Company:
NAVITAS ENGINEERING & AUTOMATION Ltd.
Sarajevo, Bosnia and Herzegovina

SPEAKERS:
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Title:
EXPERIENCE WITH SIPROTEC 5 DEVICES OVER THE YEARS
YOUR PARTNER FOR POWER ENGINEERING & AUTOMATION

SHORT COMPANY PRESENTATION
WHO IS „NAVITAS ENGINEERING & AUTOMATION“?

- *Navitas = lat. Energy*

- *Navitas Engineering & Automation Co. Ltd. is small, private, multi-discipline company, founded and owned by the skilled professionals in the field of protection, control and SCADA systems for all kind of power electrical and industrial plants*

- *Company employers are professionals with decades and decades of experience in Bosnian and market of Middle East (U.A.E., Oman, Saudi Arabia, Iraq, Turkey), Northern Africa (Egypt, Libya, Tunisia, Algeria), Albania, Italy, Portugal,...*
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Adnan Pašić, B.Sc.El.Eng. – University degree in Power Electrical Engineering, over 29 years of experience in the field of protection, control and SCADA systems in power electrical and industrial plants

Ensar Kalajdžisalihović, B.Sc.IT.Eng. – University degree in IT, over 12 years of experience in the field of SCADA systems in power electrical and industrial plants

Alen Burdžović, B.Sc.El.Eng. – University degree in Power Electrical Engineering, over 20 years of experience in the field of protection, automation and control systems in power electrical and industrial plants
Our services are mostly related to the following systems:

- Protection
- Control
- Systems for remote supervision, control and data acquisition (SCADA)

Facilities that are subject of our services are different kind of:

- Power distribution
- Power transmission
- Power generation
- Industrial plants
From Basic design, Tender design and Main design documentation, up to the As Built documentation for all kinds of power electrical and industrial plants from low, over medium, up to the high and very high voltage levels.

Parameterization, Configuration and Installation of electrical and automation equipment for all kinds of power electrical and industrial plants.

Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and start-up of all kinds of power electrical and industrial plants.

Comprehensive services in consulting like different kinds of Studies, Analysis, Tender design, Tender documentation, Trainings etc.
Today, we can say that over 70% of delivered goods and performed services by Navitas Engineering & Automation are based on SIEMENS products and systems, as follows:

- Control and Protection devices (IEDs)
- Station Control Systems
- SCADA HMI SW
- MV air insulated switchgears
- MV SF6 insulated switchgears
- LV equipment
- PLC equipment
- Etc.
After significant experience gained over years and years on-site engineering and commissioning with SIPROTEC 3 and SIPROTEC 4 IEDs, station control systems based on SICAM SAS and SICAM PAS, SCADA HMI WinCC, today NAVITAS Engineering & Automation is becoming an important, highly reliable and experienced partner in implementing the projects based on:

- SIPROTEC 5 IEDs of all kinds and purposes
- Station Control Systems and RTUs: SICAM AK3, SICAM A8000
- SCADA HMI SICAM SCC
Over last several years we implemented numerous projects with SIPROTEC 5 devices of different kind and purposes.

Some of the most important reference projects for us will be shared on the following slides:
Year 2016 - HPP Una Kostela, River Una, City of Bihać (Bosnia and Herzegovina)

Unit no. 1: 3.17 MVA / 6.3 kV±5% / cosφ=0.80
Step-up transformer 35±2x2.5%/6.3 kV / 3.15 MVA / Y(N)d5

Project: Replacement of existing, old SIPROTEC 3 unit protection devices with single SIPROTEC 5 7UM85 machine protection device

Services covered by Navitas Engineering & Automation:
delivery of equipment, design, configuration and parametrization, on site installation, testing, commissioning and start up
Year 2016 – S/S 110/x kV Visoko, city of Visoko (Bosnia and Herzegovina)

Project: Construction of new 110 kV OHL to new S/S 110/x kV Fojnica
New Bay Control Unit SIPROTEC 5 6MD86
New line distance protection SIPROTEC 5 7SA87

Services covered by Navitas Engineering & Automation:
Configuration and parametrization, Factory Acceptance Test, on site testing, commissioning and start-up

NOTE: New SIPROTEC 5 devices 6MD86 and 7SA87 integrated by Navitas Engineering & Automation into the existing Station Control System based on SICAM SAS and WinCC over USART-AD-1FO (FO) module with communication protocol IEC 60870-5-103
For this purpose we used spare FO ports on expansion XF6 module of SICAM SAS and extended existing PlusTools and WinCC projects
Year 2016 – S/S 110/20 kV within Steel Factory PREVENT in city of Ilijaš, Bosnia and Herzegovina

**Project:** Installation of new power transformer HYUNDAI 110±10x1.5%/20 kV, 18.75/25 MVA, with:
- new 110 kV bay equipment (ABB disconnectors, CB, CTs)
- refurbished spare 20 kV incoming feeder with new CTs and protection device **SIPROTEC 5 7SJ82**
- new transformer control and differential protection device with AVR functionality **SIPROTEC 5 7UT85**
- new transformer 110 kV side backup O/C and E/F protection **SIPROTEC 5 7SJ82**

**Services covered by Navitas Engineering & Automation:**
delivery of control and protection devices **SIPROTEC 5**, desing, configuration and parametrization, on site installation of new control and protection equipment into the existing control and protection board, testing, commissioning and start-up of new power transformer with all belonging control and protection equipment
On site testing of new SIPROTEC 5 7UT85 and 7SJ82 installed into the existing C&P board for new power transformer 110/20 kV, 25 MVA
Year 2017 – S/S 400/x kV Tuzla 4, in vicinity of city of Tuzla (Bosnia and Herzegovina)

**Project:** Installation of completely new 35 kV air insulated switchgear with five new **SIPROTEC 5 7SJ82** control and protection devices

**Services covered by Navitas Engineering & Automation:**

- configuration and parametrization, Factory Acceptance Test, on site testing, commissioning and start-up

**NOTE:** five new **7SJ82** devices integrated by Navitas Engineering & Automation into the existing Station Control System based on **SICAM SAS** and **WinCC** over **USART-AB-1EL (RS485)** module with communication protocol **IEC 60870-5-103**

For this purpose we used spare RS485 port on MCP module of existing SICAM SAS and extended existing PlusTools and WinCC projects
Reference Projects with SIPROTEC 5

New SIPROTEC 5 7SJ82 devices installed inside LV compartment of new MV cubicles / Existing SICAM SAS extended with 5 new 7SJ82 devices

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Year 2017 – S/S 110/x kV HAK, in vicinity of city of Tuzla (Bosnia and Herzegovina)

**Project:** Reconstruction and extension of S/S:

- new building
- new 110 kV equipment (ABB / ALSTOM)
- one new power transformer HYUNDAI 110±10x1.5%/36.75/10.5(21) kV, 40/40/27 MVA, YNy0d5 (there is another existing transformer)
- new switchgear ABB 36 kV (13 cubicles) with **SIPROTEC 5 7SJ82** control and protection devices
- new switchgear ABB 24 kV (14 cubicles) with **SIPROTEC 5 7SJ82** control and protection devices
- new 110 kV OHL C&P cubicles (2 pcs) with new BCU **SIPROTEC 5 6MD85** and line distance protection **7SA87**
- new 110/35/10(20) kV transformer C&P cubicles (2 pcs) with new BCU **SIPROTEC 5 6MD85**, transformer differential protection with AVR functionality **7UT86** and backup self supplied O/C and E/F protection **7SJ45**
- new 110 kV Bus coupler C&P cubicle (1 pcs) with new BCU **SIPROTEC 5 6MD85** and line distance protection **7SA87**
- two new **SIPROTEC 5 7SJ82** devices in AC and DC sections (used only for collecting the alarm via BIs and measurements from AC and DC sections via mA inputs)
- Station control system based on **SICAK AK3, RSG 2100** Ethernet switches, Meinberg NTP Server and **SCADA HMI SICAM SCC**
- Implemented communication protocol **IEC 61850** with redundant **RSTP** protocol and **IEC 60870-5-101(104)** for remote control and supervision purposes (Control and supervision from three remote control centers)
Services covered by Navitas Engineering & Automation:
configuration and parametrization of complete control, protection and SCADA system,
Factory Acceptance Test, on site testing, commissioning and start-up of the entire system

In this project an intensive use of **GOOSE** messages system was implemented for the
purposes of interlocking, CB failure protection, parallel operation of transformer,
exchange of different alarms between the IEDs, etc.
- First time for Navitas Engineering & Automation on this project was **successful implementation** of **AVR** functionality within **7UT86** with paralleling functionality of two power transformers (Master – Slave control logic)
Specific for the Project:

Line distance protection 7SA87 within C&P cubicle of 110 kV Bus coupler has role of replacement protection for any of two OHLs in case where 110 kV Bus Coupler CB replaces 110 kV OHL’s CB that is out of service for any reason.

In this case, dedicated Setting Group is selected from SCADA HMI or locally on device, and 7SA87 of 110 kV Bus coupler replaces complete functionality of 7SA87 device of belonging 110 kV OHL.

**NOTE:** Arised problem with reverse direction (Z1B and directional earth fault protection) combined with tele-protection 85-21 (POTT) and 85-67N (directional comparison). SIEMENS has got solution for this, as well.
Photos of installed BCU **SIPROTEC 5 6MD86** and Transformer differential protection with AVR **7UT86** inside belonging C&P cubicles.

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REFERENCES PROJECTS WITH SIPROTEC 5

Photos of installed line distance protection 7SA87 and Station Control Cubicle with SICAM AK3 and SCADA HMI Server (SEL industrial PC)

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REFERENCE PROJECTS WITH SIPROTEC 5

Screen shots of SCADA HMI (SICAM SCC) with two Monitors 24" (Complete SLD on the left, detailed 110 kV OHL with belonging Alarm list and Trend)

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Screen shots of SCADA HMI (SICAM SCC) with two Monitors 24” (110 kV SWG SLD on the left, Event list on the right)
Screen shots of SCADA HMI (SICAM SCC) with two Monitors 24" (35 kV SWG SLD on the left, Event list on the right)

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Screen shots of SCADA HMI (SICAM SCC) with two Monitors 24” (10 kV SWG SLD on the left, Event list on the right)

_Bled, September 2019_
Year 2019 – TPP Kakanj (3 Units, in total 450 MW), 110 kV SWG, city of Kakanj (Bosnia and Herzegovina)

Project: Supply and installation of six new line distance protection devices SIPROTEC 5 7SA87 instead of existing, old ABB REL 511 (in operation since 1998)

Services covered by Navitas Engineering & Automation:
delivery of equipment, design, setting study, configuration and parametrization,
on site testing, commissioning and start-up

NOTE: six new 7SA87 devices integrated by Navitas Engineering & Automation into the existing Station Control System based on SICAM SAS and WinCC over USART-AB-1EL (RS485) module with communication protocol IEC 60870-5-103

For this purpose we used spare RS485 port on MCP module and extended existing PlusTools and WinCC projects.
Specific for this project:

- 110 kV switchgear inside TPP Kakanj has one „Reserve“ bay that could be used to replace any 110 kV OHL
- Reserve bay is equipped with its own disconnectors, CB, CTs and VTs and line distance protection
- Before this project there was SIPROTEC 4 7SA611 device, with only four setting groups
- Reserve bay in TPP Kakanj is used to replace five OHLs and to operate as well as regular 110 kV Bus coupler bay
- For this purpose, its requirement is to have min. six setting groups (five setting groups for each 110 kV OHL and one setting group for regular Bus coupler operation)
- Implementing new SIPROTEC 5 7SA87 device with max. eight setting groups, this problem will be easily solved

Operation of replacing 7SA87 in Reserve bay:

- Automatically when Reserve bay is selected to replace specific any of 110 kV OHLs, dedicated setting group inside new 7SA87 device of Reserve bay will be selected, and this device will be fully ready to replace compete protection functionality of original 110 kV OHL bay
Photos of existing C&P cubicle for 110 kV OHL with new **7SA87** device / enlarged photo of new **7SA87** device / existing SICAM SAS Station Control System extended with six new line distance protection devices 7SA87 over IEC 60870-5-103

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NEW FEATURES IN DIGSI 5 & SIPROTEC 5 – OUR EXPERIENCE

- DIGSI 5 is a tool that makes the creation of protection solutions
  - Quicker (e.g. copy/paste, templates, easy handling…)
  - Cheaper (Less steps and less time needed)
  - Safer (Integrated Test Suite and Function chart (CFC) tracing)
  - IEC 61850 - simply usable

- SIPROTEC 5 protection devices are
  - Modular (Perfectly tailored hardware and functionality - Safety CT-Plug)
  - Safer (Integrated monitoring and supervision)
  - Designed to communicate
THANK YOU VERY MUCH FOR YOUR ATTENTION!

NAVITAS E&A TEAM WISH YOU A LOT OF SUCCESS IN FUTURE BUSINESS ACTVITIES AND PLANS!