

REŠENJA ZA PROCESNU INDUSTRIJU

Dušan Otašević

Menadžer prodaje | Honeywell Srbija

Honeywell

DUŠAN OTAŠEVIĆ



Work Experience

Jun 2014 – to date



Dec 2002 – Jun 2014



Education

BSc in Process Engineering (10 Semesters), Faculty of Mechanical Engineering, Chemical Process Engineering

Personal

Married, two children

Guitar Player



DUŠAN OTAŠEVIĆ

REFERENCES:

1. WWTP, DCS (Distributed Control System) integration, SmurfitKappa, 2023
2. Toyo Tires Serbia, QCS (Quality Control System), 2023
3. EPKS (Experion PKS) Migration, DCS One Time Upgrade (OTU), Benefits Guardianship Program (BGP) - 3 years, and Software Enhancement & Support Program (SESP) - 3 years, 2021, Sisecam Soda Lukavac, 2021
4. Integration of PHD with Predictive Maintenance SW, NIS Refinery Pancevo, 2021
5. EMS (Energy Management System), various customers
6. PPM (Process Performance Monitor) for CDU/VDU Unit, NIS Refinery Pancevo, 2020
7. DCU Unit PHD (Process Historian Database) & WEB Extension, NIS Refinery Pancevo, 2020
8. Aqualizer MX, Quality Control System, SmurfitKappa, 2019/2020
9. DCS Upgrade EPKS R410 to R500, NIS Refinery Pancevo, 2018
10. Dynamo – Alarm Management System plantwide, NIS Refinery Pancevo, 2018
11. KPI (Key Performance Indicators) Integration to PHD (Process Historian Database) & WEB, The Boston Consulting Group 2018
12. SMX (Cyber Security Antivirus Protection System) & Antivirus Software Package, NIS Refinery Pancevo, 2018
13. DCS/ESD (Emergency Shutdown System) for FCC Unit NIS RNP, MEROX III Project, NIS Refinery Pancevo, 2018
14. CPM (Control Performance Monitoring), NIS Refinery Pancevo, 2018
15. ESD (Emergency Shutdown System) Diagnostics and Monitoring, NIS Refinery Pancevo, 2018
16. QCS (Quality Control System) Upgrade, Belgrade paper Mill 2018
17. QCS (Quality Control System) Upgrade and 1 New Scanner, Umka Paper Mill 2018
18. Trace (Documentation and Change Management Software for Better Decisions) Sisecam Soda Lukavac, 2017
19. Devronizer, Belgrade paper Mill, 2015
20. REEINSTRUMENTATION, Thermal Power Plant Ugljevik, 2009

....

O HONEYWELL-U

Dušan Otašević

Menadžer prodaje | Honeywell Srbija

Honeywell



O HONEYWELL-U

ESSER

by Honeywell

Honeywell

Enraf Tanksystem

MatrikonOPC

RMG

Uop

A Honeywell Company



Fire and Gas



Gas Process Instrumentation



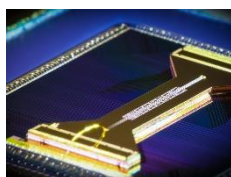
Level Gauging



Batch Controllers



Fly Recorders



Quantum Computing



Gas Detectors



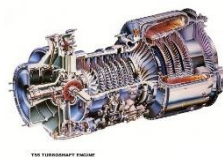
PLC, RTU, DCS



Aclar Blister Foil



Protection Equipment



Gas Turbines



M1A2 Engine



Honeywell
131-9A
Auxiliary Power Units



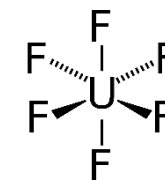
Air Brakes



Solstice® Refrigerant



Maxon Burners



Uranium Hexafluoride



Hydrogen Solution



Weather Radar



Sensors for Satellites



Cyber Security



Battery Storage



Personal Gas Detectors

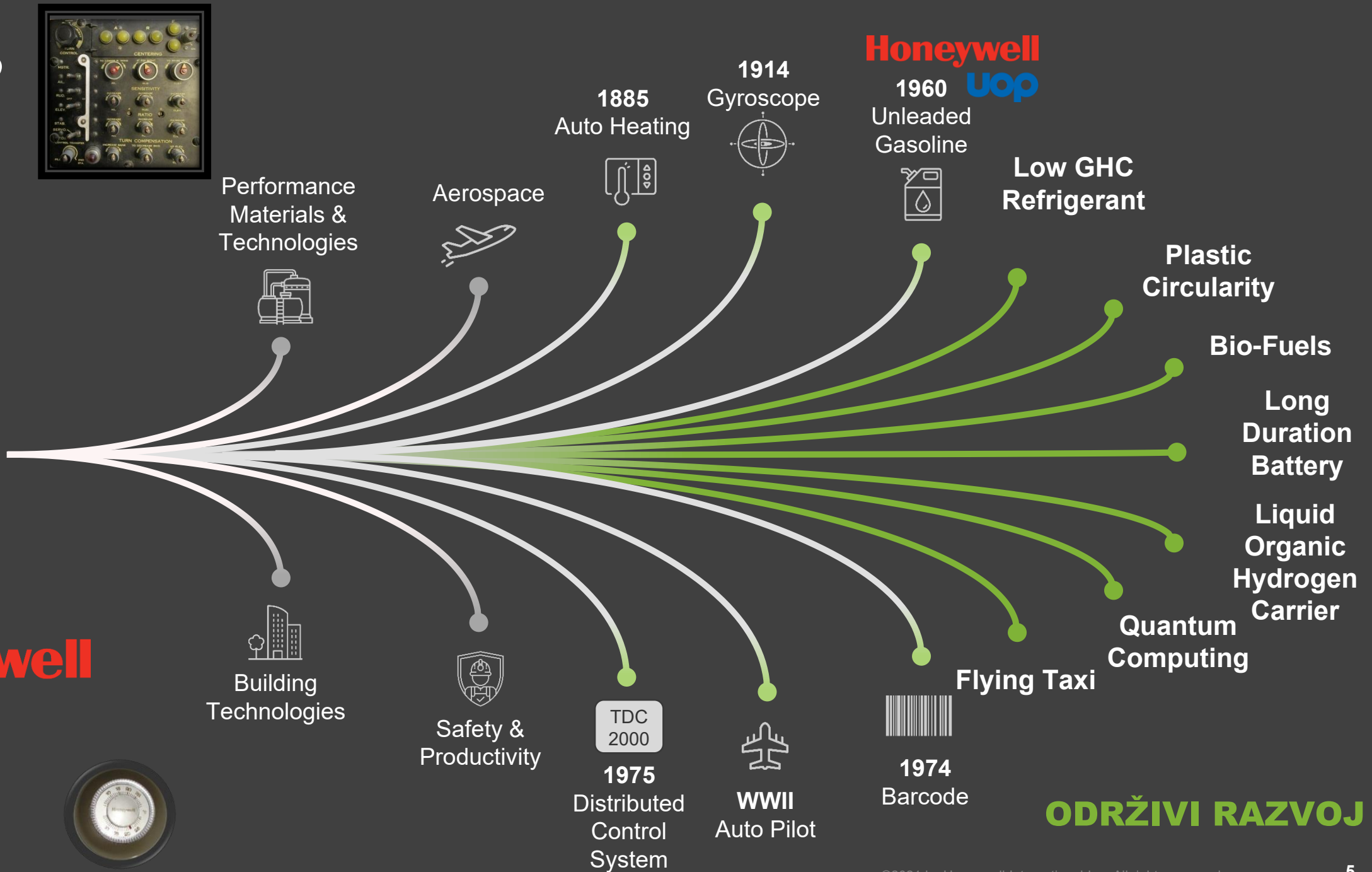
Ukoliko ne znate za nas

\$132B
Market cap



970
Sites

110k
People



Honeywell
Uop

Honeywell
THE FUTURE IS WHAT WE MAKE IT.



ODRŽIVI RAZVOJ

HONEYWELL NA PRVI POGLED

NASDAQ: HON | ~825 sites |
~103,000 employees | Charlotte,
NC headquarters | Fortune 100



AEROSPACE

Naši proizvodi se koriste na gotovo svim platformama aviona širom sveta i uključuju pogon aviona, sisteme u kokpitu, satelitske komunikacije i pomoćne sisteme za napajanje.



BUILDING TECHNOLOGIES

Naši proizvodi, softver i tehnologije nalaze se u više od 10 miliona zgrada širom sveta, pomažući klijentima da osiguraju da su njihovi objekti bezbedni, energetske efikasni, održivi i produktivni.



PERFORMANCE MATERIALS AND TECHNOLOGIES

Razvijamo napredne materijale, procesne tehnologije, rešenja za automatizaciju i industrijski softver koji revolucionišu industrije širom sveta



SAFETY AND PRODUCTIVITY SOLUTIONS

Poboljšavamo performanse preduzeća i bezbednost i produktivnost radnika pomoću automatizovanog rukovanja materijalom, skeniranja glasa, tehnologije mobilnog računara, softverskih rešenja i lične zaštitne opreme i senzorske tehnologije.

HONEYWELL CONNECTED ENTERPRISE

Ubrzavamo digitalnu transformaciju naših klijenata pomoću softvera i rešenja industrijskog interneta stvari (IIoT) preko ponude za upravljanje performansama preduzeća, Honeywell Forge. Fokus HCE-a je razvoj softvera, od mrežnog prolaza do aplikacija za krajnje korisnike, donoseći obim i mogućnosti u celom Honeywell-u.

OBLIKOVANJE BUDUĆNOSTI U INDUSTRIJAMA

HONEYWELL HPS

PROCESS SOLUTIONS

Projects and
Automation
Solutions

Lifecycle
Service
Solutions

Process
Measurement
and Control

Honeywell
Thermal
Solutions

Honeywell
Connected
Plant

Honeywell
Smart
Energy

> 10,000 instalacija u
125 Zemalja širom sveta

24
factories worldwide

200+
local offices

18,000
employees

2,000
service technicians

> **90**
local service
centers worldwide

***\$5B**
Revenue

45+ Godina Lider u Automatizaciji Postrojenja

HPS | ŠIROKE INDUSTRIJSKE PRIMENE



Oil & Gas



Pipeline & Terminals



Refining & Petrochemical



Chemicals



Refrigeration & Air Conditioning



Healthcare & Electronics



Films, Fibers & Packaging



Minerals, Metals & Mining

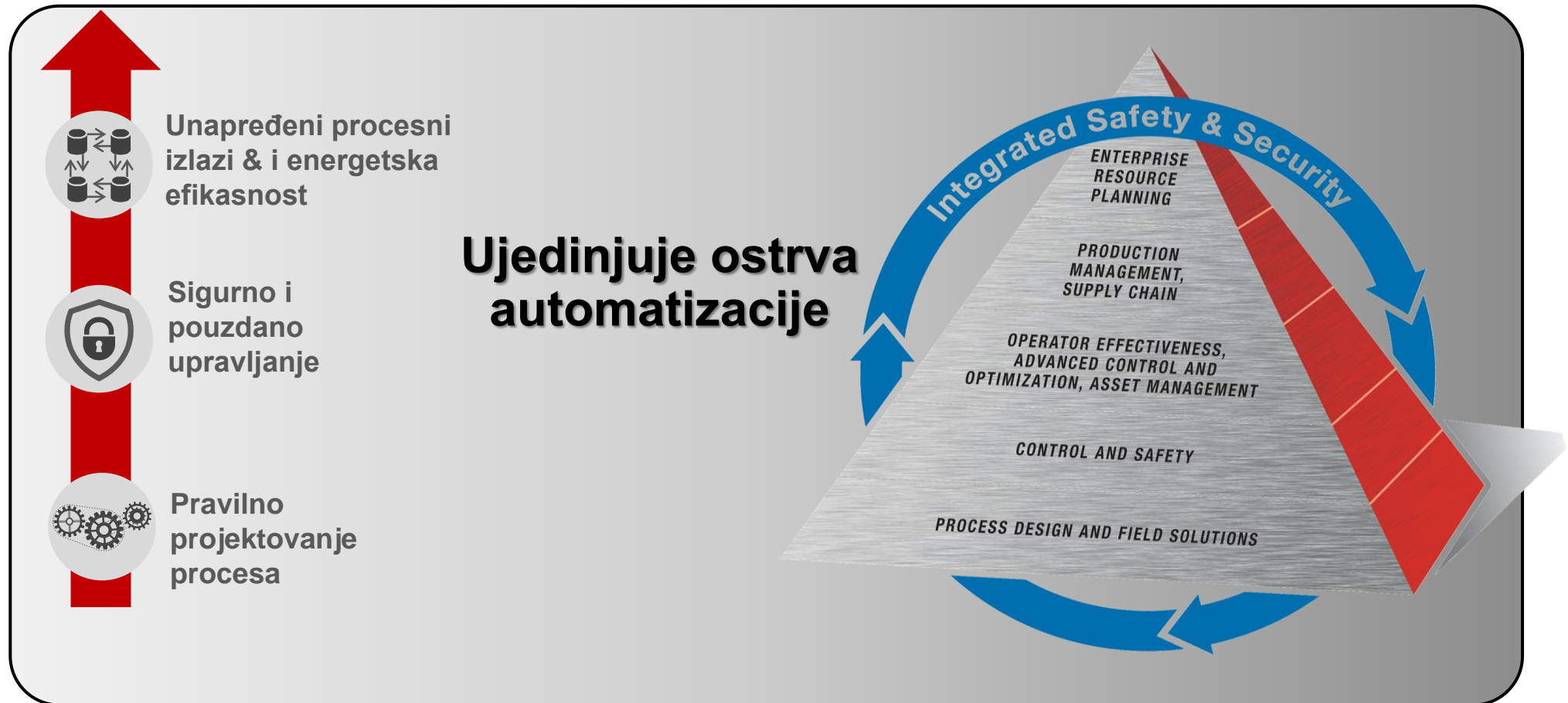


Utility Solutions

HOLISTIČKI I INTEGRISAN PRISTUP

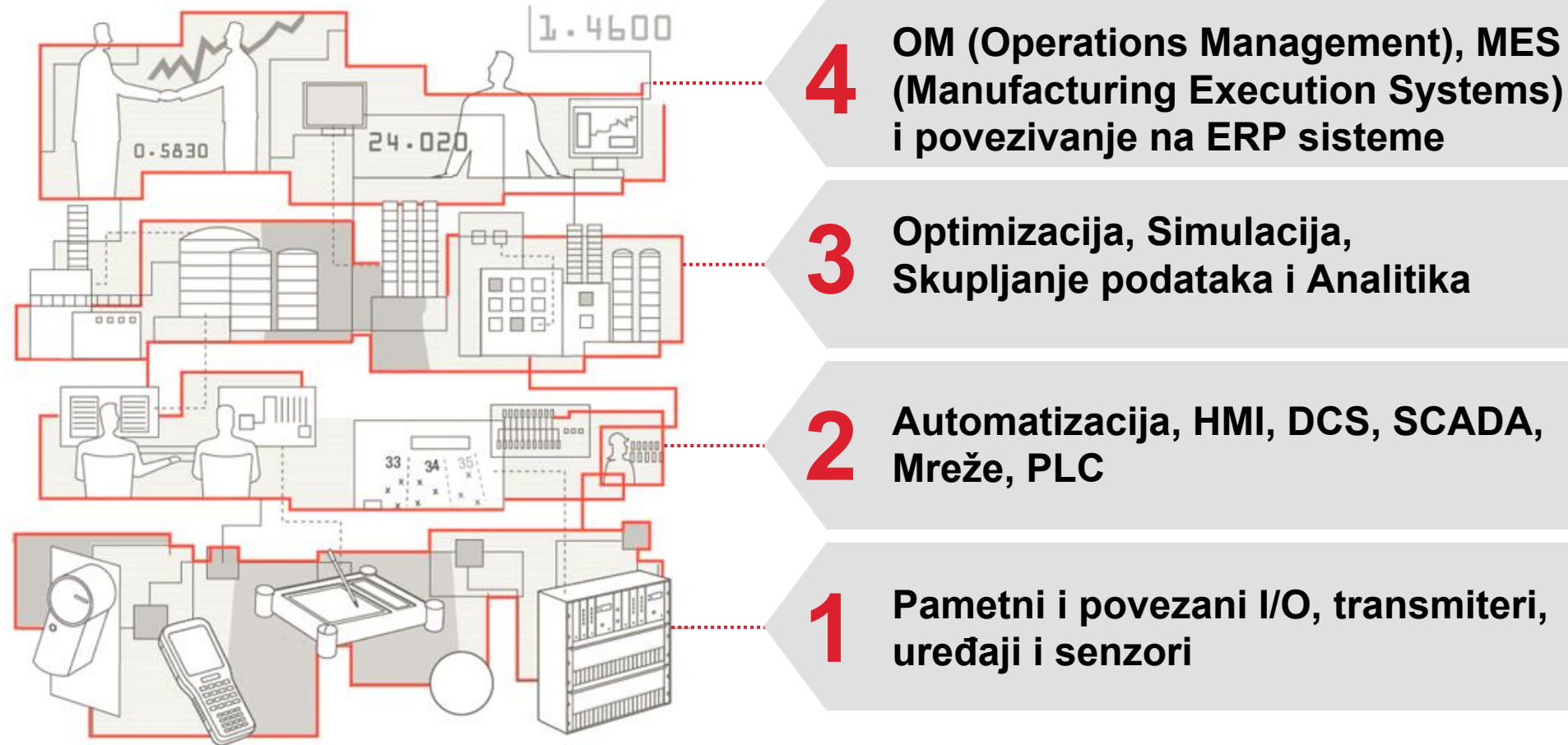
Honeywell

Najbolja rešenja u klasi vezano za operativnu integraciju



ISPORUČUJE PRIORITETE NA PROJEKTIMA I ŽIVOTNOM CIKULUSU POSTROJENJA

REŠENJA NA ZA CELU KOMPANIJU



Softver i sajber bezbednost su ugrađeni u naš čitav portfolio

EXPERION PKS - PLATFORMA

Honeywell Connected Plants

UniSim Design
 UniSim Operate
 Profit Suite
 Control Performance Monitor CX
 Dynamo Operations
 Dynamo Alarm Management
 Uniformance Asset Sentinel
 Honeywell Pulse

Experion Station
 Remote Operations



Digital Video Manager
 Video as Process Sensor



Uniformance PHD
 Enterprise Historian



eServer
 Web Server



FDM
 Asset Management System



AV + Backup
 EBR



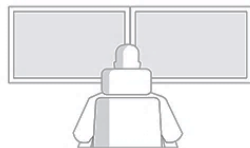
Advanced Applications Network

Control HMI Layer



Firewall

Experion Station
 ASM Operator Effectiveness



Consol Station



Flex Station



Redundant Servers
 Global Database, History



Simulation Node
 SIM C300



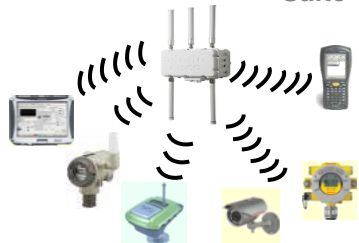
Cyber Security
 Risk Manager



Fault Tolerant Ethernet (FTE)

Supervisory Control Network

Honeywell One Wireless Suite



ISA 100 WIRELESS
WirelessHART



PROFI BUS



PGM



FIM



S8 C300



Controller

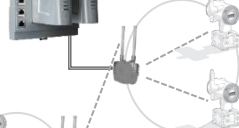


ControlEdge PLC



ControlEdge HC900
 Process and SIL2 Safety System

ControlEdge RTU



ControlEdge UOC

Safety Manager
 SIL3 Safety System



Experion PPC
 Panel HMI with Experion UI

HART

PROFI NET

Field Instruments



S8 I/O



Matrikon OPC
 3rd Party Connectivity
 (PLC, SCADA, DCS)

Robusna platforma za integraciju sa najboljim SCADA funkcijama u klasi

JEDINSTVENO PREDUZEĆE SVEOUBUHVATAN PRISTUP

Honeywell

Turbine control

Compressor control

Power
Management

Heat distribution
control

Gas pressure
reducing station

Cyber security

Leak detection

Pipeline control
system

Corrosion
monitoring

Emission
monitoring

Wastewater
treatment control
system

Boiler protection

Tank gauging
system

Burner
management

Automatic overflow
prevention system

Railcar weighing
system

Advance process
control

Gas detection
system

Building
management
system

Fire alarm system

Firefighting system

Access control
system

Site security
system

Video surveillance
system

Asset management



Svi ovi podsistemi se moraju integrisati

EXPERION SUITE

Honeywell



FORGE®

ERP Integration, Metersuite

Experion® PKS / SCADA

Experion® Industrial Security



- Measurement Custody
- 3rd Party Devices
- Process Control
- Process Safety
- Fire & Gas
- Loading Injectors Blending
- Wireless
- Leak & Theft Detection
- Telecom Network Security
- Video Surveillance
- Life Safety
- Energy Mgmt
- Building Mgmt
- Security & Access Control

Jedinstveno integrisano rešenje na novou preduzeća

EXPERION PKS

Honeywell

GLAVNE KARAKTERISTIKE

- Nepostojanje slabe tačke
- Redundancija u ponudi IO modula, kontrolera, napajanja, komunikacione mreže i servera
- Sekvenca događaja sa rezolucijom 1ms
- Funkcijski blokovi za energetske aplikacije
- Blokovi (termodinamički) za gasove i paru usklađeni sa ASME
- Moduli kontrole sekvence za automatizovano pokretanje/gašenje postrojenja
- Mogućnost udaljenog IO-a
- Integracija sa sigurnosnim sistemom
- Simulacioni objekat za testiranje logike
- Firewall zaštita i sajber bezbednost
- Industrijski standardni interfejsi
- IEC61850 sposobnost za objedinjenu električnu kontrolu



Experion postiže i prevazilazi sve zahtevane funkcionalnosti

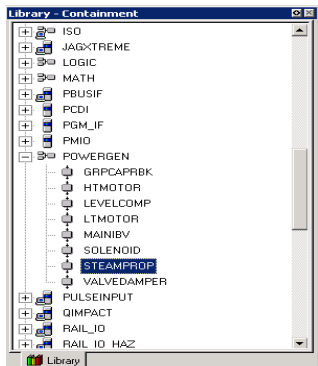
C300 KONTROLER DIZAJN: VERTIKALNA INSTALCIJA **EFIKASAN HARDVER**

- Integrisano ožičenje za smanjenje prostora
- Dvoslojno ožičenje za jednostavnu instalaciju i održavanje
- Redundantnost
- Jedinstveno upravljanje toplotom za produženje životnog veka proizvoda

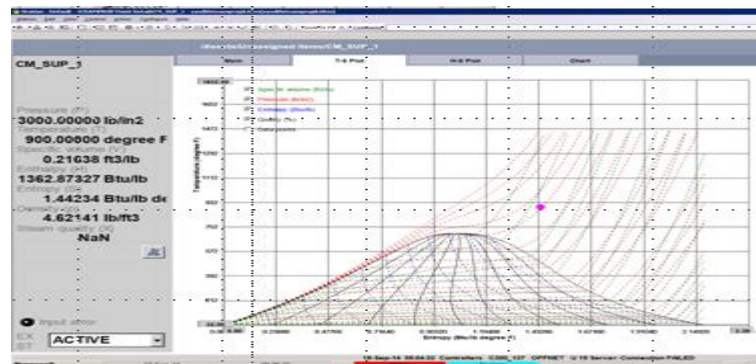


ENERGETSKI FUNKCIONALNI BLOKOVI

SVOJSTVA VODE I PARE – U skladu sa ASME/IFC-97



- Poboljšane performanse strategija kontrole
- Smanjeno vreme za konfigurisanje i testiranje
- Manja potreba za hardverom za kontrolu obrade
- Lakoća logičkog otklanjanja grešaka
- Pojednostavljena logička dokumentacija



- Dizajniran da se bavi specifičnim funkcijama koje se koriste u strategijama kontrole procesa u elektrani
- Posebno ciljano za upotrebu od strane kupaca za proizvodnju električne energije, potencijalno za upotrebu u drugim segmentima industrije



Bolje performanse za upravljanje energetskim postrojenjima

SISTEM ZAŠTITE KOTLA/SISTEM UPRAVLJANJA GORIONICIMA

Sigurnosno sistemsko rešenje Safety Manager omogućava bezbedno pokretanje, rad i gašenje peći sa višestrukim gorionicima

Bazirano na standardnom paketu, prilagođenom za karakteristike svakog tipa kotla

Ciljevi

Lična sigurnost

Zaštita peći

Povećana pouzdanost i operativnost

Glavne funkcije

Automatski stavlja gorionike u rad

Nadgleda uslove plamena

Isključuje gorionike iz rada

Ispunjava važeće kodove i standarde za sigurnosne kontrolere i/ili aplikacije za upravljanje gorionicima (NFPA, 85/86, ISA S84.01, TUV i IEC 61508)



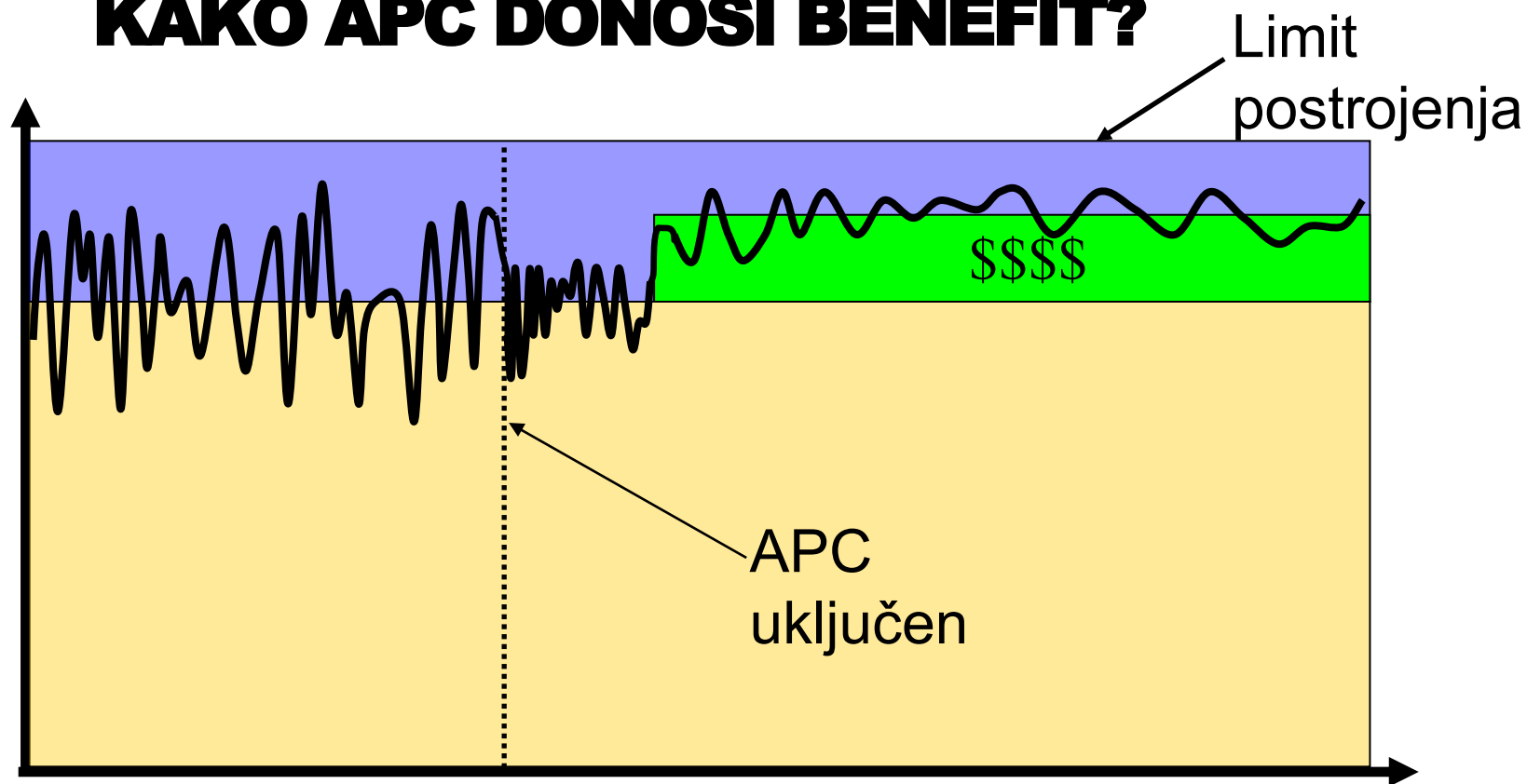
Sertifikovan BMS (Burner Management Sistem) koji ispunjava zakonske obaveze

NAPREDNO UPRAVLJANJE – APC

ADVANCED PROCESS CONTROL

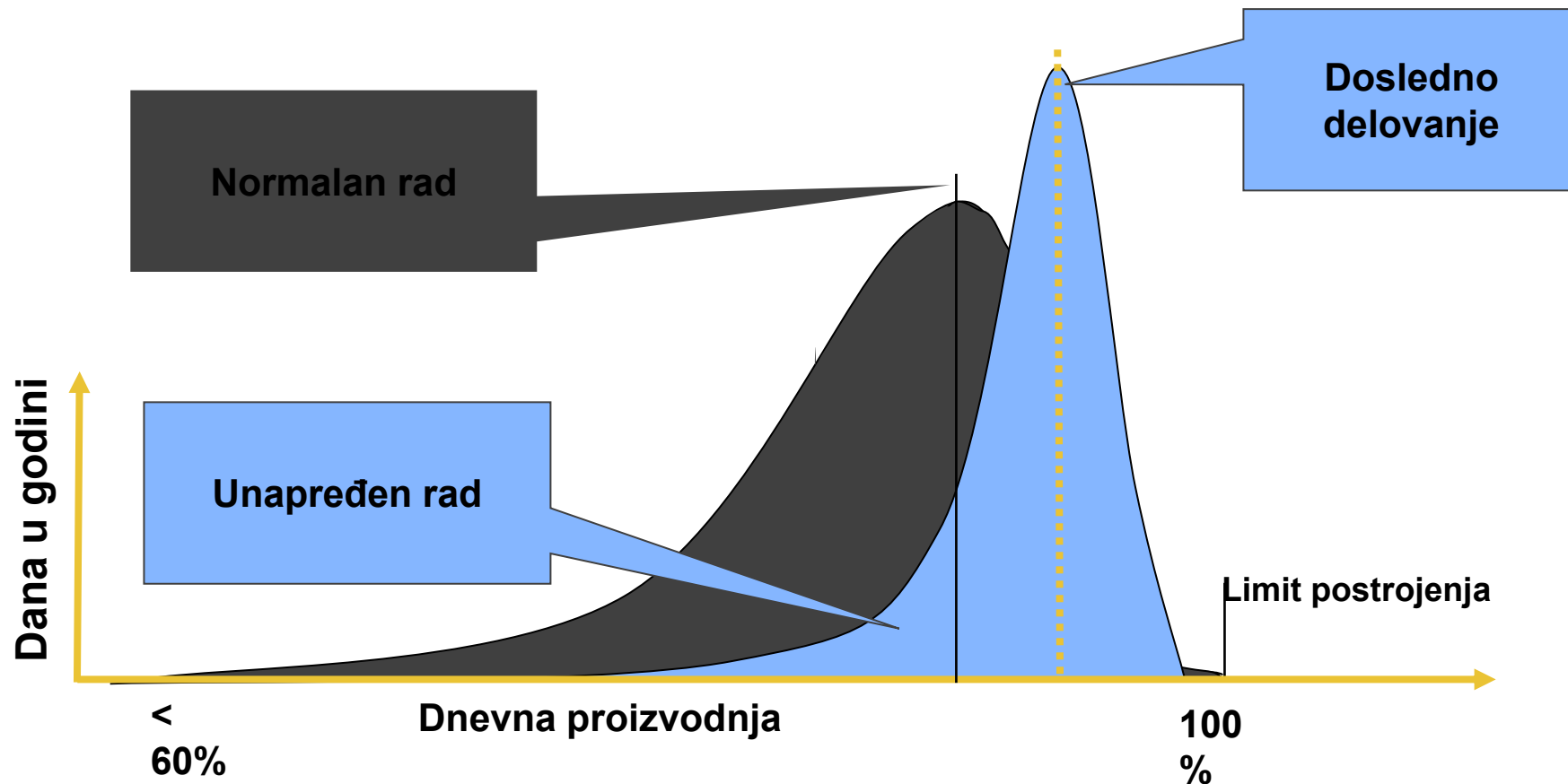
REŠENJE KOJE SE MOŽE PRIMENITI U SVIM INDUSTRIJAMA

KAKO APC DONOSI BENEFIT?



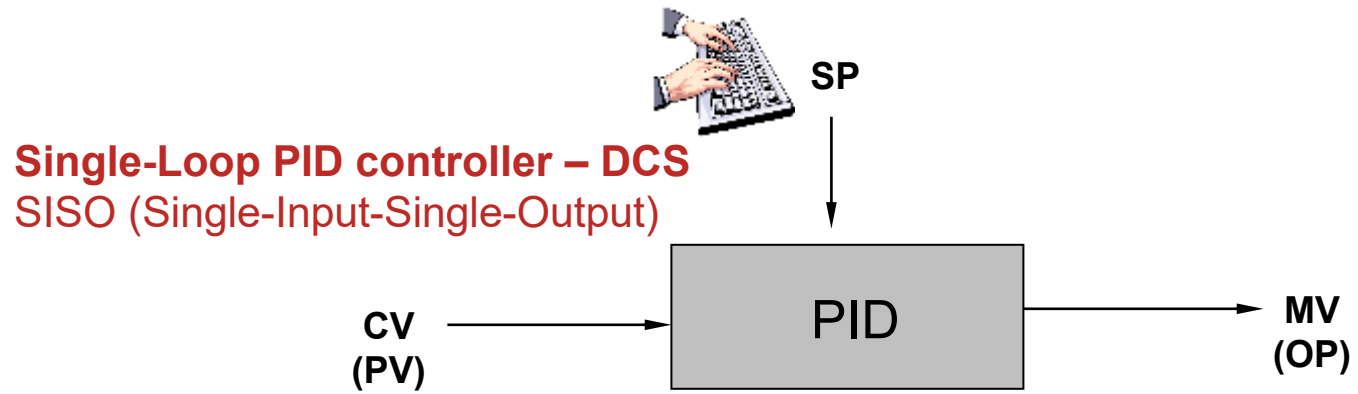
OPTIMIZACIJA - više zelenog, manje plavog....

NAPREDNO UPRAVLJANJE – ADVANCED PROCESS CONTROL

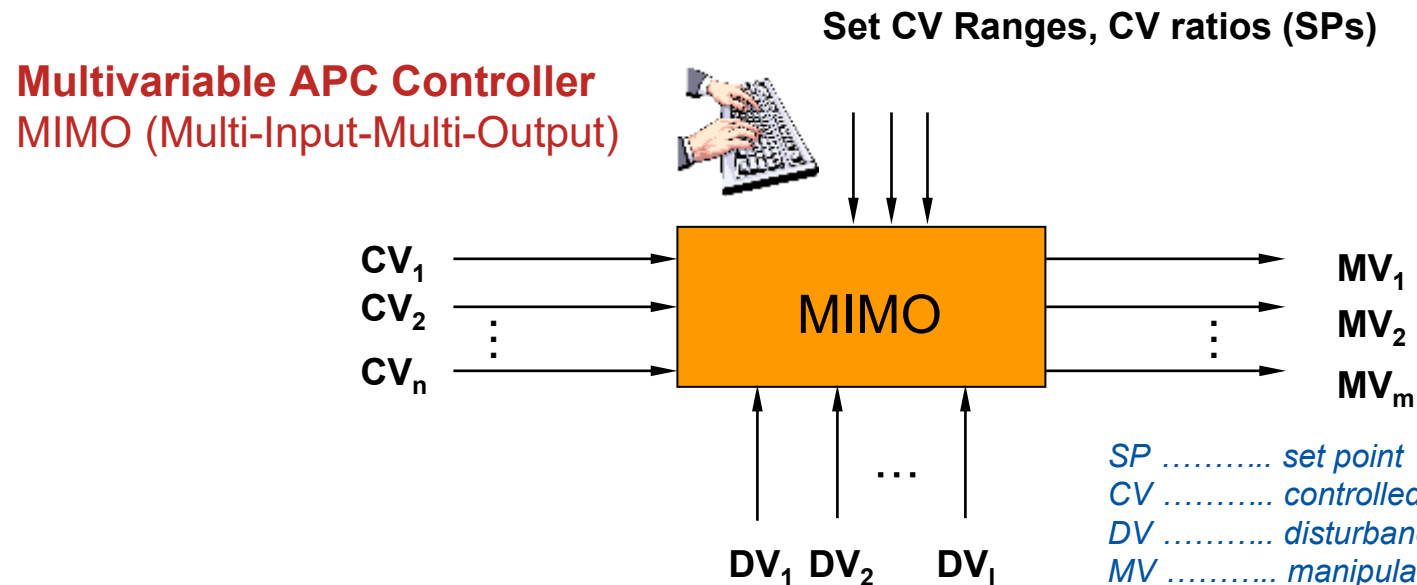


KAKO APC DONOSI KORIST?

RAZLIKA APC-A U ODNOSU NA PID UPRAVLJANJE



„Basic“

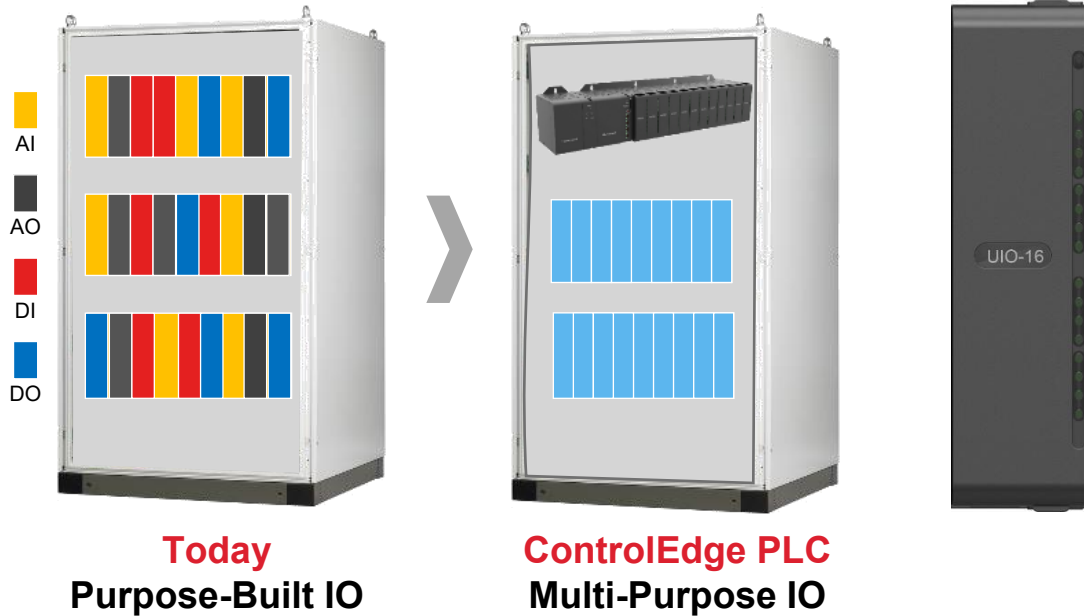


„Advanced“

SP set point
CV controlled variable
DV disturbance variable
MV manipulated variable

O UIO TEHNOLOGIJI

Honeywell



ZBOG ČEGA JE UNIVERSAL IO TAKO DRAGOCEN?

- Lako se prilagođava promeni
- Smanjuje hardver
- Smanjuje neophodne rezervne delove

UIO

UIO je Universal IO – omogućava da se različiti tipovi signala povežu na jednom IO modulu

UIO
BENEFITS



End User



EPC



System
Integrator



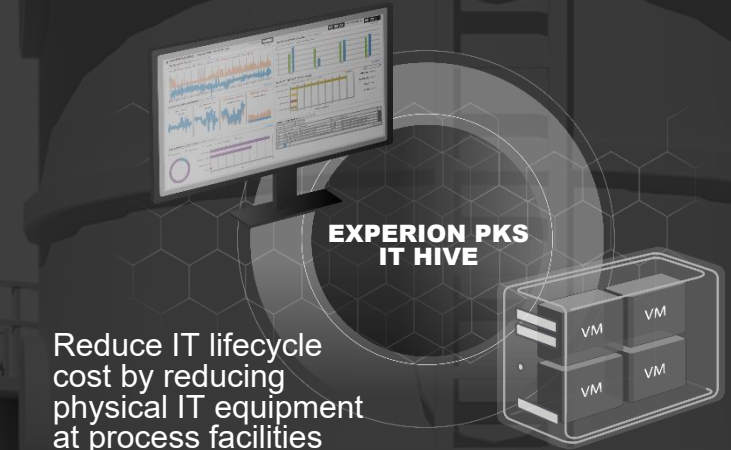
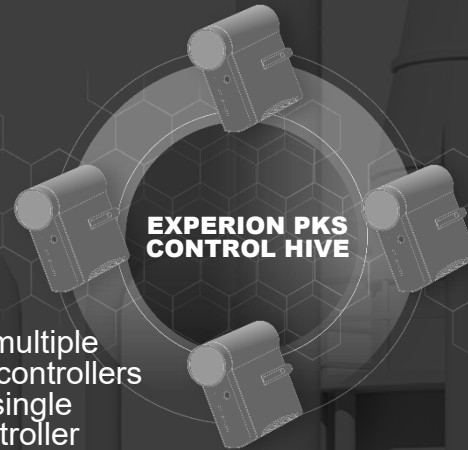
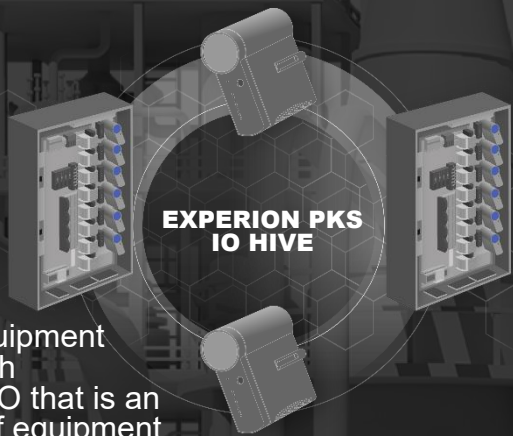
OEMs

UIO omogućava laku promenu, smanjuje prostor i rezervne delove

HONEYWELL EXPERION® PKS

HIGHLY INTEGRATED VIRTUAL ENVIRONMENT (HIVE) VIRTUALIZACIJA NA NIVOU ULAZNIH KARTICA, KONTROLERA I SERVERA

Evolution of Experion Delivering a New Generation of Benefits



DIGITAL TWIN PROCESS MODEL

PROCESNA MERNA OPREMA

„Pametni“ Transmiteri za Pritisak, Temperaturu, Nivo, Protok i analizatori.

Prednosti

- Modularni dizajn
- Napredni displeji
- Lako i intuitivni za upotrebu
- Lako održavanje
- Manji troškovi
- Integracija na pravljački sistem



Proizvodi i softver povećavaju tačnost, efikasnost i pouzdanost za ukupan životni vek opreme

INTEGRISANA INDUSTRIJASKA SIGURNOST I F&G REŠENJA

Detekcija prolaza



Detektori plamena i požara



Kontrola pristupa



Detekcija gasa



Radarsko praćenje



Sistem kamera



Video nadzor



Sirene i javljači



Standardni HMI



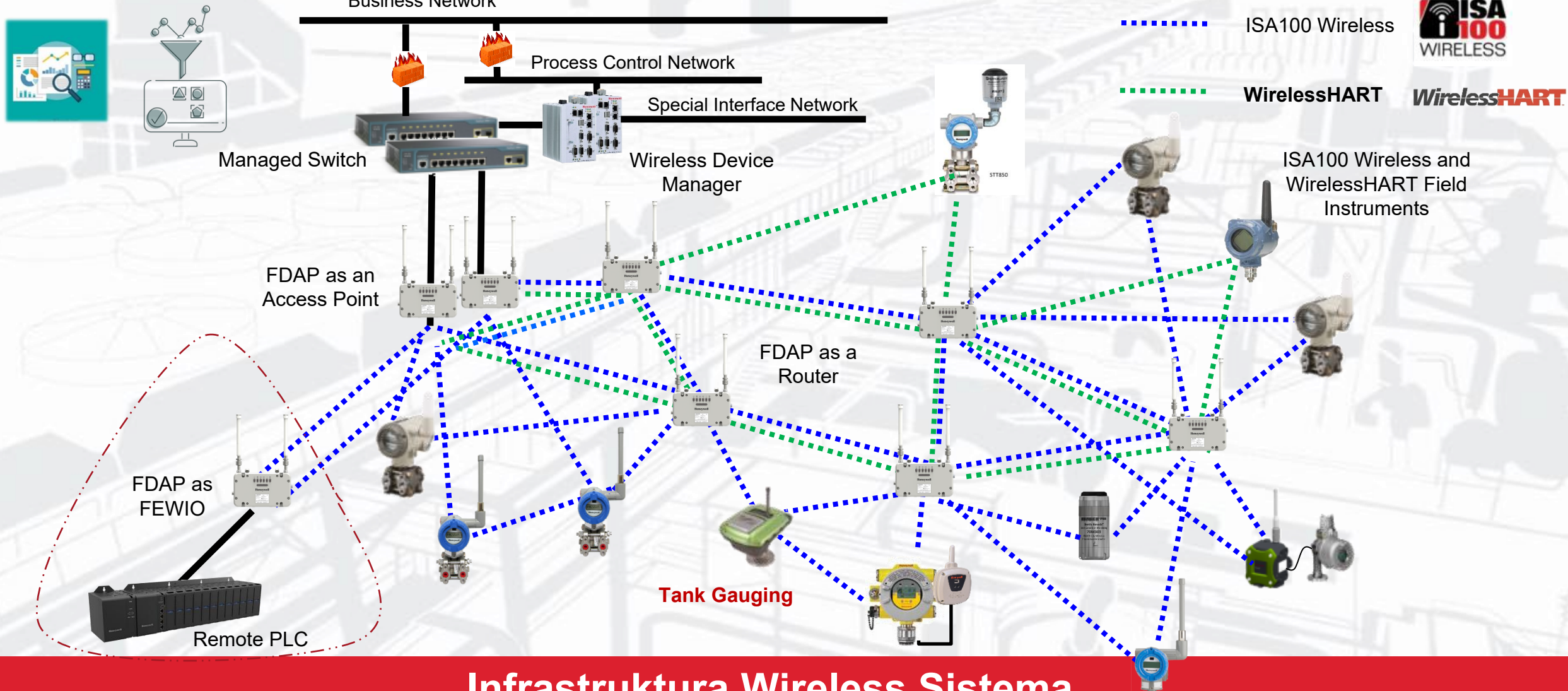
Blokadni sistemi
(F&G System) SIL-3



Korišćenje širokog Honeywell Portfolia

HONEYWELL ONEWIRELESS

MULTIPROTOCOL SOLUTION – NO WIFI



Infrastruktura Wireless Sistema

CENTRALNA UPRAVLJAČKA SOBA

Honeywell



Honeywell Confidential

POVEĆANJE VIDLJIVOSTI PUTEM ORION KONZOLE

Boje indikatora ambijenta usklađene sa prioritetima alarma

Više prozora iz više izvora na ekranima od 50 inča

Mimika požara i gasa i CCTV ekrani



Operatorski „Touch Panel“ za trenutne kontrolne ulaze

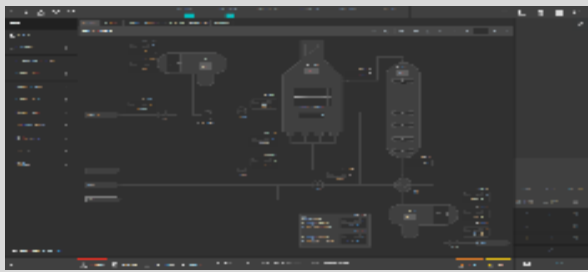
Komunikaciona oprema

Operatorska „Pushbutton“ Stanica

Pritiskom ovog dugmeta se podešava visinu radne površine, do stojećeg položaja

REŠENJE | INTEGRISANI CENTER UPRAVLJANJA

Advanced Applications



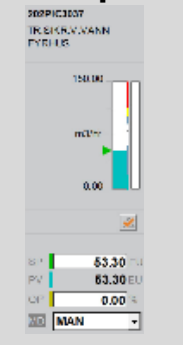
Solution Pack Shapes



Trend



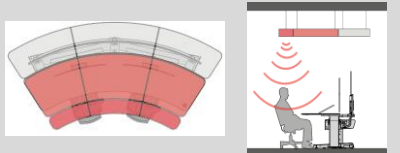
Faceplat



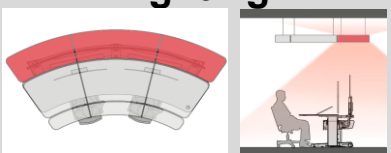
DVM



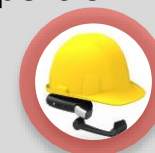
Sound



Lighting



Expert on Call



Coms.



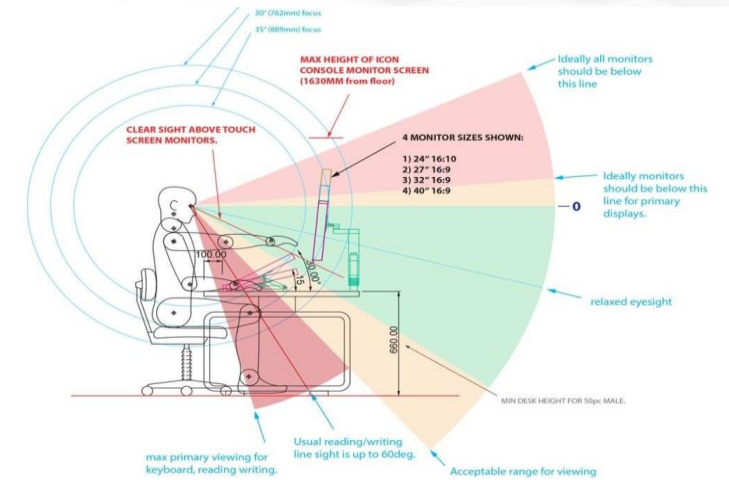
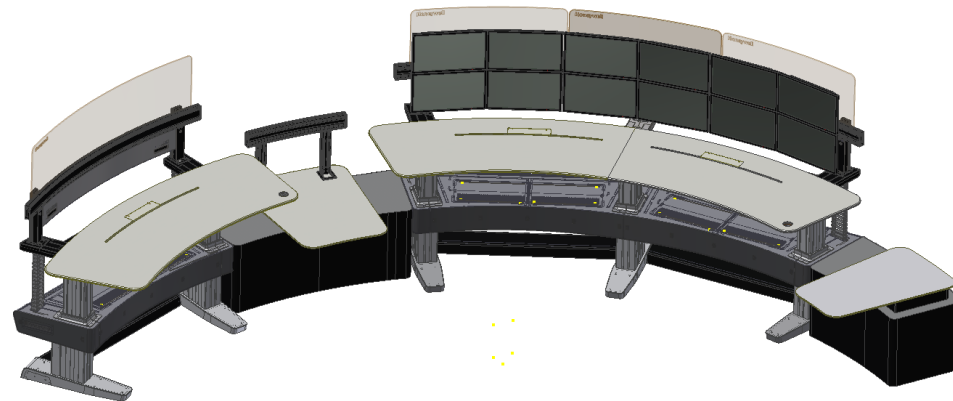
Help



Centar za upravljanje i kolaboraciju

REŠENJE | INTEGRISANI CENTER UPRAVLJANJA

Honeywell



Honeywell Orion Konzola

BENEFITI NAPREDNOG INTEGRISANOG UPRAVLJANJA

- Bolja koordinacija između različitih podsistema postrojenja
- Uobičajene hardverske i softverske platforme
- Zajednički skup rezervnih delova za održavanje
- Zajednička konzola za inženjering, dijagnostiku i dokumentaciju
- Lakoća rada i obuke
- Zajednički operatorski interfejs za celo postrojenje
- Efikasno i konsolidovano izveštavanje i arhiviranje podataka



Smanjuje opterećenje, rizik i troškove

CYBER SECURITY

Honeywell



ZAŠTO KLIJENTI BIRAJU HONEYWELL

Honeywell



OT DOMAIN KNOWLEDGE

- 100+ godina ekspertize u industriji
- 15+ godina OT cybersecurity expertize



CYBERSECURITY LEADERSHIP

- 300+ eksperata fokusiranih na OT cybersecurity
- 1,000 aplikacija sa sigurnim daljinskim pristupom
- Preko 5,000 projekata



INVESTMENT AND INNOVATION

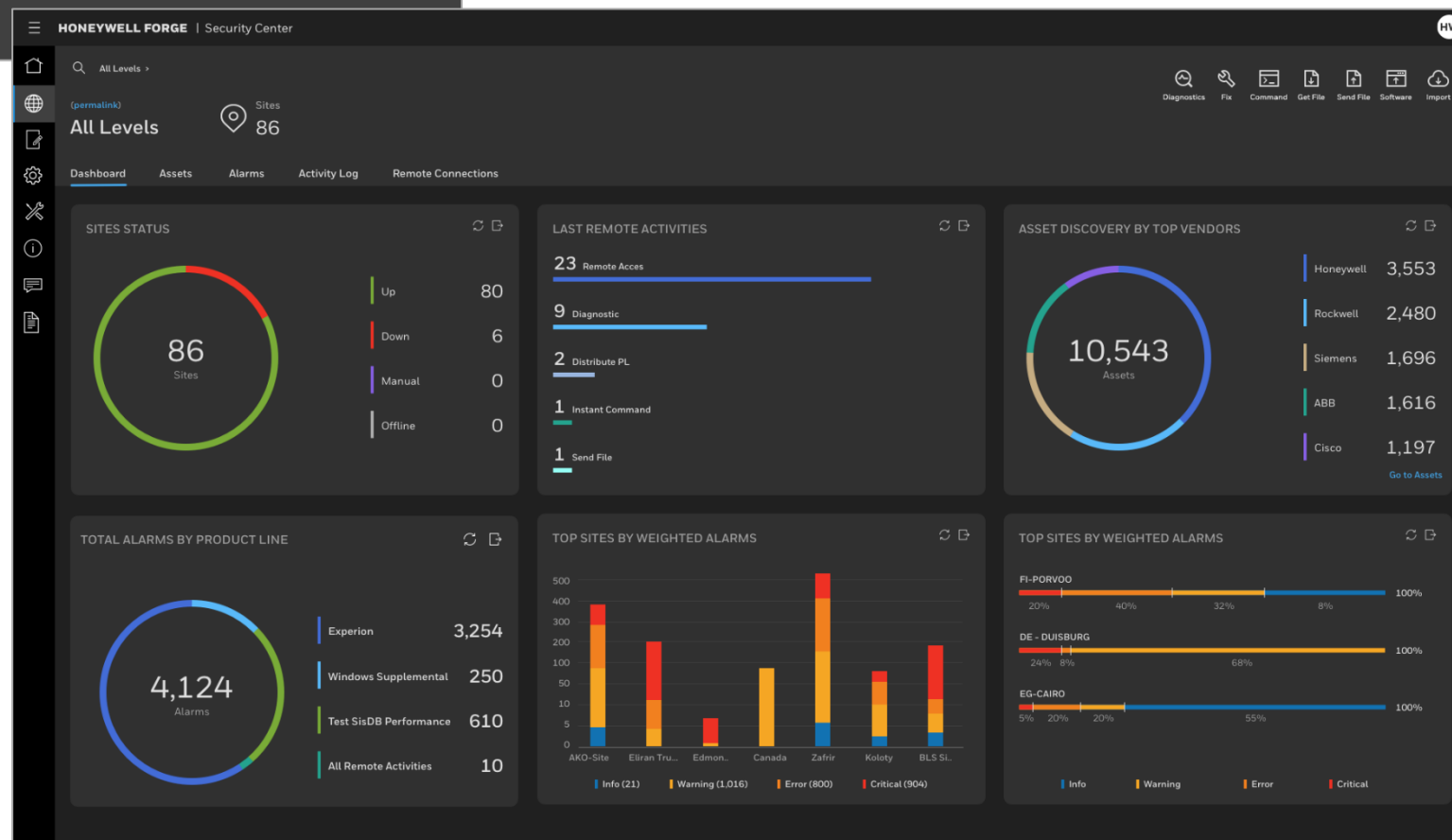
- Vendor neutralno rešenje
- Patentirana tehnologija
- Više regionalnih laboratorija i ekspertskih centara

Naš OT Cybersecurity iskustvo pravi razliku

Honeywell Forge Cybersecurity Suite
Softversko rešenje za poboljšanje performansi industrijske sajber bezbednosti u celom preduzeću

Vendor - Neutralno rešenje za jačanje sajber odbrane bez obzira na upravljački sistem

Zasnovan na industrijski dokazanim tehnologijama „**ICS Shield**“ i „**Risk Manager**“ instaliranih na stotinama lokacija



Jedinstveno OT Cybersecurity rešenje za upravljanje i rad više lokacija

**NAŠ PORTFOLIO
HONEYWELL
REŠENJA ZA
ODRŽIVOST**

ODGOVORNOST

- Building assessment and optimization
- Transparent tracking and real-time, integrated dashboards
- Measurement systems
- Roadmap with firm commitment to SMART goals
- Auditable progress to defined outcomes

OTPORNOST

- Safety, Protection, Emergency and Disaster Response Management
- Healthy Building Technologies
- Virtual Expert* Support to Augment Worker Knowledge
- Cybersecurity
- Battery back-up

**OKOLINA
(ŽIVOTNA
SREDINA)**

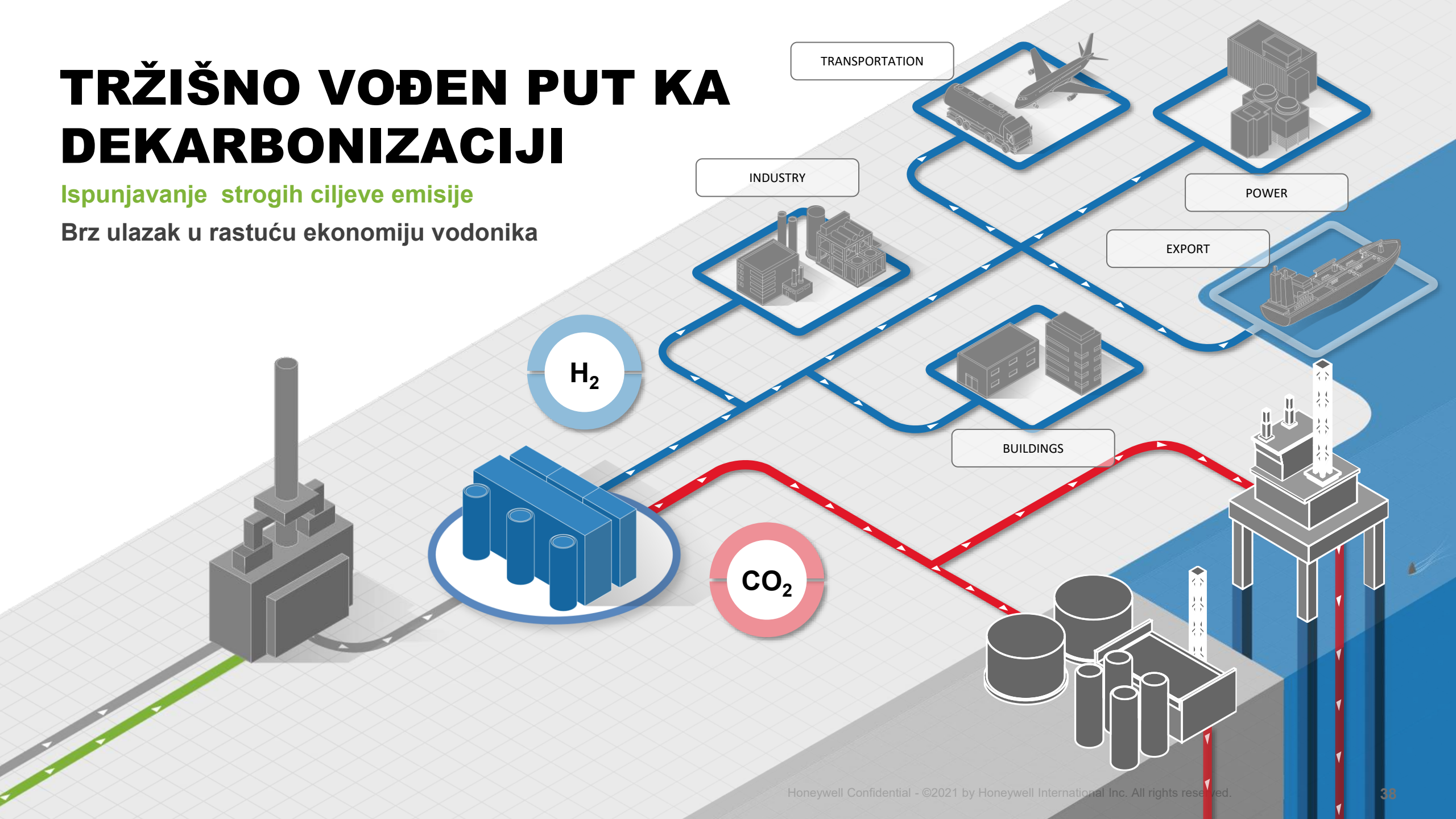
- GHG reduction: LGWP molecules
- Fleet electrification and smart logistics
- Renewable power advanced power management, VPPs*
- Energy storage: flow batteries and hydrogen storage
- Biofuels: SAF and renewable diesel
- Hydrogen: Blue and green hydrogen; Fuel Cells
- Lifecycle Impact: HGW emissions monitoring and remediation
- Ongoing methane gas monitoring
- Energy management services
- Energy and water* conservation and facility improvement
- Energy optimization and predictive maintenance
- Flight management
- Bio-sourced materials, bio-derived plastics
- Upcycle Plastics Recycling
- Carbon Capture

* Available through the Honeywell Partnership Ecosystem

TRŽIŠNO VOĐEN PUT KA DEKARBONIZACIJI

Ispunjavanje strogih ciljeve emisije

Brz ulazak u rastuću ekonomiju vodonika



BATTERY STORAGE

Honeywell



BESS | LI-ION SOLUTION – DC BLOCK

Applications

- ✓ Peak Shaving
- ✓ Capacity Firming
- ✓ Capacity Smoothing
- ✓ VAr support
- ✓ Frequency Regulation
- ✓ Ramp Rate Control
- ✓ Dispatch Controller
- ✓ Charge Discharge Control
- ✓ Ancillary Services
- ✓ Microgrid Controller
- ✓ Virtual Power Plant
- ✓ Market Participation

Container Specifications

- ✓ Battery Chemistry: Lithium Iron Phosphate (LFP)
- ✓ Usable Energy: Min. 500 kWh to 4 MWh
- ✓ Rated Power: 2 MVA
- ✓ DC Voltage Range: < 1,500 VDC
- ✓ AC Voltage: 600 V
- ✓ Depth of Discharge (DOD): 100%
- ✓ DC Round Trip Efficiency [2-hour rating]: 95%
- ✓ Communications Interface: Modbus, DNP3
- ✓ Cooling: Forced air
- ✓ Ambient Temperature Range: -30°C to +50°C
- ✓ Fire Suppression: Aerosol-based
- ✓ Water Ingress Detection: Included

Rack Specifications

- ✓ Battery Manufacturer: Narada
- ✓ Rack capacity: 250 kWh
- ✓ C-rating: 0.5C
- ✓ DC Voltage Range: 870 – 1130 VDC
- ✓ Rack configuration: 13 modules
- ✓ Depth of Discharge (DOD): 100%

HVAC units

on doors

Return air duct x 2

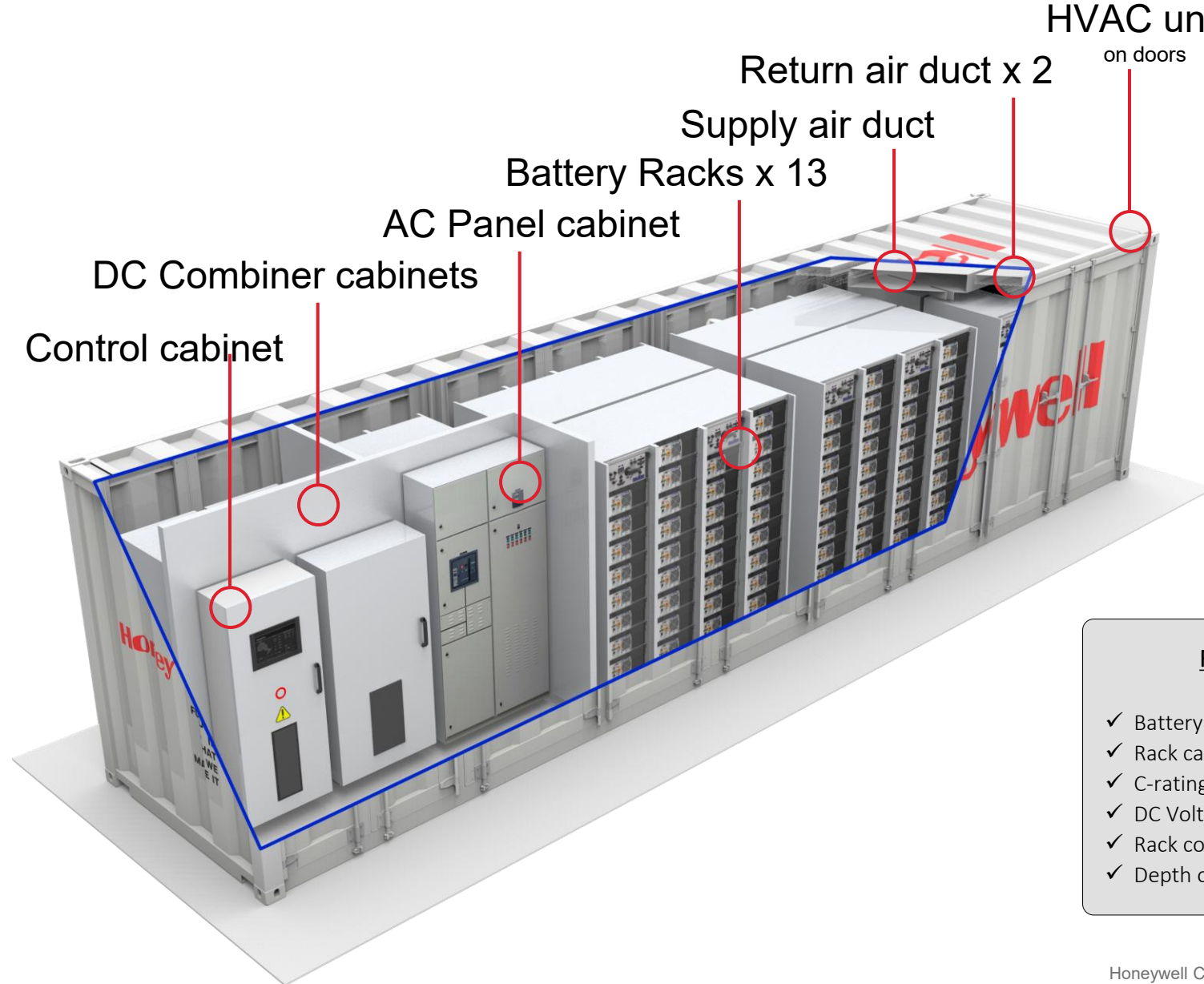
Supply air duct

Battery Racks x 13

AC Panel cabinet

DC Combiner cabinets

Control cabinet



EMS | ENERGY MANAGEMENT SYSTEM

- **EMS je kombinacija:**
 - softvera,
 - hardvera za akviziciju podataka
 - senzora
 - kontrolera i
 - sistema za komunikaciju
- **Glavne funkcije EMS-a su:**
 - merenje,
 - akvizicija,
 - analiza i
 - prikaz podataka

da pomogne industrijskim energetskeim menadžerima, menadžerima objekata, proizvodnim i finansijskim menadžerima u smanjenju upotrebe energije i troškova u industrijskim postrojenjima.



EMS - PRIKAZ EKRANA OPERATERA

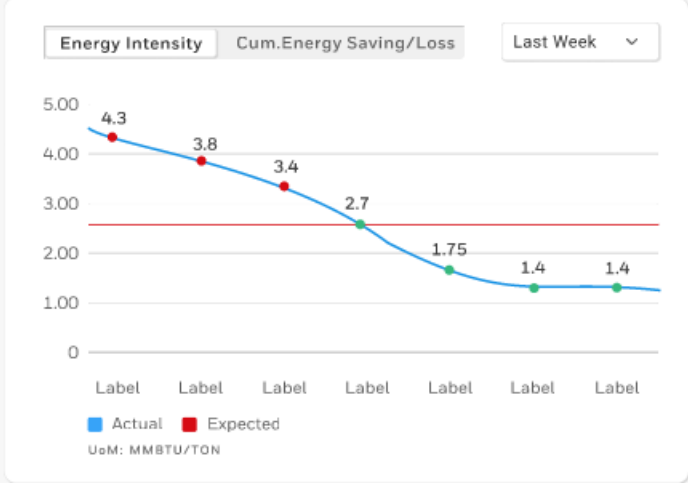
PRODUCTION
16,700 TON
 ↑ 10% higher consumption from previous day

ENERGY CONSUMPTION
1,00,050 MMBTU
 ↑ 15% higher consumption from previous day

ENERGY INTENSITY
5.09 MMBTU/TON
 ↑ 09% higher intensity from previous day

GHG EMISSIONS
49 tCO₂e
 ↑ 05% higher emissions from previous day

GHG EMISSIONS INTENSITY
0.5 tCO₂e / TON
 ↑ 0.5% higher intensity from previous day



PLANT ANALYSIS Sort by High Energy Intensity

Plant 01

Feed	Production	Energy Intensity	Economic Impact
250 MMSCF	7050 TON	3.09 MMBTU/TON	\$ 2k

Energy Consumption

Actual	Expected	Deviation
900 MMBTU	850 MMBTU	50 MMBTU

Plant 02

Feed	Production	Energy Intensity	Economic Impact
200 MMSCF	6900 TON	2.90 MMBTU/TON	\$ 1k

Energy Consumption

Actual	Expected	Deviation
600 MMBTU	575 MMBTU	25 MMBTU

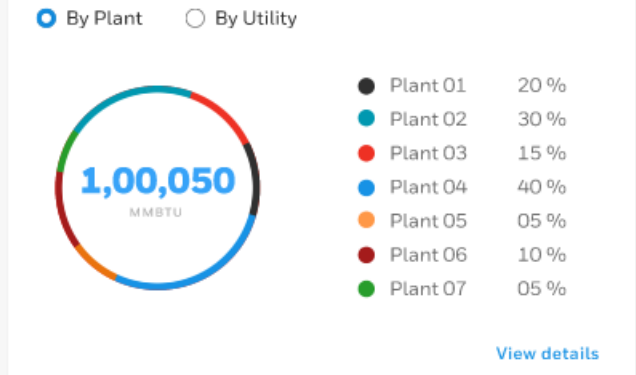
Plant 03

Feed	Production	Energy Intensity	Economic Impact
180 MMSCF	6000 TON	2.50 MMBTU/TON	\$ 0.4k

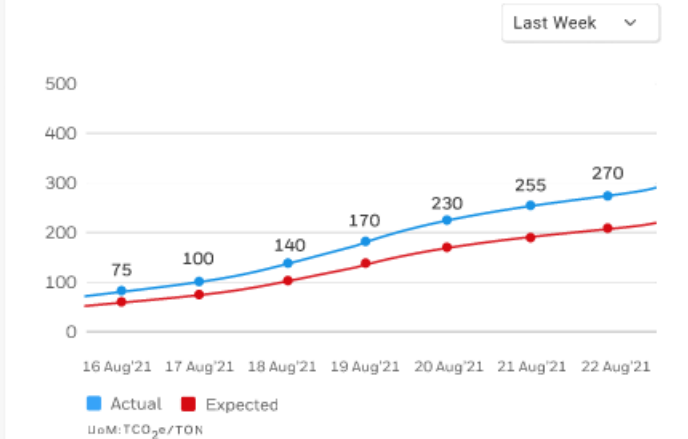
Energy Consumption

Actual	Expected	Deviation
500 MMBTU	490 MMBTU	10 MMBTU

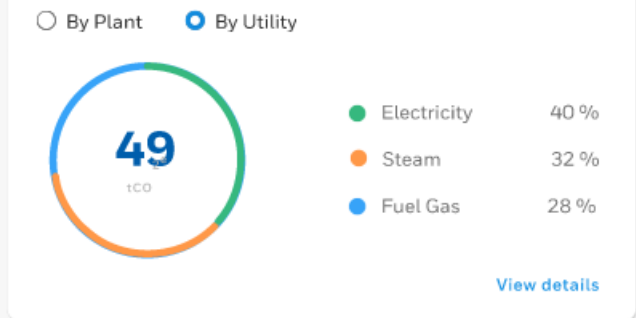
ENERGY CONSUMPTION Today



Cum. GHG Avoided/Emitted | Emission Intensity | Last Week



GHG EMISSIONS Today





Hvala na pažnji!
PITANJA?

APPENDIX

PREZENTACIJA O IMPLEMENTACIJI 2 EMS (ENERGY MANAGEMENT SYSTEM) REŠENJA U OBLASTI VODA I OTPADNIH VODA

Honeywell





EMS Projekti implementirani u oblasti voda i otpadnih voda:

- 1) Sistem Vodosnabdevanja „Morava“ Kragujevac
- 2) PPOV Kruševac

- Presentacije su bile deo dokumentacije za konačan prijem i evaluaciju izvedenih EMS projekata u oblasti voda i otpadnih voda koji su delom bili finansirani iz donacija i iz tog razloga su na engleskom jeziku.
- Ovi projekti su pokazali da primenom rešenja koja su bila kombinacija sistema upravljanja, meranja, praćenja, daljinskog prenosa podataka i EMS-a mogu doneti konkretnu korist u veoma kratkom vremenskom periodu i u industrijama koje nisu primarno viđene kao neki od najvećih potrošača energije, i da pri tome imaju veoma mali period povraćaja investicija (ROI).
- Jasno je da se primenom EMS u Energetici, Rafinerijama, Hemijskoj, Baznoj i drugim industrijskim granama koje su veći potrošači i proizvođači energije mogu se postići i mnogo veće uštede.

SISTEMI UPRAVLJANJA ENERGIJOM



- Energetska efikasnost u proizvodnji, pomaže kompanijama da povećaju **produktivnost** u svojim postrojenjima, što zauzvrat poboljšava njihovu **konkurentnost** u svim sektorima.
- Osnova je implementiranje dobro strukturiranog sistema upravljanja energijom kao sistematskog pristupa praćenju upotrebe energije i smanjenju troškova.
- Implementacija sistema upravljanja energijom nije cilj sama po sebi.
- Bitni su rezultati sistema: poboljšanje energetske performansi usmeravanjem pažnje na energiju u svakodnevnoj praksi.

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac



Jun, 2023

Dušan Otašević

Honeywell

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Project is implemented in a way that USAID and TetraTech provided the financing of part of this project with a donation (30%).

The second part was financed by customer through its own funds.

Parties involved in the realization of the project are:

- Customer:
Waterworks and Sewerage System Kragujevac
- Donator:
USAID
- Donation implementation:
TetraTech
- Donation part Project Implementation:
Honeywell Belgrade
- Implementation of part of the project financed by the client:
O2 Process Solutions Belgrade



USAID



TETRA TECH

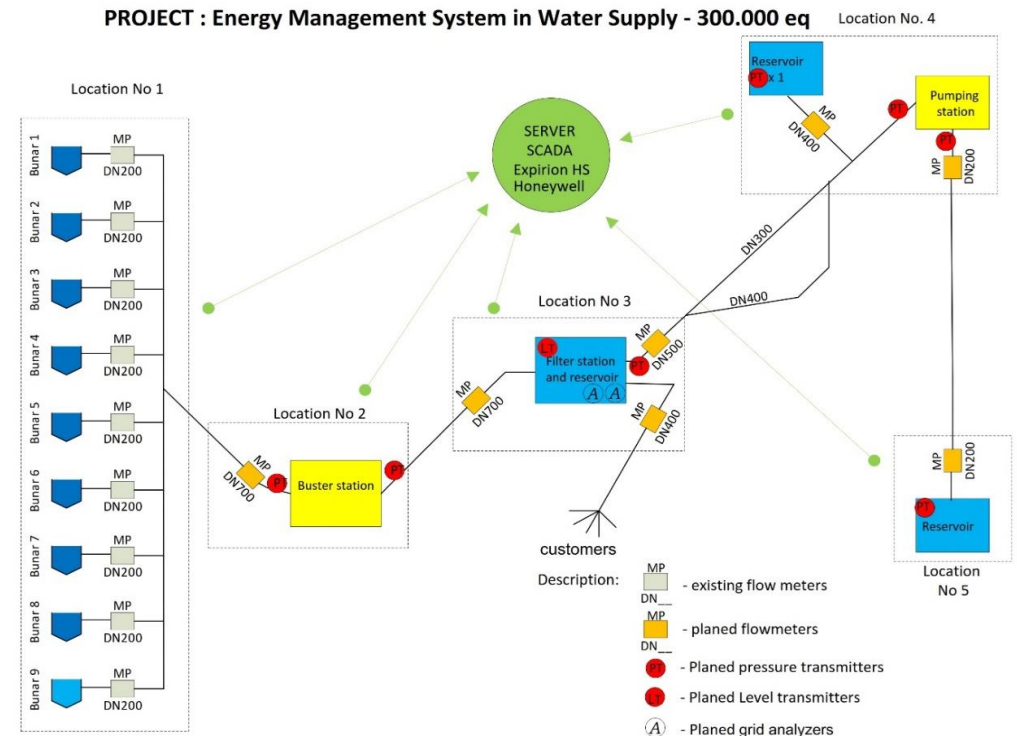
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O2 PROCESS
SOLUTIONS

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- The intention of the project is to cover the water supply system "Morava", which supplies the city of Kragujevac with about **40%** of drinking water, with a monitoring system, data acquisition and a system for monitoring energy consumption and efficiency of the entire system.
- The main goal of the project is to provide insight into the amount of raw water that is transported from remote locations and to detect pipeline losses through a comparative analysis and to gain insight into production and consumption during the year.
- It is also intended to cover the main consumers with smart meters for electricity consumption, which will help determine the efficiency of certain parts of the system.



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- The water supply system "Morava" covers a large area of app. **40km²** and the main sources of water wells are located at a relatively large distance from the city itself.
- This required a solution that enables measurement of flow and pressure on pipelines, data collection and transmission, local control and remote monitoring from a Control Center located in the city.
- The challenge was also the fact that the flow meters had to be installed on the main pipelines of large diameters, which required special installation conditions and closing the water supply to certain areas of the city due to installation.
- The system also needed to integrate existing flow meters.



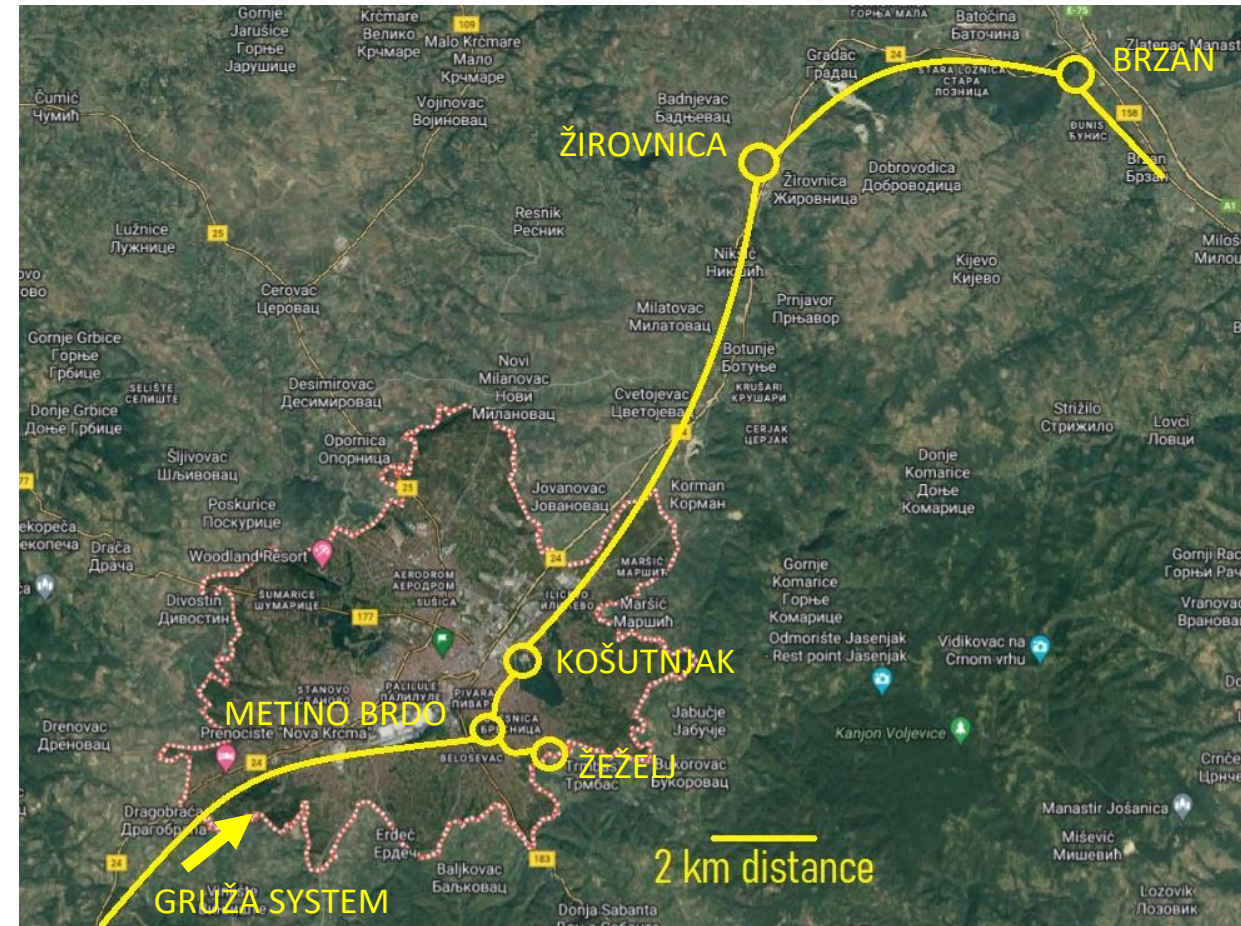
ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Main 5 locations of this system are:

- **1. Brzan Morava Wells**
- **2. Žirovnica Pumping Station**
- **3. Košutnjak Water Treatment**
- **4. Metino Brdo Reservoir**
- **5. Žeželj Reservoir**

At certain locations on this system, there are already built-in flowmeters that are in operation, primarily at 9 pumps at the Brzan Morava location and special insertion type of flowmeters for big pipes DN700, DN900 and DN1000 (that have several sets of sensors for several measuring areas per each flowmeter).



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

The project executed **Honeywell** in cooperation with Honeywell Authorized System Integrator company **O2 Process Solutions** on a „turnkey basis“ and included:

- Delivery of equipment:
 - EMS/SCADA Server,
 - EMS/SCADA Operator Station,
 - Industrial Ethernet Switch,
 - Controllers,
 - Field Instrumentation (Flowmeters, Pressure and Level Transmitters)
 - Control Cabinets,
 - Modems,
 - El. Smart Meters,..
- Electrical Installations and Wiring and
- Commissioning.



Honeywell

O2 PROCESS SOLUTIONS

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ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

The project executed **Honeywell** in cooperation with Honeywell Authorized System Integrator company **O2 Process Solutions** on a „turnkey basis“ and included:

- Design and Preparation of Technical Documentation
- System Engineering,
- Programming of Controllers,
- Signals Integration to the EMS/SCADA system,
- Creating Views and Displays in SCADA/EMS,
- Creating reports and
- Training Operators.

Control Cabinets before delivery



Honeywell

O2 PROCESS
SOLUTIONS

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- **Operator Workstation / Server** is installed in the Control/Dispatch Center and it communicates with 5 locations via GSM/GPRS Modems.
- Backbone of the EMS/SCADA solution is Honeywell **Experion HS**.
- Special feature of this solution was delivery of "**History Backfill**" license which allows in the event of a loss of communication, all data that stored on the controller's internal memory to be written to the system after re-establishment of communication.



Experion[®]HS
A New Level in Operational Excellence

- Cost Effective
- High performance, stable and secure software
- Simplified Installation
- Experion Historian
- Operator Workflow Engineering Usability & Productivity
- Virtualization
- OneWireless

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Experion HS Main Features

Reliability

- Stable and secure high-performance software,
- It can be used with rugged computers that withstand extreme conditions
- The full redundancy option ensures the highest possible availability

Flexibility

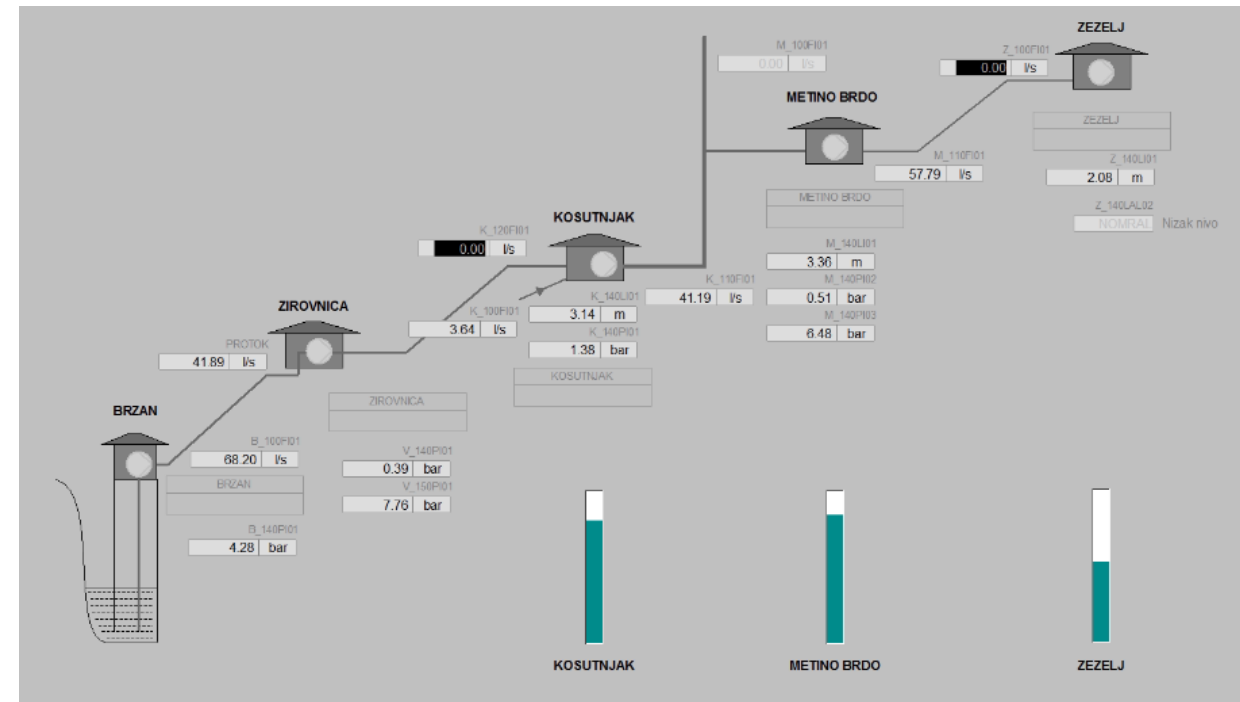
- Adaptable system: from small to large multi-site systems and the possibility of integration on Experion PKS
- It successfully solves the needs of a large number of applications

Efficiency and Cost Effectivnes

- Simplicity of configuration and ease of use ensure fast and efficient execution of projects

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ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- On all sites are installed **Control Edge RTU** controllers (PLCs) and a modem that communicates with the EMS/SCADA system.
- The controllers communicate as "slave" devices with the distributed SCADA/EMS supporting **Modbus** and **DNP3** protocols via: **2 x Ethernet ports**, **2 x RS-232** serial ports and **2 x RS-485** serial ports.
- They are very reliable and have a low power consumption typically below **2W**.
- RTUs have possibility of working in redundant mode
- Operating temperature range is: -40..75oC
- All analog inputs and outputs have **HART** communication enabled
- RTU also supports **IEC 61131-3** programming environment



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- The RTU controllers have the following number of inputs and outputs and can be expanded if needed with additional slots that have the same configuration:
 - Analog inputs: 8
 - Analog outputs: 2
 - Digital inputs: 10
 - Digital outputs: 6
 - Impulse inputs: 2
- RTUs have the possibility of remote diagnostics.
- RTUs can be programmed and upgraded remotely



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- Project included delivery, el. connection and commissioning of 7pcs. flow meters:
 - Žirovnica 1xDN700;
 - Košutnjak 2xDN700 and 1xDN400;
 - Metino brdo 1xDN400 and 1xDN200;
 - Reservoir Žeželj 1xDN150;
- Waterworks already had Badgermeter el. Magnetic flowmeters installed base, for this reason as well as for a very good ratio of quality and price, flow meters from the US manufacturer Badgermeter were delivered.



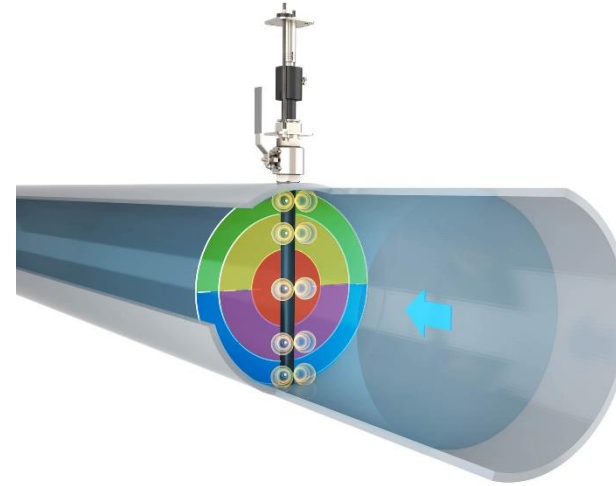
ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Project included delivery, el. connection and commissioning of:

- **2 level meters** and
- **6 pressure transmitters**

As well as Integration of existing el. Magnetic and insertion type profile measurement flowmeters from Belgian manufacturer Flowtronic on pipe diameters DN700, DN900 and DN1000 and pressure and level meters from various producers.



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

- Project included delivery and installation of 2 pcs. of "Smart" electricity consumption analyzers, on important pump station for the operation of the system, that are communicating with the controller via the Modbus protocol.
- Rated powers of existing pump motors are: 90kW.
- Monitoring the consumption (active and reactive) of energy on the main units providing insight how additional savings can be achieved.



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Installed Equipment: location Brzan

- INSERTION TYPE FLOWMETER Torpeemag DN700
- PRESSURE TRANSMITTER



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ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Installed Equipment: location Žirovnica

- FULL BORE MAGMETER DN700
- PRESSURE TRANSMITTER INLET
- PRESSURE TRANSMITTER OUTLET



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Installed Equipment: location Žirovnica



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Installed Equipment: location Žirovnica



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Waterworks and Sewerage System Kragujevac

Installed Equipment: location Košutnjak



- FULL BORE MAGMETER DN700
- FULL BORE MAGMETER DN500
- FULL BORE MAGMETER DN400
- HYDROSTATIC LEVEL TRANSMITTER
- PRESSURE TRANSMITTERS INLET
- PRESSURE TRANSMITTERS OUTLET
- CURRENT ANALYZERS



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Installed Equipment: location Košutnjak



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Waterworks and Sewerage System Kragujevac

Installed Equipment: location Košutnjak



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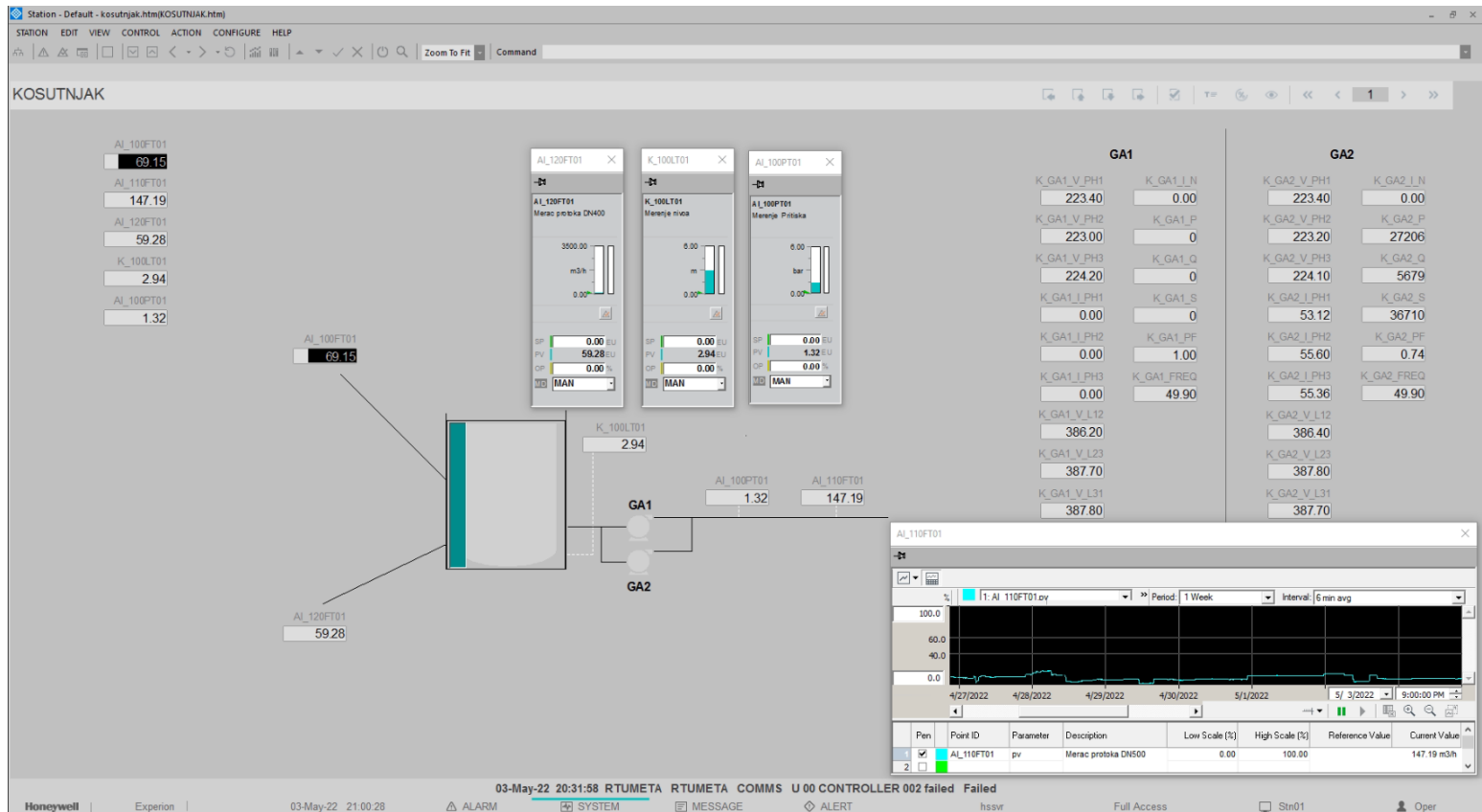
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Waterworks and Sewerage System Kragujevac

Installed Equipment: location Košutnjak



ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Installed Equipment: location Metino Brdo

- FULL BORE MAGMETER DN200
- FULL BORE MAGMETER DN500
- PRESSURE TRANSMITTERS



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ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Installed Equipment: location Žeželj

- FULL BORE MAGMETER DN200
- FULL BORE MAGMETER DN500
- PRESSURE TRANSMITTERS



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ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Installed System: location Control Center

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ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Main Benefits of the implemented project

- The main general benefit is that the measurements were obtained on magistered pipelines, and in this way the Waterworks Kragujevac can always know what capacity it has.
In this way, it is possible to obtain a balance of the amount of water, as well as a comparative analysis of production/consumption by the amount of electricity consumed.
- Controllers and a centralized System for Supervision and Management and for Energy Management were installed on the "Morava" water supply system over 5 remote locations. All locations have the possibility of management through SCADA system and PLC. Currently, the system is used only for data acquisition. This system can be easily extended to long sections of water supply system such as the "Gruža" water supply system.
The implementation of this system led to an increase in:
 - **Reliability of water supply**
 - **Energy efficiency**
 - **Efficiency of plant operation**
 - **Better insight into the current situation**
 - **Ability to analyze data over a longer period of time**
 - **Easier decision-making**

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Main Benefits of the implemented project

By applying this system and analyzing the obtained data, Waterworks Kragujevac also reached the following conclusions:

- By inspecting the balance sheets and comparing the data at different locations, losses on certain shares were determined. On those sections, it is necessary to find the exact locations where the biggest losses occur by working in the field and using leak detection equipment.
- At the Žirovnica pumping station, it was determined that the energy consumption is disproportionately high in relation to the amount of water being pumped. After engaging the designers and preparing the study, it was concluded that instead of one large pump of 200kW, a booster plant with three smaller pumps of 55kW should be installed. By implementing this solution, savings of 50% are expected compared to the current situation. The motors on the old pumps are high voltage and do not have the possibility of frequency regulation. With the new booster plant, only one pump would work most of the time because there is not enough water from the Morava, so the savings would be more than 50%. (the last bill for electricity at this plant was in September for 20kEUR. The city of Kragujevac is also very interested in carrying out this project. The projected budget for this investment is EUR 150,000, as construction works and the installation of a new transformer station are required.

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Main Benefits of the implemented project

By applying this system and analyzing the obtained data, Waterworks Kragujevac also reached the following conclusions:

- There is also a large space for saving energy at Brzan Wells, where there is also a disproportion between the amount of energy consumed and the amount of water introduced into the system:
There are 9 wells with 75-90 kW motors with frequency regulators, but with a very small amount of water. The monthly bill is around 20k EUR.
The pumps pump directly into the pipeline that goes to Žirovnica.
Data analysis led to the idea that instead of the current configuration, two main wells are used from which the main pipeline is pumped, and that water is pumped from the other wells into these two main ones (with new smaller pipelines and 5-15kW pumps). Due to the situation on the field, 2 flow meters are still not installed, and their installation will result in a complete balance of raw water.

ENERGY MANAGEMENT & DATA ACQUISITION SYSTEM

Waterworks and Sewerage System Kragujevac

Conclusion:

This project fully met all expectations and justified the invested funds and already in the first year of use it contributed to easier supervision and management of the "Morava" water supply system, as well as in assessing the situation and defining the next steps in improving production security and increasing energy and efficiency in general.



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ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac



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ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

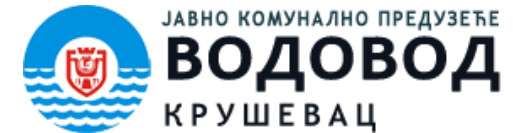
Wastewater Treatment Plant Krusevac

Project is implemented in a way that USAID and TetraTech provided the financing of part of this project with a donation (37%).

The second part was financed by the customer through its own funds.

Parties involved in the realization of the project are:

- Customer:
Public Utility Company Waterworks Krusevac
- Donator:
USAID
- Donation implementation:
TetraTech
- Donation part Project Implementation:
Honeywell Belgrade
- Implementation of part of the project financed by the client:
O2 Process Solutions Belgrade



ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

- The project is executed by **Honeywell Belgrade** in cooperation with Honeywell Authorized System Integrator company **O2 Process Solutions Belgrade** on a „turnkey basis“.
- The main purpose of implementing the project is to improve the safety of the city's Wastewater Treatment Plant by controlling the quality and quantity of wastewater on WWTP inlet and to increase energy efficiency through the implementation of the **EMS** (Energy Management System).



Honeywell

O2 PROCESS SOLUTIONS

ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

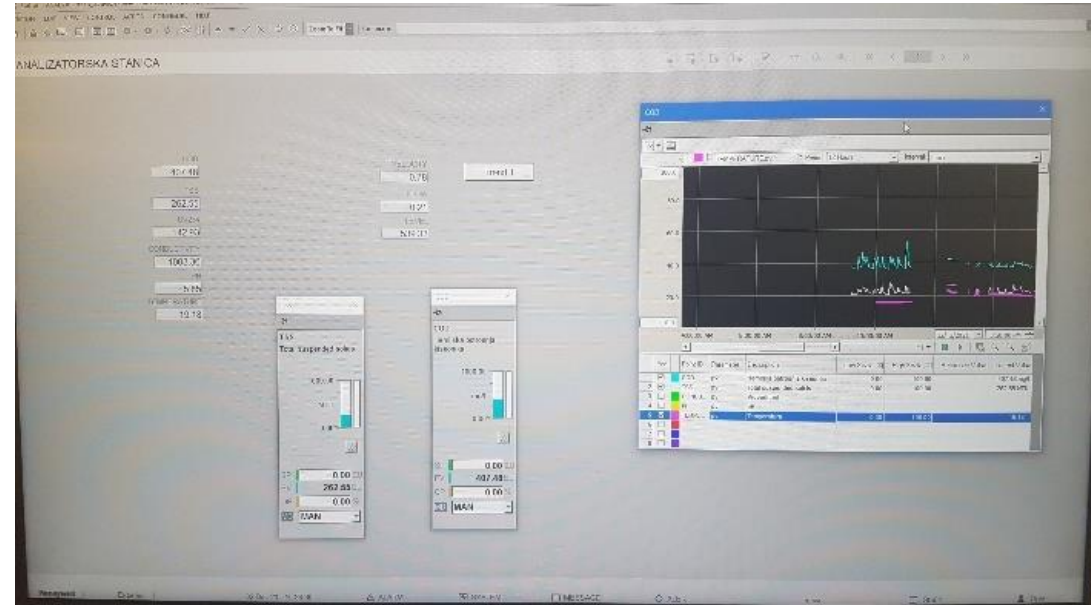
- The project included the installation of an **automatic station for quality and quantity monitoring** from one of the two main collector pipes coming to the wastewater treatment plant and the integration of data into the EMS/SCADA system.
- The Automatic Analyzer Station is placed in a **protective housing** and has an appropriate electrical cabinet, an independent control system of all necessary sub-systems for the proper operation, such as: Probe cleaning system using compressed air, air valve manipulation and sampling, as well as the sampling system (pump, fittings, valves).



ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

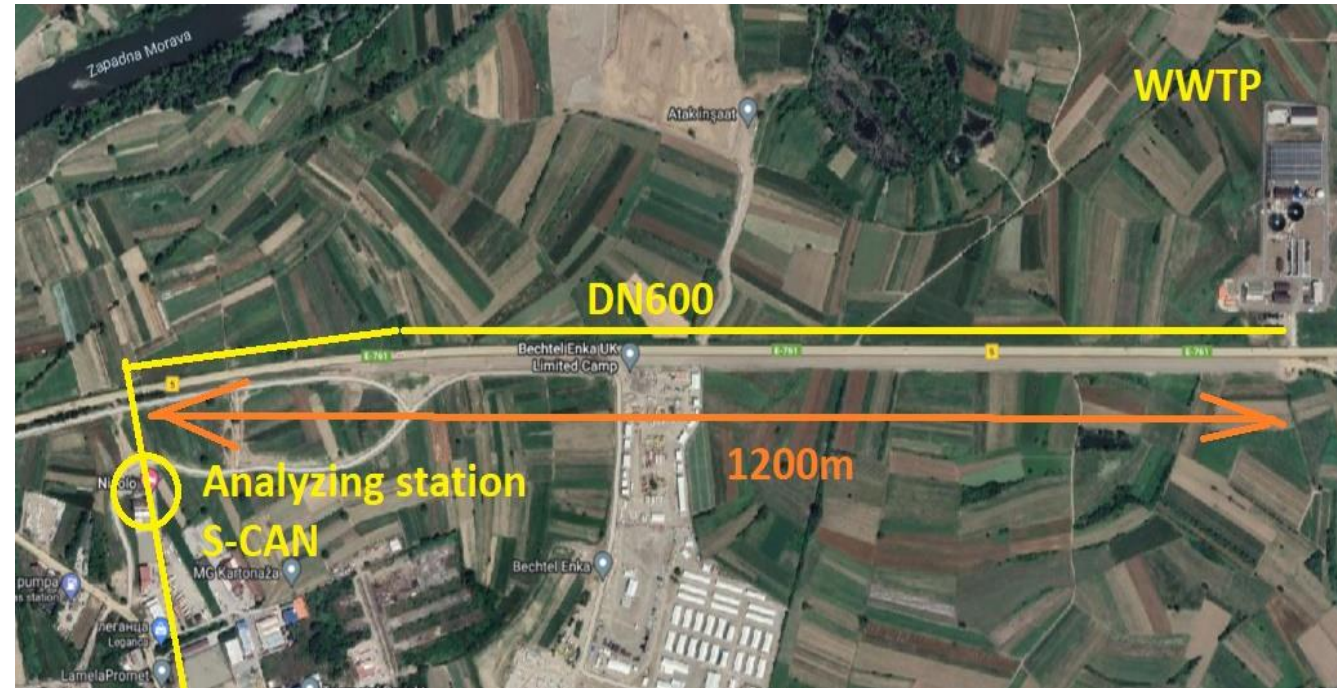
- Initially, it was agreed that the user should enable the EMS/SCADA system via the MODBUS protocol (recommended) or OPC server to integrate data from the existing SCADA at the plant that are essential for the Energy Management System, such as pumps, blowers and electrical analyzers.
- Unfortunately, there was no pre-approved budget for the services, which are required for the engagement of the supplier of the control system, without whom it was not possible to perform this action.
- The task remains to do this in the time to come.



ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

- The consistive parts of the offered system are:
 - the EMS/SCADA system with the necessary hardware components and licenses,
 - the development of the application software and
 - the **Analyzer Station** for "on-line" monitoring of the flow and quality of wastewater at the main collector at a distance by air of **1200m** from the plant.



ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

- The system provides continuous "on-line" monitoring of the wastewater **quality** and **quantity** on 1 out of 2 main collectors through the monitoring of all important analytical and process parameters:
 - Chemical Oxygen Demand **COD**,
 - Total Suspended Solids **TSS**,
 - Organic Matter **UV254**,
 - Acidity **pH**,
 - **Conductivity**,
 - **Temperature**,
 - **Flow and velocity** and
 - **Level**.



ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

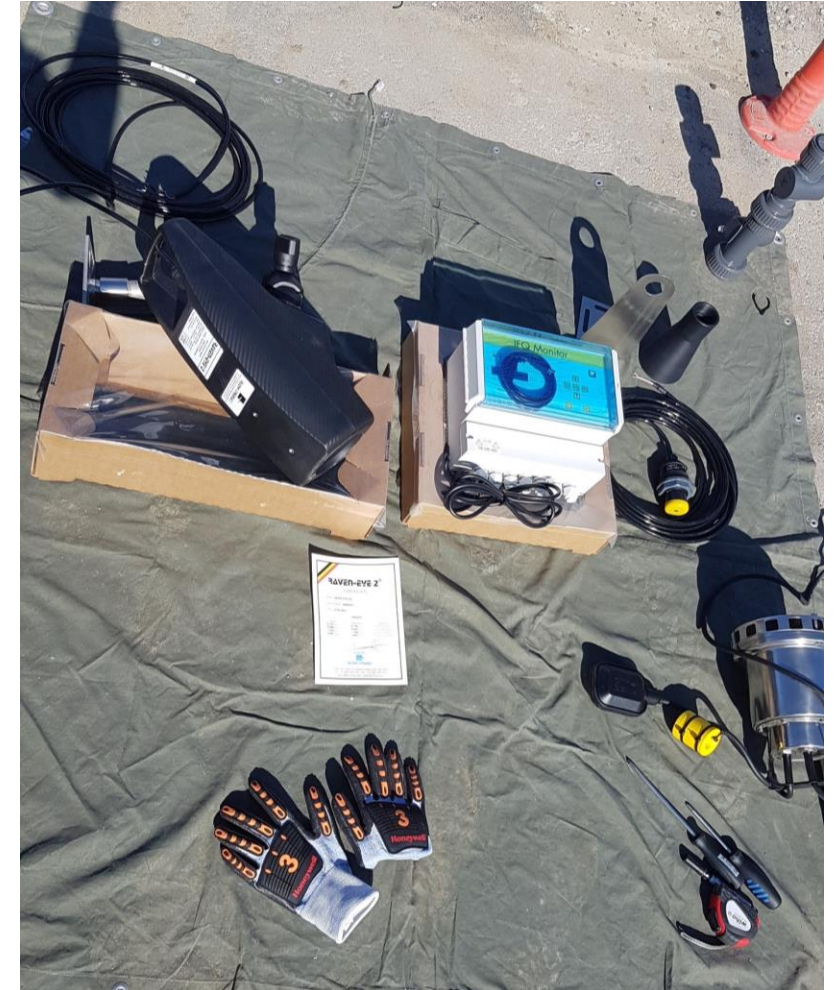
- Project included delivery of the following equipment:
 - **EMS/SCADA Server,**
 - **EMS/SCADA Operator Station,**
 - **Industrial Ethernet Switch,**
 - **Automatic Analyzer Station with all necessary sub-systems,**
 - **Raven-Eye Open Channel Flowmeter,**
 - **Level Transmitter,**
 - **Control Cabinet and**
 - **Modems.**



ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

- Project included performing the following services:
 - **Electrical Installations and Wiring,**
 - **Physical installation of Raven Eye Flow Measurement System**
 - **Physical installation of Automatic Analyzer Station**
 - **Commissioning of all equipment,**
 - **System Engineering,**
 - **Signals Integration to the EMS/SCADA System,**
 - **Creating Views and Displays in EMS/SCADA,**
 - **Creating Reports and**
 - **Training the Operators.**

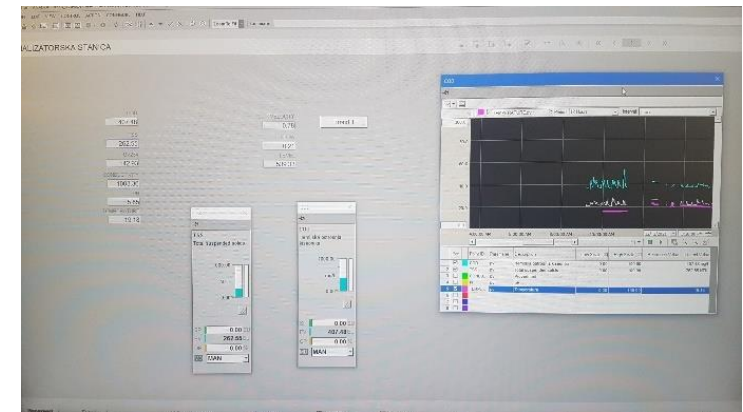
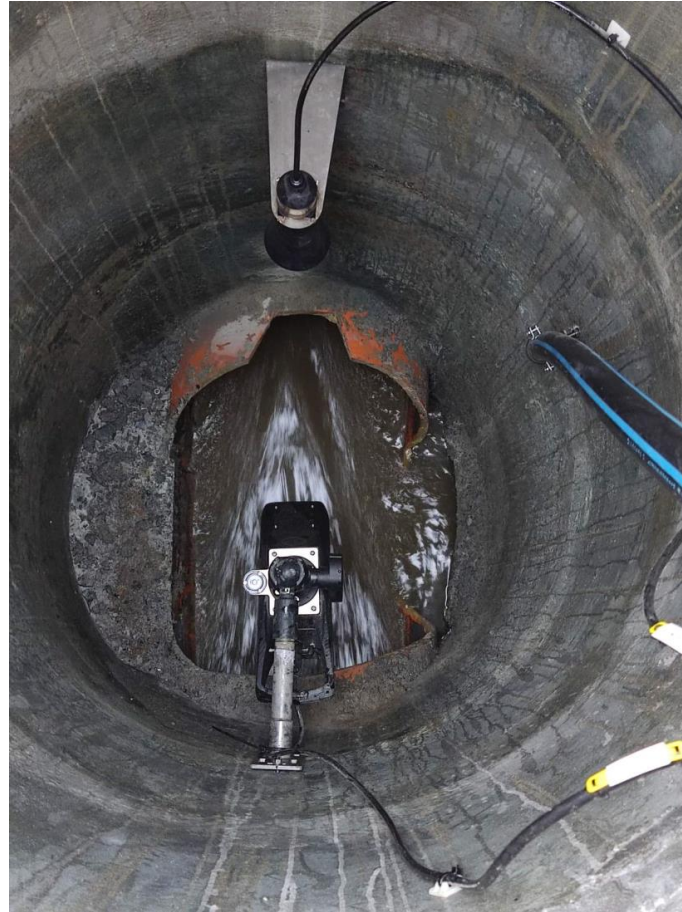


ENERGY MANAGEMENT and QUALITY&QUANTITY MONITORING SYSTEM

Wastewater Treatment Plant Krusevac

The main parts of the implemented solution are:

- 1. Automatic Analyzer Station**
- 2. Main Collector Flow and Level Measurement System**
- 3. SCADA/EMS System**

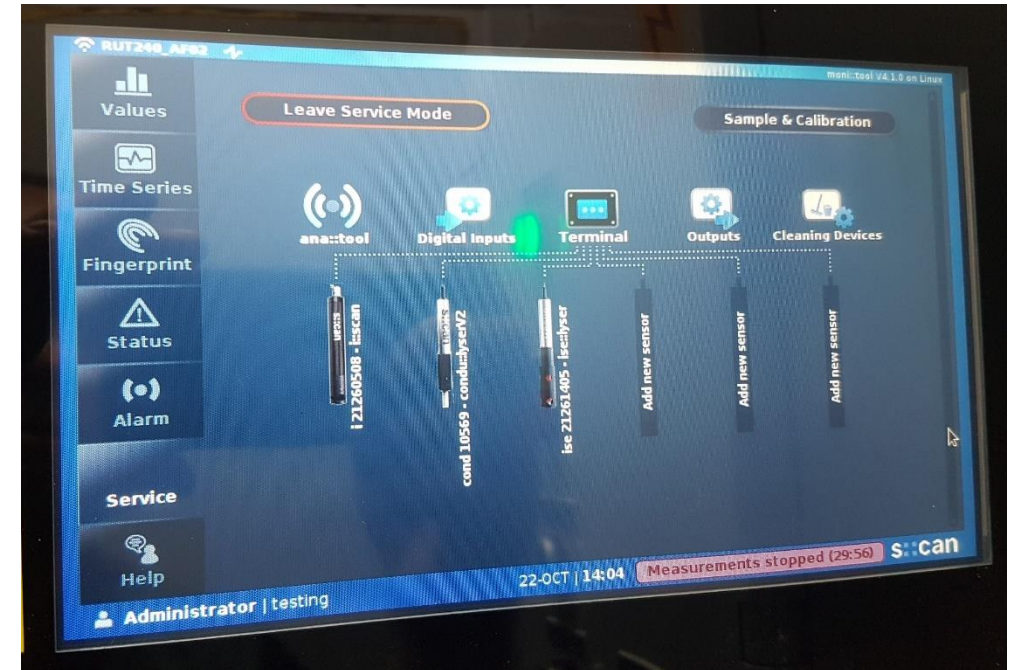


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Wastewater Treatment Plant Krusevac

Automatic Analyzer Station

- The Automatic Analyzer Station has an **independent control system** that manages all necessary sub-systems for proper operation, such as:
 - Probe **cleaning system** using compressed air,
 - **Mechanical cleaning** system,
 - Automatic **manipulation** of air-valves,
 - **Sampling system** with submersible stainless steel drainage pump.



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Automatic Analyzer Station

- The control system of the analyzer station also **integrates signals** from the system for **non-contact flow measurement** on the collector, which consists of a radar flow meter, a level measurement probe and a flow transmitter, and through a modem provides communication with the EMS/SCADA.
- Data from the the Automatic Analyzer Station are integrated via remote communication with a **3G/4G modem** with an EMS/SCADA system that is located in the wastewater treatment plant.



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Automatic Analyzer Station - main parts

- **Industrial computer (Terminal)** for analysis of values obtained from sensors and analyzers and for communication with the control system,
- **Electrical cabinet** in which is placed the industrial computer, all transmitters, necessary electrical equipmen and modem for communication with the SCADA/EMS system,
- **System for Automatic Cleaning** of process analyzers with compressor and valve system,



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Automatic Analyzer Station - main parts

- **Process Analyzer**, which works on the basis of a **Process Spectrophotometer**,
- **Process Analyzer of pH and Temperature**.
- **Conductivity and Temperature Process Analyzer**,
- **Submersible Stainless Steel Drainage Pump** for taking samples from the collector,
- **Sample Collection and Preparation System**,



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Automatic Analyzer Station - main parts

- **Analyzer House** for protection against external influences, made of panels with insulation and with all the necessary equipment for the proper operation and protection of the Process Analyzer equipment, Raven-Eye Transmitter and Control and Communication System.
- Analyzer House contains **heating body** (radiator), and **fan**.
- It contains all necessary **electrical and process (water and compressed air) installations** required for the operation of the system.

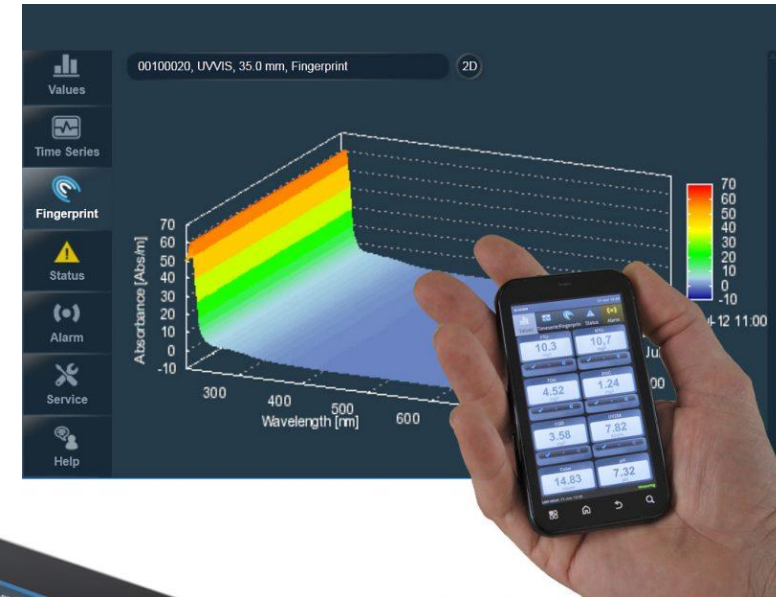


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Terminal/Industrial Computer – Main Features

- The Terminal/Industrial computer has a touch screen and it is made in **IP65 protection**.
- Low power consumption
- The Terminal has functionality of making **time series** and spectral analysis.
- It is able to control sensors and stations up to **64 parameters**:
 - automatic cleaning,
 - data recording,
 - sampling and calibration including **history** and **multi-point calibration**,
 - sensor **function check**,
 - easy data transfer via **USB** stick.

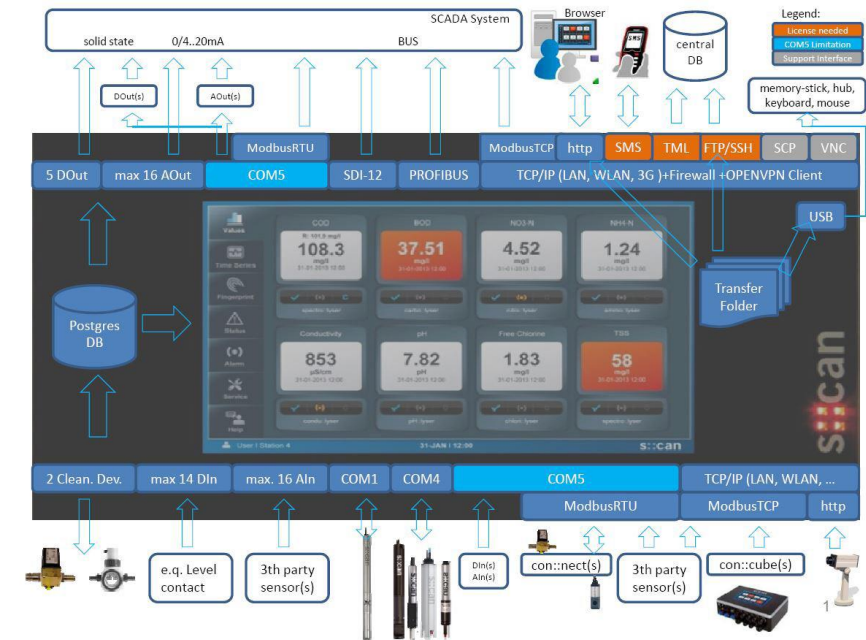


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Terminal/Industrial Computer – Main Features

- **IoT** (Internet of Things) and **M2M** (Machine to Machine) connectivity: 100 Mbps Ethernet, 300 Mbps Wi-Fi and optional WCDMA 3G interface, remote control (http) and cloud data transfer via FTP, SSH and TML protocols.
- Process interface for SCADA ("SCADA") system via **Modbus RTU/TCP, SDI-12, Profibus DP**, analog **0/4-20mA** and relay outputs.
- Integration of sensors via analog 0/4-20mA and digital (solid state) inputs, Modbus RTU/TCP.
- Possibility of easy expansion and availability of the following functions: **8 slots** for adjusting input and output (I/O) parameters, pre-installed software, "online" data validation and event detection (accident situations).



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Main Collector Flow and Level Measurement System

The flow measurement system consists of the:

- **Radar flow meter,**
- **Ultrasonic level probe and**
- **Transducer.**



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Main Collector Flow and Level Measurement System

Raven Eye Radar – Main Features

- Stationary non-contact radar flow meter, with an external ultrasonic probe for level measurement, for installation above wastewater.
- The device is able to additionally integrate ultrasound Doppler on the collector ceiling, which is used to measure the flow under conditions of complete submergence of the collector.
- Highly sophisticated, robust device, fully (factory) sealed sensor, designed for installation in the toughest possible, conditions.

Raven Eye Radar - mounting and commissioning



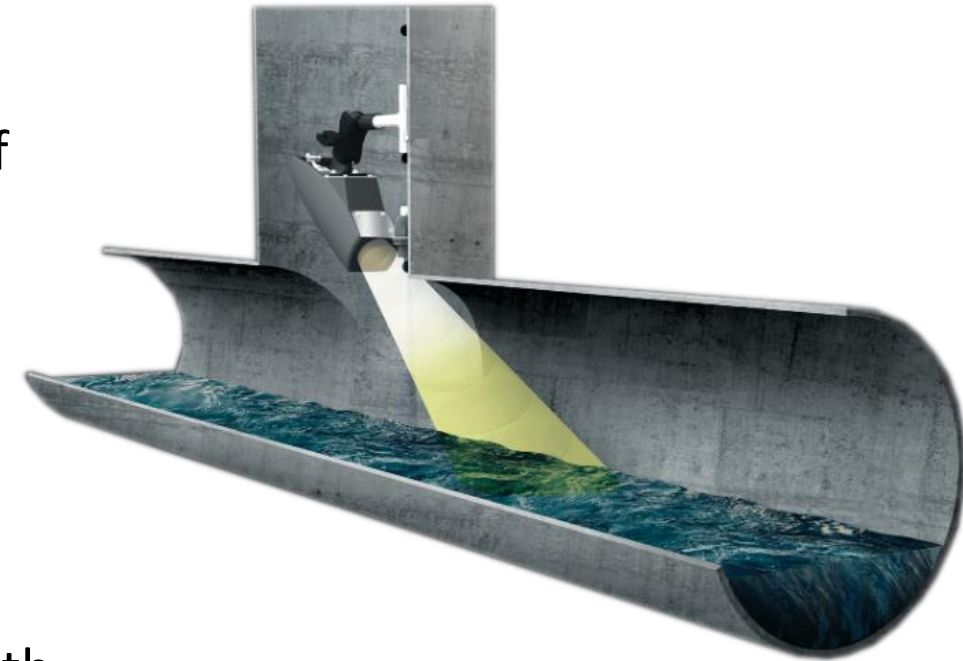
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Main Collector Flow and Level Measurement System

Raven Eye Radar – Main Features

- Radar and Ultrasonic sensor are supplied with communication cables and a set for mounting for operating conditions in reinforced concrete collectors of fecal and atmospheric wastewater elliptical and circular profile.
- System works in partially and fully filled pipes and channels, with low and large flow regimes.
- It works both at **laminar and turbulent flows** (speeds from **0 to 15 m/s**) and has possibility of measuring in both directions of fluid movement (bi - directional reading).



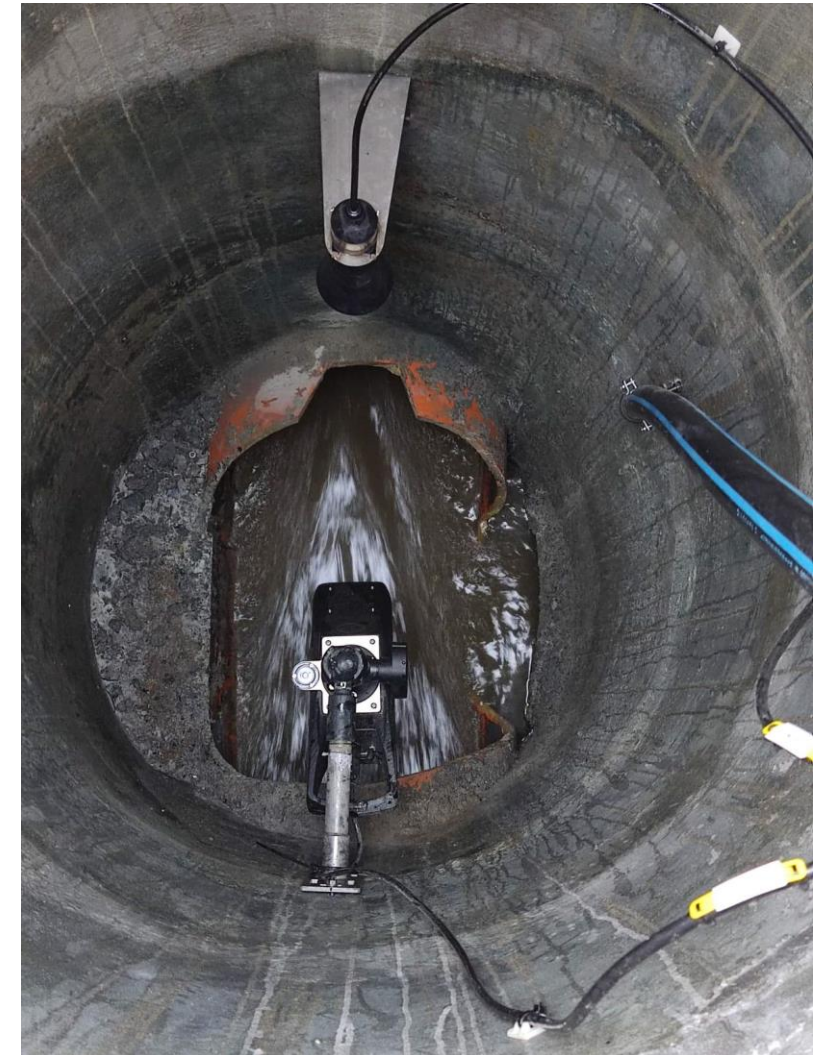
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Main Collector Flow and Level Measurement System

Raven Eye Sensor – Main Features

- The digital Doppler Radar for measuring speed with RS485 communication port and Modbus communication protocol
- Housed in a polyurethane (PU) waterproof, fully sealed housing (under vacuum),
- Withstand a pressure of 4 bar.
- The sensor is in IP68 protection.
- The housing is equipped with AISI 316L stainless steel brackets.



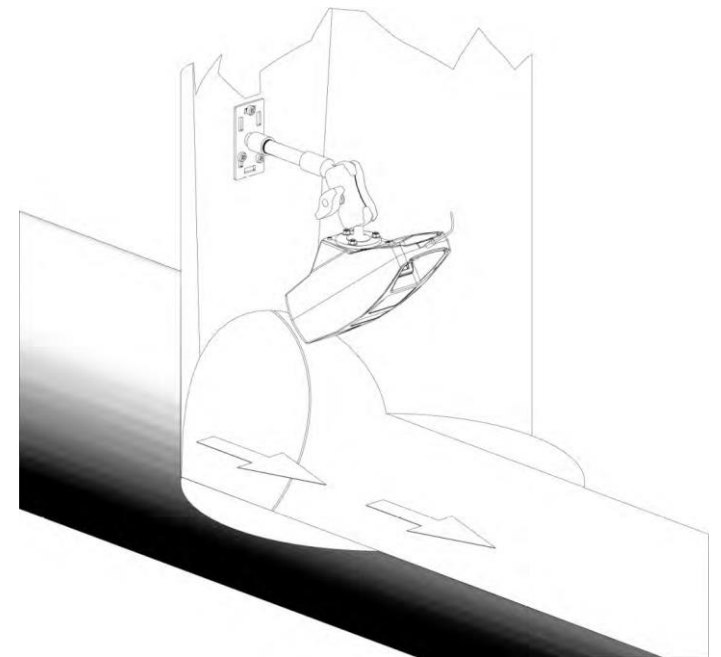
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Main Collector Flow and Level Measurement System

Raven Eye Sensor – Main Features

- The sensor has a self-diagnostic fault system:
 - internal pressure measurements,
 - measurement of internal humidity and
 - temperature measurements (in the range - 20oC to +50oC)
- The speed measurement range in both directions is:
from +/- 0.15 m/s upto +/- 15 m/s,
- Measuring accuracy:
 - +/- 0.5% and
 - +/- 0.02m/s in the range from 0 to 9 m/s



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SCADA/EMS System - Experion HS Main Features

Reliability

- Stable and secure high-performance software,
- It can be used with rugged computers that withstand extreme conditions
- The full redundancy option ensures the highest possible availability

Flexibility

- Adaptable system: from small to large multi-site systems and the possibility of integration on Experion PKS
- It successfully solves the needs of a large number of applications

Efficiency and Cost Effectivnes

- Simplicity of configuration and ease of use ensure fast and efficient execution of projects

Experion[®]HS

A New Level in Operational Excellence



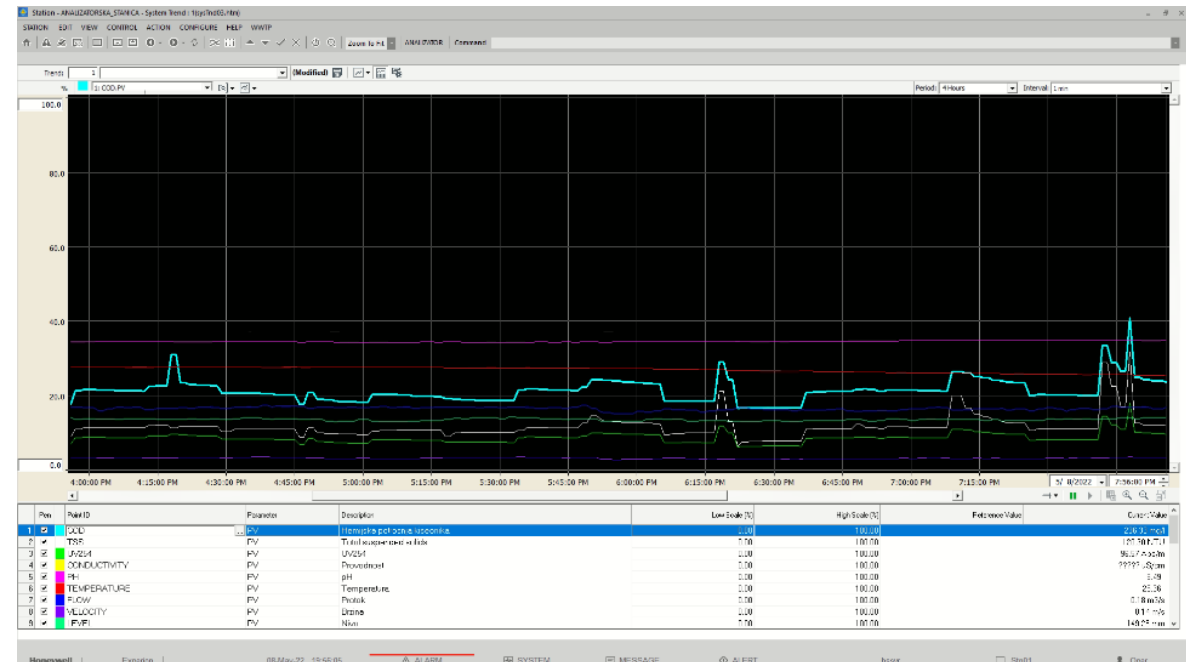
- Cost Effective
- High performance, stable and secure software
- Simplified Installation
- Experion Historian
- Operator Workflow Engineering Usability & Productivity
- Virtualization
- OneWireless

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SCADA/EMS System - Experion HS Main Features

- **Operator Workstation / Server** is installed in the Control Center of the Waste Water Treatment Plant and it communicates with Automatic Analyzer Station via GSM/GPRS Modems.
- Backbone of the EMS/SCADA solution is Honeywell **Experion HS**.
- SCADA has "**History Backfill**" option which allows in the event of a loss of communication, all data that stored on the controller in the Automatic Analyzer Station Controller internal memory to be written to the system after re-establishment of communication.



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Main Benefits of the implemented project

- Continuous monitoring of **analytical parameters, flow rate and level** in the inlet collector provides valuable data that enables **better management and protection** of wastewater treatment plant from accidental situations such as extreme chemical pollution, mud and sand inflows, and enables the execution of preventive actions and protection of vital functions of the system, in order to ensure better operation of the plant and to increase energy efficiency.
- By integrating "energy important" parameters, the EMS/SCADA system is able generate reports and provide insights that are enabling operators and management to make right decisions, to identify potential problems and to perform corrective actions.
- In next stage of the project, it is foreseen EMS/SCADA to perform direct control of certun subsystems and to perform corrective control actions.

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Main Benefits of the implemented project – Customer Feedback

- Customer: “The analyzer station enables constant supervision and monitoring of incoming wastewater (influent) from collector C. With its help, the control of the wastewater process and the efficiency of purification are improved.”
- In the period from July 1, 2021, when the analyzer station was put into operation until May 2023, **sixty-five incident situations were recorded** with phenomena that indicated a **gross violation of the City Regulations** on the discharge of industrial and communal wastewater into the sewage system according to the "Regulation on the discharge of wastewater into public sewerage, measures to protect the public sewerage system and the method of solving wastewater quality control" (Article 13. Table 1.). Official Gazette of the City of Kruševac No. 3/2011. As well as the violation of the Regulation on limit values for the emission of polluting substances into water and deadlines for their achievement (Official Gazette of the Republic of Serbia, No. 67/2011, 48/2012 and 1/2016).

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Main Benefits of the implemented project – Customer Feedback

- SCADA operators directed the flow of raw wastewater via storm water pumps into the recipient Zapadna Morava in a total time of 97.5 hours.
- The main and basic benefit is that the biology of the plant is preserved and that the operation of the plant is preserved. In this way, the suspension of work, which in such situations lasts up to a month until the re-establishment of working conditions, has been prevented.
- The ecological effect is immeasurable.
- During the year 2023 until the 12th of May, fifteen incident situations were recorded in which the bypass was used for a duration of 22.5 hours.
- During the operation of pumps for atmospheric (storm) water, i.e. after turning on the bypass, the consumption of electricity is lower.

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Main Benefits of the implemented project – Customer Feedback

- The total hourly saving of electricity when the stormwater pumps are working is 165 kWh, i.e. the total average savings in the entire operation of the plant is 360 kWh – 165 kWh = 195 kWh.
- Savings in the operation of the analyzer station in the period from July 2021 to May 2023 amounts to 500k dinars only on the basis of reduced electricity consumption.
- Please note that if, due to the entry of industrial wastewater with a high biological load (non-biodegradable substances), it directly disrupts the imbalance between nutrients and microorganisms, thus hindering the processes of nitrification and denitrification in bio-aeration basins.
- The consequences of such incidents are financially **immeasurable** for the plant.

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Main Benefits of the implemented project – Preventing incidents



Appearance of the primary precipitator after the incident

Jun, 2023



Appearance of foam on fine grids

Dušan Otašević



Appearance of foam and dark coloration in primary clarifiers

Honeywell

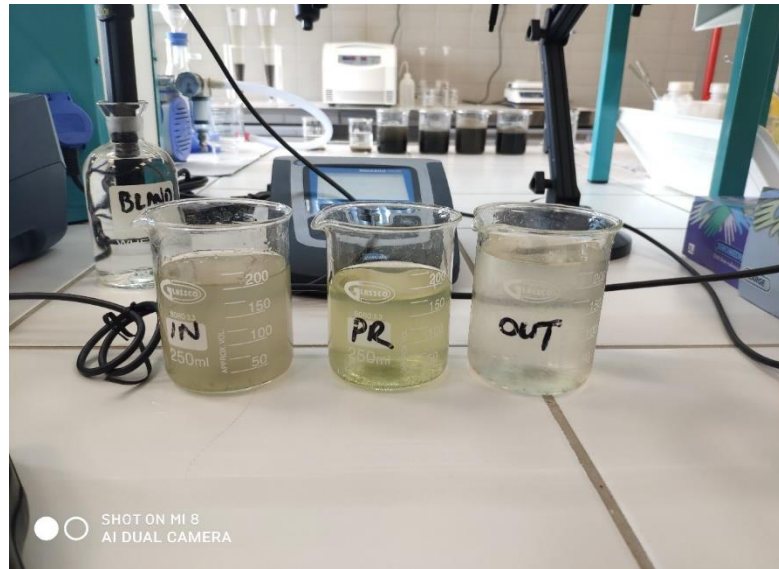
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Main Benefits of the implemented project – Preventing incidents



Appearance of green coloration in primary settling tanks



Laboratory samples of the incident situation



Appearance of incoming incident situations of different colors

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Main Benefits of the implemented project – Preventing incidents



Slaughterhouse "Braća Đokić",
April 1, 2022



Samples of coagulated fat - fine
screen, April 7, 2022

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Conclusion:

WWTP Plant Manager: “This project fully met all expectations and justified the invested funds. Waterworks Kruševac utilizes the benefits of the implemented solution, considering the timely information that the station's automatic equipment sends to the EMS/SCADA at the plant. The implementation of this solution led to increased safety and efficiency and process operation. We hope that such systems will be implemented at the new plants in Brus and Blace, which will also be managed by Waterworks Kruševac.”



Jun, 2023

Dušan Otašević

Honeywell



QUESTIONS ?

<https://en.wikipedia.org/wiki/%3F> (bistro)

Jun, 2023

Dušan Otašević

Honeywell