MUST-IPRA Corporation Khartep Ltd. Ukraine

POWER GEN Exibition, Milan, Italy

June 7-9, 2011



MUST-IPRA Corporation Introduction

Khartep Ltd. has joined Must-Ipra Corporation early in 2000.

The highly qualified specialists of a military-industrial complex formed the core of our team. All specialists have rich and wide experience in the creation of I & C systems for terrestrial facilities and space vessels.





Licenses and certificates

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Agreement



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Activities

Control systems design "under key":

- Dispatching automated control systems;
- Automated metering systems of energy, different gas, steam and compressed air, hydrocarbon oils, water, pulp, heat;
- Billing systems settlements with private and industrial consumers;
- Process control systems for various industrial fields and applications;
- Systems of telemechanics for substations;
- Satellite navigation, landing and localization systems;
- GIS-systems;
- Local and corporate networks.

Production activities:

- Production of automation equipment for energy supply facilities (RTU, communication module, channel adapter).
- Design works and supply of dispatcher panels and video walls.

B2B activity:

- Outsourcing;
- Outstaffing;
- Engineering hub creation for various application and direction.





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I & C system for power energy block No 1 Zuevskaya HPP





Basic indicators of the system

Indexes designation	Values
Number of technological video frames of work station	113
Technological protection	146
Technological blockings	60
Step-by-step program	22
Frequency converters	13
Technological regulators	86
Regulation of shutoff and cutoff valves	278
Regulation of control valves	178
Regulation of electric motors of mechanisms	138
Additional discreet inputs – single contact	621
Analog input 4 - 20 mA, 0 - 5 mA	597
Analog input – temperature sensor	650
Analog input of high-speed impulse counter	12
Additional discreet inputs	78
Additional analog outputs (CPT)	23



Principle diagram

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Structure of the system. Low level

- ✓ Control sensors of technological process;
- ✓ Actuating mechanisms (shutoff, shutoff and cutoff and multypurpose valves, mechanisms for own needs);
- ✓ Cabinets of frequency control of pulverized coal feeder engines;
- ✓ Stands with control equipment;
- ✓ Local control panels;
- ✓ Force control cabinets;
- ✓ Junction boxes;
- ✓ Low level Connection and communication cables



TSOM



Structure of the system. Middle level

✓ Cabinets of dual redundant controllers :

- 4 control cabinets for control subsystem, functional and group control, subsystems of technological protections and blockings;

- 1 control cabinet for turbine regulation subsystem (TRS) and feed pumps;
- 1 expansion cubicle (for receipt of analog and discrete signals);
- 1 control cabinet of TRS actuators and feed pumps;
- ✓ Power supply subsystem with power distribution cabinets and uninterruptible power supply;
- Cabinets of intermediate relays
 8
- ✓ Cabinets of weightfeeder regulators
- ✓ Cabinet of relay protection schemes
- ✓ Emergency control desk (ECD);
- ✓ Backup database server and network equipment; автоматизации (Industrial Ethernet);
- ✓ GPS-clock;
- ✓ Interconnection and network communication lines.



- 8 pcs.; - 2 pcs.;
- 1 pcs.;

Structure of the system. High level

- ✓ Backup server for applications;
- ✓ Work stations of the personnel: Work station of power unit operator;
 4 pcs.;
 Work station of shift supervisor;
 1 pcs.;
 Work station in electrical department;
 1 pcs.;
 Work station control automation department
 1 pcs.;
 Work station of engineer station
- ✓ Collective use screens (54")
 ✓ Network equipment of loop applied network (Industrial Ethernet);
 ✓ Documentation and record facilities:

 network matrix printer A4
 1 um.;
 network laser color printer A3
 1 um.;
- ✓ Communication cables.

Every workstation includes PC (with system and applied software), two LCD desktops 21", keyboard and mouse.











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I & C system for multifuel boiler for Heat Power Plant of «Zaporozhstal» Plant





Brief characteristics of a multifuel boiler

- Steam productivity of the boiler on blast-furnace gas with coke or natural gas lightening is 120 t/h, on natural gas - 150 t/h.
- Superheated steam parameters: pressure 3,2 MPa, temperature 390°C. Feed water temperature is 103°C, superheat temperature deviations ±50C.
- Feed water pressure before regulating valve 4,3 MPa.
- Main fuel types blast-furnace and coke gases.
- Reserve fuel type natural gas.
- Emergency fuel fuel oil.
- ✤ Base modes № 1 and № 2:
 - №1 boiler operation on blast-furnace and coke (natural) gases at the proportion: 80% of the heat load on blast-furnace gas and 20% of the heat load on coke (natural) gas.
 - №2 boiler operation on blast-furnace and coke (natural) gases at the proportion: 90% of the heat load on blast-furnace gas and 10% of the heat load on coke (natural) gas.



MUST- IPRA Corporation Functions of the system

> Supervision, boiler control and signalization in normal, transient and emergency alarming modes for ensuring the main function - production of the necessary volume of steam with set-up parameters.

> Automatic regulation of boiler heat load and steam temperature at the output at the operating load range.

> Protection, lockup and maintenance staff warning in case of emergency mode.

Provision of staff with sufficient, reliable and timely information about technological processes and equipment state for on-line control.

- > On-line diagnostics of boiler elements and auxiliary equipment.
- > Automatic support of economical modes of boiler operation;

Lockup of an operator's incorrect actions and exclusion of operative staff abuses at the violation of technological protections and lockups.



Basic indicators of the system

Indicators	Indicator value
Number of metering channels	90
Number of processed signals: >Analog >Digital	250 400
Number of output control signals	350
Number of database parameters	2000
Reduced error of analog parameters conversion into digital code, not worth than	0.5%
Periodicity of current technological information refreshment at the middle level of the system	1 sec. or less
Periodicity of current technological information refreshment at the top level of the system	60 sec. or less
System reboot time (time of all system functions renewal from currentless state since the start of voltage supply).	20 sec. or less
One system unit reboot	10 sec. or less





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Automated Control Systems

Process control systems of gas cleaning of Aksu and Aktubinsk (Kazakhstan) ferroalloy plants



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MUST- IPRA Corporation Goals of PCS for Gas Cleaning

The system realizes centralized automated control of technological processes of furnaces gas cleaning in Workshop №1 of Aksu Ferroalloy Plant (subsidiary of "KazHrom" Public Corporation) with high reliability and simplicity of technological process control for operation staff.

- System of removal and filtration of gas-dust mixture from electric furnaces;
- Regeneration system of electric furnaces bag filters;
- System of dust pneumatic transportation form electric furnaces filter bunkers to general dust-collecting chambers.

Number of signals:

- Discrete outputs 236;
- Discrete inputs 332;
- Analog inputs 240;



Solved tasks

- Control of parameters variation within prescribed technological limits;
- Alarm in case of emergency values of controlling parameters;
- Automatic regulation in compliance with PID-rule;
- Automatic balancing, bumpless start, bumpless mode switching and control loops adjustment as well as governor channel switching;
- Automatic lockups and/or switching of valves and other equipment to the safe state;
- Remote change of technological tasks, control loops settings, limits of technological and other adjustable parameters;
- Automatic and remote control of all system electric drives, valves and gates;
- Display of current values of technological parameters on video frames, as graphs with the possibility of arbitrary scaling;
- Archiving of all metering parameters, events and operators' actions;
- Automatic creation of reports;
- Transmission of processed information into computer network of a workshop or a plant.





Principle diagram

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Dispatching automated control systems





Functionality

- Supervision and control of electrical grid elements 6/10/35/110/330/750 kV;
- Gathering, processing, accumulation and storing of telemechanical information about electrical grid elements state;
- > On-line control of microprocessor protection relays of different producers;
- Automated technical metering of energy resources;
- Calculation, control, analysis and evaluation of electrical grid modes;
- Automatic analysis of electric grid state;
- Management of substations communication schemes;
- Determination of reconcilable parameters;
- > Information on-line display at dispatcher's workstations and panels;
- > Information exchange with adjacent systems.



Typical principal diagram



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Microprocessor relay protection and automation

- Siemens серия SIPROTEC 4;
- Schneider Electric –Sepam series 1000+ and Sepam 2000;
- ABB REF_541/543/545/610, REX_, SPAC_, SACO, SPAS_, SPAF_, SPER_, SPAJ_, SPAU;
- Alstom Micom series;
- Khartron-Inkor «Diamant» series;













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MicroSCADA (ABB) solutions

Solutions based on SAS 600 series



Typical principal diagram

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MicroSCADA certificates of Khartep's specialists after learning in ABB, Finland





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II.

MUST- IPRA Corporation SICAM 1703/230/PAS (SIEMENS) solutions





SICAM PAS + PAS CC

✓ Software and hardware based on PC;
✓ HMI on PC.







MUST- IPRA Corporation SICAM 1703/230/PAS (SIEMENS) solutions





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SICAM 1703 + SICAM 230

✓ Software and hardware based on PC;
✓ HMI on PC.



MUST- IPRA Corporation SICAM 1703/230/PAS (SIEMENS) solutions





SICAM 1703

- ✓ The same family RTU controller;
- ✓ To apply on various energy object.



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Automated metering systems





Subsystems

The system could comprise following counting subsystems:

- Commercial and technical counting of electric energy;
- Commercial and technical counting of natural, blast-furnace and coke gas;
- Commercial and technical counting of oil products and gas condensate;
- Commercial and technical counting of heating energy (hot water, steam);
- Commercial and technical counting of process water, ammonia, etc.;
- Technical counting of compressed air;
- Technical counting of process gases: oxygen, argon, nitrogen.



MUST- IPRA Corporation Purposes of the system

 \checkmark Commercial settlements with providers at the realisation of commercial counting of energy resources;

- ✓ Decrease of groundless and non-production losses of energy resources;
- ✓ Ensuring of on-line analysis of production and energy resources consumption;
- ✓ Optimization of production parameters and reduction of energy resources consumption up to the optimal level;
- \checkmark Planning, counting and analysis of energy component of prime cost for different types of products manufactured by plant;
- ✓ Reduction of financial expenses for products manufacturing by rational usage of energy resources;
- ✓ Planning, forecasting and control of energy recourses consumption;
- ✓ Exemption of human factor during energy recourses counting and distribution.





Unified principle diagram



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Monitoring cars system based on GPS





The main goal of the system

Cost reduce of motor-vehicle transport maintenance and increase of effectiveness of its operation due to receipt of correct and online information about its movement.

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System goals

- ✓ Traffic control
- Coordination of activity of maintenance departments
- Suppression of misuse of motor-vehicle transport of enterprise
- Ensuring compliance with technical conditions of motorvehicle transport operation



Parameters to be controlled

- Current location
- Passed route
- > Deviations from guided path
- » Speed
- Time
- Stops and parking
- Leaving of allowed zone
- > Entrance into prohibited zone



Additional sensors

- Fuel level sensor
- Alarm button
- > Temperature sensor
- > Door opening sensor



Examples

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Examples





Examples





Outsourcing And Outstaffing activity



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Experience with AkerSolutions, Norway?



The first step consisted of:

> Selection Must-Ipra's engineers in accordance with Aker's directions and requirements;

Learning stage including both e-learning courses on Aker's Internet portal and leaning program in Norway during one month. Eleven Must-Ipra's engineers have gone through all required learning courses very successfully.

Approval of Must-Ipra's engineers by Aker's customers to confirm their responsibilities on real projects;

> Start on real projects of Must-Ipra's engineers in accordance with their new responsibilities.

Evaluate first results of Must-Ipra's engineers work on real projects in accordance with their new responsibilities as positive assessments in basically;

<u>Remote work in Ukraine</u> of Must-Ipra's engineers on their project with good results. We have already proved that any task can be implemented remotely in Ukraine, of cause, except live meetings.



Experience with AkerSolutions, Norway?

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Experience with AkerSolutions, Norway?

Coming step by step we can achieve expected results as following:

> <u>Create Aker Solutions engineering hub</u> which is based on joint venture between our companies to meet the increasing demand in a growing market, both in Norway and especially internationally with high qualified competitive staff;

<u>Create some learning base</u> for preliminary learning and training for all staff in Ukraine to cover all requirements in specialists for real projects using experience already involved in real projects engineers;

> Select a new talented employees oriented on various directions in accordance with Aker's requests;

> <u>Build up capacity of engineering hub</u> in Ukraine due to expanding of exist directions and creating a new opportunities to resolve a new tasks using of high Kharkov region's science and education potential.





AkerSolutions

MUST- IPRA Corporation Why Kharkov, Ukraine?

"Ukraine's well-educated, highly-skilled workforce and low labor costs provide an ideal environment for businesses to prosper".

> Silviu Popovici, General Manager of Coca-Cola Beverages, Ukraine.

Kharkov as an IT Hub



Overview of Economy

- Ukraine is an emerging free market, with a gross domestic product that has experienced rapid growth in recent years
- Western-oriented government policies encourage partnership and close business ties with US and EU companies
- In 2008 Ukraine joined the World Trade Organization
- Ukraine now has the potential to be one of the region's leaders in volume of foreign direct investment and portfolio investment
- In 2007 Ukraine had the highest IT industry growth rate among Central and Eastern European countries. Ukrainian IT market ranked fourth after Russia, Poland and the Czech Republic, with almost 40 percent growth and over \$3,4 billion in volume, accordingly to IDC survey
- The USA, Germany, Poland, the UK, Japan, China, Russia are the main trade partners of Ukraine





Education in Ukraine

- Ukraine has a long standing reputation as major technology region, with a well developed scientific and educational base
- With only 1% of all world's population, Ukraine has 6% of the world's physicists, mathematicians, computer programmers, and other highly educated professionals
- More than 16,000 IT specialists with bachelor degree and about 14,000 IT specialists with master degree graduate from universities each year
- To bridge the gap between classical education and real business and technical process, outsourcing companies have partnered with leading universities to offer additional classes and labs for students
- Bologna process in higher education area.



IT Labour Market

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IT Outsourcing Services Export Market

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Main Services Provided by Companies

- Custom software development
- Dedicated development team
- Support and Maintenance, System Administration

"Outsourcing in CEE. Country Overview. Ukraine"

nitiative

- QA and Consulting
- Embedded Software
- Web solutions, E-commerce
- Business Processes
- IT Hardware



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Were is Kharkov?



Eastern Ukraine

Getting here:

- 1. Direct flight from Vienna (< 2h)
 - 1 daily flight (except Tue)
- 2. Direct flight from Zurich (< 2h)
 - 1 daily flight
- 3. Direct flight from Kiev (< 1h)
 - 4 daily flights
- 4. Train from Kiev (≈ 6–8h)
 - 4 daily trains



General Facts



Kharkov, 1902



Freedom Square, Kharkov, 2008

- Established in mid 17 cent
- 1st capital of Ukraine (1917-1934)
- 2nd largest city in Ukraine
- Population of 1,5 m (permanent)
 - + App. 1 m (rotating temps)
- One of the hosts of EURO 2012
 - Construction of the new airport
 - Improvements to the city's infrastructure
- Major cultural, scientific, educational, and industrial centre of Ukraine



Education

- 3d most significant scientific & educational hubs in USSR
- Largest scientific & cultural centre in Ukraine and CIS
 - 60 Research Institutes
 - 45 Higher Degree Institutions
 - ≈150, 000 students annually
- Known worldwide for work in machinery
 - (aerospace, nuclear electronics, turbines, arms, etc.)
- 4 major Ukrainian Technical Universities
- ≈ 3,000 IT graduates annually
 - 25-30% join Software Development companies







IT Industry

- One of 3 primary R&D outsourcing destinations in Ukraine
 - Kiev ≈ 50%; Kharkov and Lviv ≈ 15% each
 - Market Value of ≈ 95 m USD in 2010 (given Ukraine's ITO MV of 1,0 billion USD)
- 2nd largest pool of ITO specialists in Ukraine 20% (Kiev is 1st with 42%)
 - Current pool of around 6,000 ITO specialists
- About 220 IT companies of various sizes and service offerings



IT Specialist

- Wide range of technologies
 - Very large pool of .Net
 - Perfect knowledge base for embedded software development
- Salaries are ≈ 10-15% lower of Kiev
- Aim to work for well-established/leading companies (especially Western)
 - Good working conditions, interesting projects and good pay
 - Big companies: low turnover
- West oriented
- Speak English
- Good pool of freelancers
- Popular recruitment method: headhunting



Thank you for your attention!

Questions?

