9260
-9270
-9280
-9290
-9300
-9310
-9320
-9330
-9340
-9350
-9360
-9370
-9380
-9390
-9400
-9410
-9420
-9430
-9440
-9450
-9460
-9470
-9480
-9490
-9500
-9510
-9520
-9530
-9540
-9550
-9560
-9570
-9580
-9590
-9600
-9610
-9620
-9630
-9640
-9650
-9660
-9670
-9680
-9690
-9700
-9710
-9720
-9730
-9740
-9750
-9760
-9770
-9780
-9790
-9800
-9810
-9820
-9830
-9840
-9850
-9860
-9870
-9880
-9890
-9900
-9910
-9920
-9930
-9940
-9950
-9960
-9970
-9980
-9990
-10000
-10010
-10020
-10030
-10040
-10050
-10060
-10070
-10080
-10090
-10100
-10110
-10120
-10130
-10140
-10150
-10160
-10170
-10180
-10190
-10200
-10210
-10220
-10230
-10240
-10250
-10260
-10270
-10280
-10290
-10300
-10310
-10320
-10330
-10340
-10350
-10360
-10370
-10380
-10390
-10400
-10410
-10420
-10430
-10440
-10450
-10460
-10470
-10480
-10490
-10500
-10510
-10520
-10530
-10540
-10550
-10560
-10570
-10580
-10590
-10600
-10610
-10620
-10630
-10640
-10650
-10660
-10670
-10680
-10690
-10700
-10710
-10720
-10730
-10740
-10750
-10760
-10770
-10780
-10790
-10800
-10810
-10820
-10830
-10840
-10850
-10860
-10870
-10880
-10890
-10900
-10910
-10920
-10930
-10940
-10950
-10960
-10970
-10980
-10990
-11000
-11010
-11020
-11030
-11040
-11050
-11060
-11070
-11080
-11090
-11100
-11110
-11120
-11130
-11140
-11150
-11160
-11170
-11180
-11190
-11200
-11210
-11220
-11230
-11240
-11250
-11260
-11270
-11280
-11290
-11300
-11310
-11320
-11330
-11340
-11350
-11360
-11370
-11380
-11390
-11400
-11410
-11420
-11430
-11440
-11450
-11460
-11470
-11480
-11490
-11500
-11510
-11520
-11530
-11540
-11550
-11560
-11570
-11580
-11590
-11600
-11610
-11620
-11630
-11640
-11650
-11660
-11670
-11680
-11690
-11700
-11710
-11720
-11730
-11740
-11750
-11760
-11770
-11780
-11790
-11800
-11810
-11820
-11830
-11840
-11850
-11860
-11870
-11880
-11890
-11900
-11910
-11920
-11930
-11940
-11950
-11960
-11970
-11980
-11990
-12000
-12010
-12020
-12030
-12040
-12050
-12060
-12070
-12080
-12090
-12100
-12110
-12120
-12130
-12140
-12150
-12160
-12170
-12180
-12190
-12200
-12210
-12220
-12230
-12240
-12250
-12260
-12270
-12280
-12290
-12300
-12310
-12320
-12330
-12340
-12350
-12360
-12370
-12380
-12390
-12400
-12410
-12420
-12430
-12440
-12450
-12460
-12470
-12480
-12490
-12500
-12510
-12520
-12530
-12540
-12550
-12560
-12570
-12580
-12590
-12600
-12610
-12620
-12630
-12640
-12650
-12660
-12670
-12680
-12690
-12700
-12710
-12720
-12730
-12740
-12750
-12760
-12770
-12780
-12790
-12800
-12810
-12820
-12830
-12840
-12850
-12860
-12870
-12880
-12890
-12900
-12910
-12920
-12930
-12940
-12950
-12960
-12970
-12980
-12990
-13000
-13010
-13020
-13030
-13040
-13050
-13060
-13070
-13080
-13090
-13100
-13110
-13120
-13130

Heat exchanger dashboard in PI Vision



Soft sensor for the prediction of benzene content in light reformate

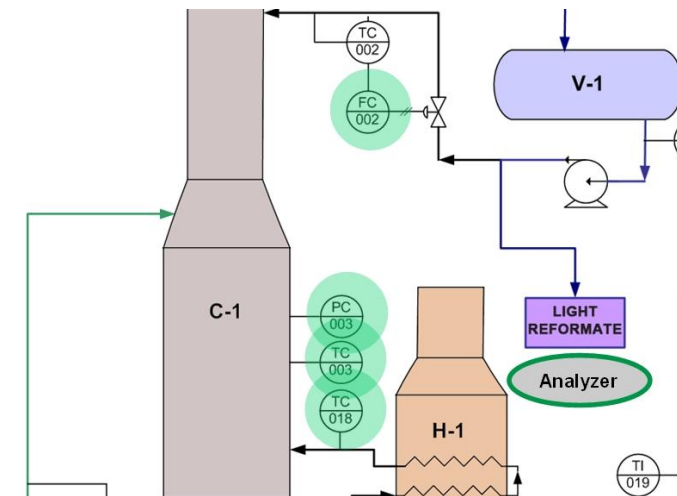




FKITMCMXIX



Soft sensor in fractionation reformat plant at INA/MOL Refinery Rijeka Croatia



CHALLENGE

On-line analyzes often **unavailable** (failure, service), laboratory analyses infrequent.

- Emission and technological standards become more stringent.
- Benzene content in reformat needs to be strictly maintained.

SOLUTION

Substitute on-line analyzers with **soft sensors** by embedding the data driven model.

- Model implemenetation through the Analyses within PI Asset Framework
- Soft sensors continous prediction in PI Vision.

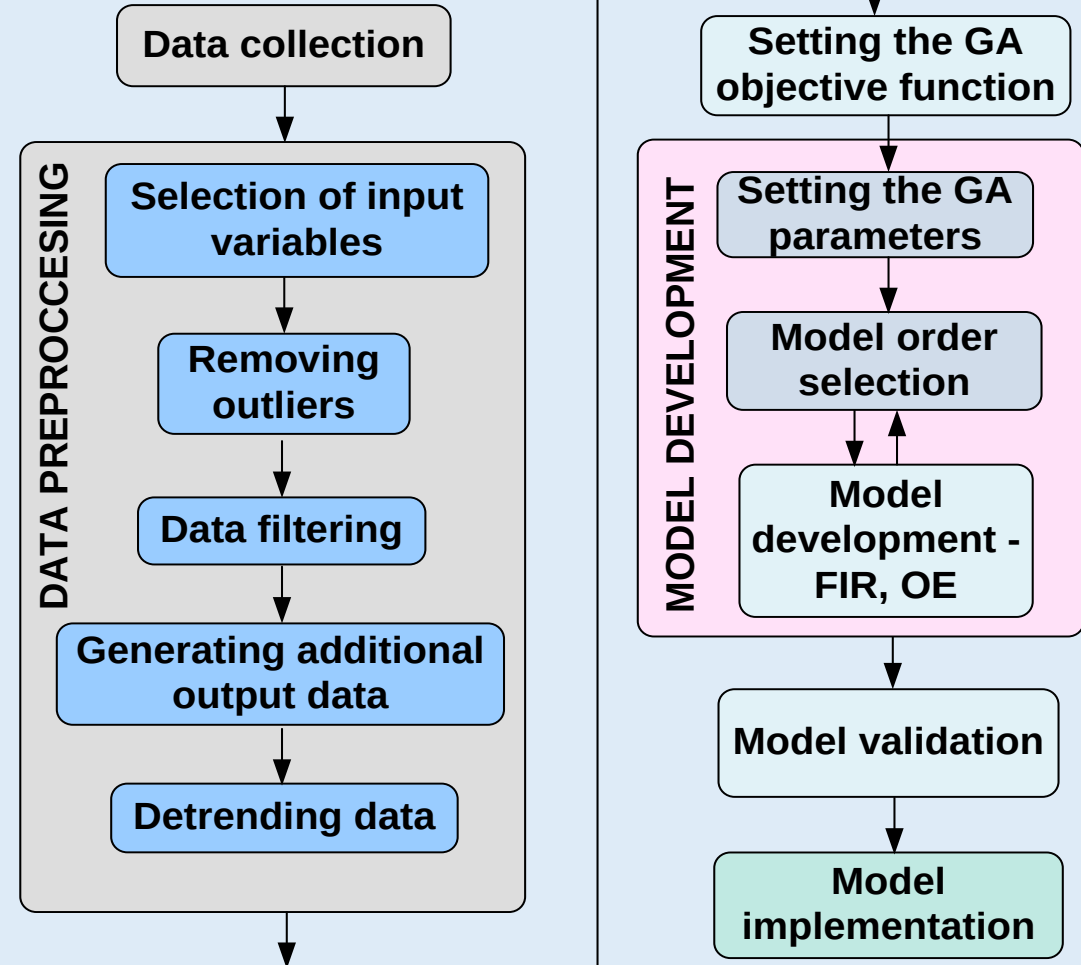
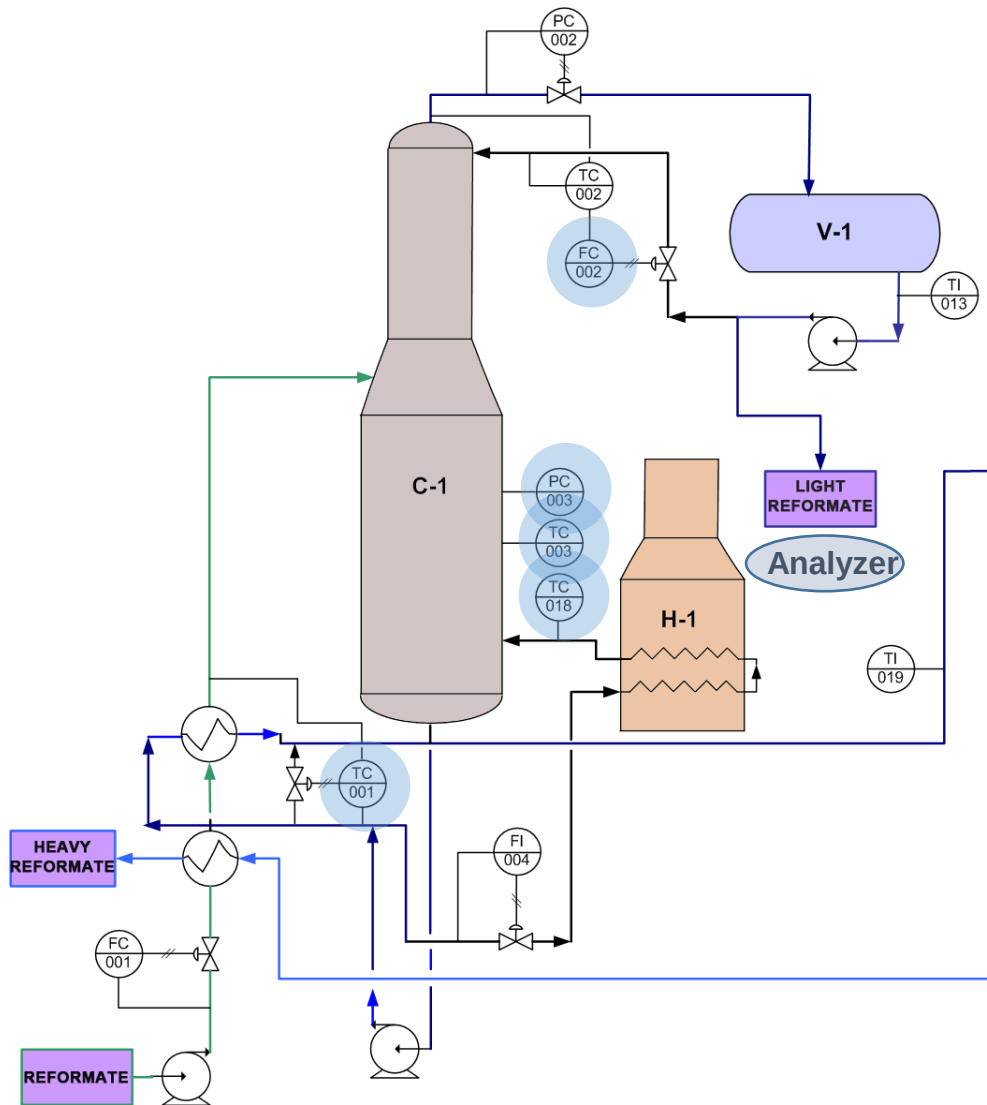
RESULTS

Continuous prediction of benzene content in real time.

Possibility to implement inferential control.

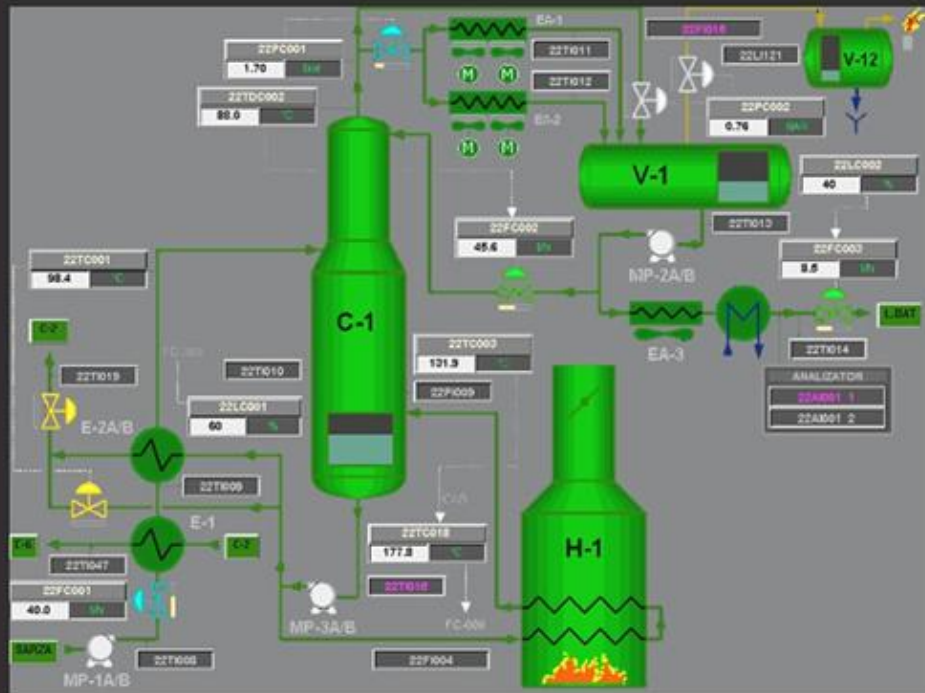
- The model matching experimental data trends.
- Consistency of reformat quality.
- Optimal control performance and fast response to the disturbances.

Soft sensor development – Fractionation reformat plant



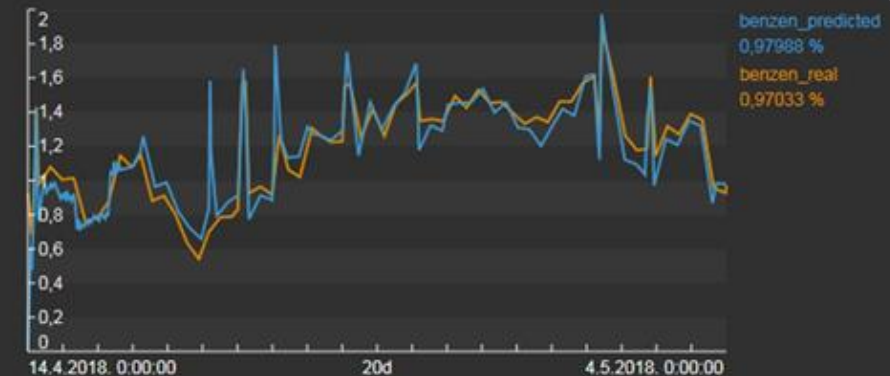
Soft sensor dashboard in PI Vision

Fractionation Reformate Plant - C-1 Column



Name	Description	Value ▼	Units	Trend ▼
Benzen in LR TC018	C1 column bottom tempera	175,96	°C	
Benzen in LR TC003	C1 column temperature	124,86	°C	
Benzen in LR TC001	C1 inlet stream temperatur	97,65	°C	
Benzen in LR FC002	pumparound flowrate	44,817	l/d	
Benzen in LR PI009	C1 column pressure	2,0089	bar	

Comparison of real and predicted benzene content



Model residual (real minus predicted benzen content)



Plans for the near future

- PI integration with Matlab and R for on-line model retraining
- Connection to the refinery system using **PI to PI interface** or **PI Cloud Connect**
- Further implementation of PI templates for soft sensors and refinery equipment diagnostics
- More student projects and the laboratory upgrade

Contact information



- Željka Ujević Andrijić, PhD, Senior assistant
University of Zagreb, Faculty of Chemical
Engineering and Technology,
zujevic@fkit.hr



- Nenad Bolf, PhD, Professor
University of Zagreb, Faculty of Chemical
Engineering and Technology,
bolf@fkit.hr
- Laboratory for Automation and Measurements
[http:// lam.fkit.hr](http://lam.fkit.hr)

Questions?

Please wait for
the **microphone**

State your
name & company



Please rate this session in the mobile app!



THANK YOU

OSIsoft.
PIWorld

謝謝 KEA LEBONA
TAPADH LEIBH 고맙습니다
БАЯРЛАЛАА MISAOTRA ANAO
DZIĘKUJĘ CI NGIYABONGA
TEŞEKKÜR EDERIM OBRIGADO شكرا
DANKON TANK TAPADH LEAT SALAMAT
DANKIE TERIMA KASIH
СПАСИБО
PAKMET CIZGE
KÖSZÖNÖM
GO RAIBH MAITH AGAT
БЛАГОДАРЯ GRACIAS
ТИ БЛАГОДАРАМ
TAK DANKE
RAHMAT MAHADSANID
MERCİ
HATUR NUHUN
CẢM ƠN BẠN
WAZVIITA
FALEMINDERIT
DANK JE
ΕΥΧΑΡΙΣΤΩ GRATIAS TIBI
AČIŪ SALAMAT MAHALO IĀ 'OE TAKK SKALDU HA
GRAZZI PAKKA PÉR
PAXMAT CAĞA
SIPAS JI WERE TERIMA KASIH
UA TSAUG RAU KOJ
ТИ БЛАГОДАРАМ
СИПОС
MULTUMESC
FAAFETAİ
ESKERRIK ASKO
HVALA ХВАЛА ВАМ
TEŞEKKÜR EDERIM
GRAZIE
ДИ ОУ МЕСИ
ĎAKUJEM
MATUR NUWUN

PI ICU and UFL Designer – Creating configuration files

The screenshot displays the PI Interface Configuration Utility (PI ICU) and UFL Designer. The main window is titled "PI Interface Configuration Utility - PI_UFL2" and shows the "General" tab. The "Interface" section is set to "PI_UFL2 (PI_UFL2) -> PI-SERVER". The "Type" is "UFL" (PI Universal File Loader). The "Description" is empty. The "Versions" section shows "PI_UFL.exe version 3.5.28.92".

The "Configuration File" section shows the path "D:\PI Osisoft\ZELJKA\Online COURSE". The "Additional Parameters" section is empty.

The "UFL" tab is selected, showing the "INTERFACE" section with the "PLUG-IN" set to "AsciiFiles.dll". The "PLUG-IN" section shows the "Input File Mask" set to "D:\PI Osisoft\ZELJKA\Online COURSE". The "SETTING" section shows the "Debug Level" set to "0", "Max LogFiles" set to "10", "Max LogSize" set to "20", "Messages in Errors" set to "C:\Program Files\PIPC\Interfaces\PI_UFL\...", "Output Filename" set to "C:\Program Files\PIPC\Interfaces\PI_UFL\...", and "Locale" set to "en-us".

The "ASCII" tab is selected, showing a list of data points with their timestamps and values. The "IniFile" tab is selected, showing the configuration file content:

```
[INTERFACE]
PLUG-IN=AsciiFiles.dll

[PLUG-IN]
IFM=D:\PI Osisoft\ZELJKA\Online COURSE & HE Data\INI_files\PROBA3\ini_test.txt
IFS=N
REN=_OK
ERR=BAD
PURGETIME=1d
PFN=False
PFI=False
NEWLINE=13,10

[SETTING]
DEB=0
MAXLOG=10
MAXLOGSIZE=20
MSGINERROR=C:\Program Files\PIPC\Interfaces\PI_UFL\Logs\err.log
OUTPUT=C:\Program Files\PIPC\Interfaces\PI_UFL\Logs\out.log
LOCALE=en-us

[FIELD]
FIELD(1).NAME="Tagname"
FIELD(1).TYPE="String"
FIELD(2).NAME="Timestamp"
FIELD(2).TYPE="DateTime"
FIELD(2).FORMAT="d.M.yy. h:mm"
FIELD(3).NAME="Value"
FIELD(3).TYPE="Number"

[MSG]
MSG(1).NAME="Data"
MSG(1).EPC="Float32"

[Data]
Data.FILTER=C1=="*"
Tagname=["(*) * *"]
Timestamp=["* (*) *"]
Value=["* * (*)"]
StoreInPI(Tagname, ,Timestamp,Value, , )
```

```
B1 = 0.0001745* PrevVal ('TC001', '*-50m') -
0.002517* PrevVal ('TC001', '*-55m') -
0.0007928* PrevVal ('TC001', '*-60m') +
0.002649* PrevVal ('TC001', '*-65m') +
0.005372* PrevVal ('TC001', '* -70m') -
0.001842* PrevVal ('TC001', '*-75m') -
0.01119* PrevVal ('TC001', '*-80m')

B2 = 0.002248* PrevVal ('TC018',*-45m) +
0.02477* PrevVal ('TC018',*-50m) - 0.008204*
PrevVal ('TC018',*-55m) - 0.008963* PrevVal
('TC018',*-60m) + 0.002962* PrevVal
('TC018',*-65m)

B3 = 0.02152* PrevVal ('TC003', '*-70m') +
0.01299* PrevVal ('TC003', '*-75m') -
0.002255* PrevVal ('TC003', *-80m) - 0.006053*
PrevVal ('TC003', *-85m) + 0.01966* PrevVal
('TC003', '*-90m') + 0.0002582* PrevVal
('TC003', '*-95m') + 0.0293* PrevVal
('TC003', '*-100m')

B4 = -2.158* PrevVal (' PI009', '*-50m') -
0.7991* PrevVal (' PI009', '*-55m') - 0.2701*
PrevVal (' PI009', '*-60m') - 0.4887* PrevVal
(' PI009', '*-65m') - 0.4887* PrevVal ('
PI009', '*-70m') - 0.5009* PrevVal ('
PI009', '*-75m') + 0.6556* PrevVal ('
PI009', '*-80m') - 0.3157* PrevVal ('
PI009', '*-85m')

B5 = -0.0203* PrevVal ('FC002', '*-75m')

benzen_pred = B1+B2+B3+B4+B5
```

n PI System Explorer for FIR soft sensor

AnalysesNotification RulesVersion

ling

Name:benzen_pred

Description:

Categories:

Analysis Type:☒ Expression☐ Rollup☐ Event Frame Genera

Evaluate

	Value at E	Value at La	Ou
('TC001', '*-50m') - 0.002517* PrevVal ('TC001', '*-55m') - 0.0007928* PrevVal ('TC001', '*	-0,82642	-0,82642	B1 C
, '*-50m') - 0.002517* PrevVal ('TC001', '*-55m') - 0.0007928* PrevVal ('TC001', '*-60m') + 0.002649*			
+ 0.005372* PrevVal ('TC001', '* -70m') - 0.001842* PrevVal ('TC001', '*-75m') - 0.01119* PrevVal			
'TC018', '*-45m') + 0.02477* PrevVal ('TC018', *-50m') - 0.008204* PrevVal ('TC018', *-55m')	2,2614	2,2638	Map
TC003', '*-70m') + 0.01299* PrevVal ('TC003', *-75m') - 0.002255* PrevVal ('TC003', *-80m')	9,4187	9,4187	Map
PI009', '*-50m') - 0.7991* PrevVal (' PI009', *-55m') - 0.2701* PrevVal (' PI009', *-60m') -	-8,7768	-8,7768	Map
FC002', '*-75m')	-0,92662	-0,92662	Map
	1,1503	1,1527	benz