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ANNEX P: GUIDANCE ON INFORMATION TO INCLUDE IN THE GRANTEE PROGRESS REPORT

Name of Grantee: Vojvodina Metal Cluster

Grant Number: 03IMCDNS03

Activity Title: Innovative Cluster-Wide Product

Reporting Period: 11/21/2014 – 06/15/2015

Date of submission: 06/19/2015

Activities

Activity 1 - Developing, testing and setting up the interactive map on the official VMC website

The interactive map is placed on official VMC website (Homepage, in the left column) and now it is available to all final users of the available data. The purpose of interactive map is to provide integrated mapping and routing solution for displaying locations and branches of 128 Vojvodina Metal Cluster members. Interactive map provides not only required but other relevant additional information and enables users to conduct more efficient comparison of similar and diverse data.

VMC executive office engaged local IT consultant who was in charge of developing web site application with relevant company data on VMC members. Application supports VMC members to connect with potential foreign buyers and will increase the international visibility of the Cluster and enables better positioning on the global market. Data includes basic facts on companies such as contact information but more important it will have data on available products, on the production capacities, existing production standards, technology and operation, delivery time. When collecting data on VMC members, executive office applied UNIDO questionnaire of Industrial Surveys. By that available data are standardized and in line with international practice.

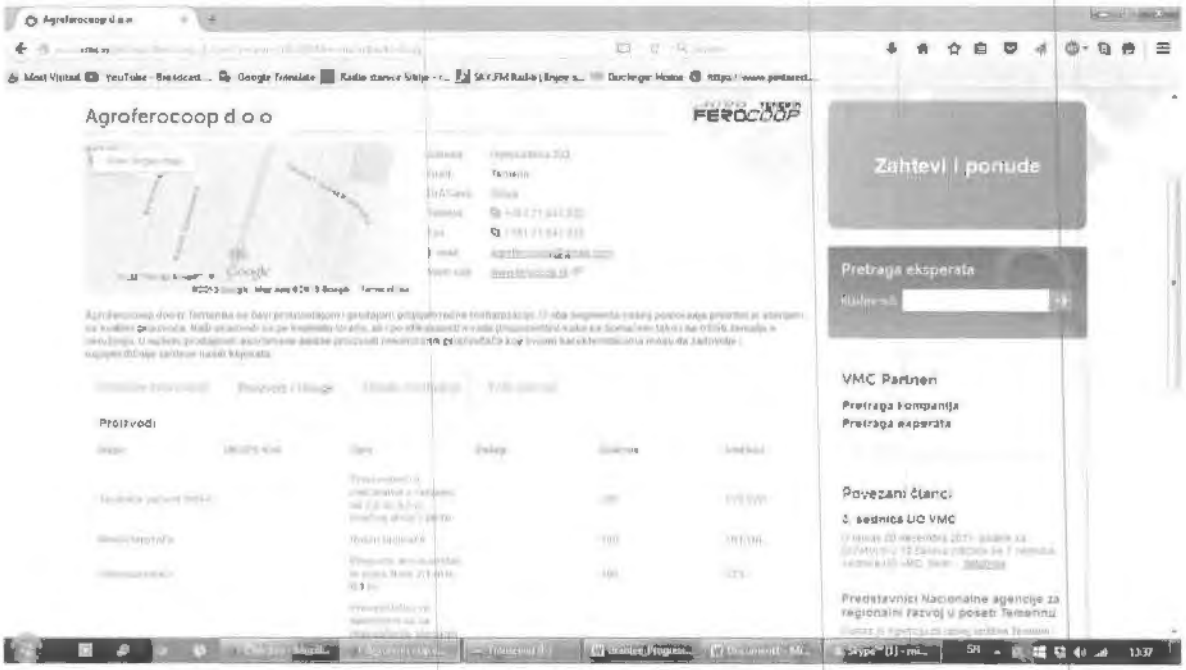
The interactive map shows the territory of Serbia, divided into regions, which are active and by accessing the same, the names of the companies (the members of VMC) located in that regions appear/show up. Furthermore, by entering new regions, previously inactive regions become active. By clicking on a region on the map, system needs to open Search results page which will list the companies that meet the criteria of the selected region.

What is important, application is useful and simple for final users of the available data as well as about practical side of its application. The objective was to reach complete functionality and usefulness of the map for all who see their interest in using the same and accordingly want to achieve that objective before the map is put on official website.

In addition, all members have been sent password to enter their page on the application, not only to validate data but to add additional info and to be able to update it on regular basis.

Interactive map and companies' profiles can be seen on VMC Homepage (http://www.vmc.rs/eng/Home).

Below you can see an example of the company's profile.



Activity 2 - Procurement of CNC coordinate table

One of the VMC units is VMC Education Centre which consists of workshop equipped with CNC machine (for plasma cutting and welding) and other smaller tools. The existing CNC machine is able to perform simple operations such as cutting linear shapes (circle, square, etc.), operations that require simple programming and to cut small series. In order to upgrade machine operations relating to plasma cutting and enable cutting more complex non-linear shapes, VMC has purchased a CNC coordinate table.

Purchasing of CNC cutting table is in kind SLDP contribution to the VMC. The Sustainable Local Development Project conducted a full and open competition by publishing the RFP on December 11, 2014 on the Project's web site www.lokalnirazvoj.rs. The Project called and sent an e-mail to the following companies identified through the internet research as competent to perform under the SOW from the RFP, to encourage them to visit the Project website and prepare proposals:

1. CITRONIX doo
2. GEM TRADE D.O.
3. Arpel
4. Alco
5. NEMINIK D.O.O.
6. Alfa Motor D.O.O.
7. Newname d.o.o.
8. SR KONTAKT
9. Monette International d.o.o.

Technical specification of CNC coordinate table, which was included in RfP:

1) The coordinate table should provide the precise guidance of CNC plasma torch in the XY level and automatic power correction along the Z-axis. The control unit shall be equipped with the licensed software on behalf of VMC. Working desk, torch and plasma generator are not included.
2) Configuration of the device: Operating range of cutting 1500 x 3000 mm; The design should be a cantilever type which ensures that one longer and one shorter side of the desk are open (without guide rail), which enables placing of metal sheets from two directions; Profile guides of hardened steel, hardness 60Hrc; Linear and rolling bearings of the world leading brands; Centralized lubrication system; Secured sliding surfaces; Admission for two types of machine torch (plasma and gas); Regulation of the torch high to 150 mm; Safety keys (min 3 pieces) to turn off all processes in emergency cases.
3) Operating system: Navigating the X and Y axes is realized by servo motors via linear racks, and Z axes through ball screws; Primary voltage: 3x230/400 V +/- 10%; Management protection: IP 54; Speed of tool positioning: v= 30.000 mm/min; Speed of cutting: v= 0 - 12.000 mm/min; Accuracy of the axes positioning +/- 0,1 mm; Optical reader of positions on all axes; Sensor for automatic torch height control.

4) The managing software should provide: Graphical display of the torch position; Automatics for sheet puncturing; Service and maintenance diagnoses; Software-rotation of cutting plan; Return to place interrupted after power failure; Manually finding the actual position of the sheet; Manual cutting mode; JOG operation; Positioning of the software zero point; Graphical display of the subprograms; Graphical display of the total cutting time and the number of punching.
5) The programming software is expected to provide: 2D drawing in DXF format; Generating standard machine-readable G-codes; The structure of the input and output cut; Entering the cutting speed; Selection of the cutting technology; Automatic compensation of cut (KERF); Defining paths between cuts; Defining the position of the head parking after completing the cut; Possibility of manual and automatic nesting.
6) The control computer: Supports software on the Windows 7 platform; Network card 10/100 Mbps; Interface for network; USB IP 65 port; 17" LCD monitor, TFT XGA 1.280 x 1.024.

Selected vendor was Arpel Company from Belgrade who was the only one able to meet technical characteristics requested by the RFP. The offer was sent to VMC experts who performed more detailed technical parameters comparison. VMC confirmed that the offered CNC Plasma Cutting Coordinate Table complies with all technical characteristics from the RFP and their needs. Table was delivered on May 15, 2015.

CNC coordinate table is able to cut all materials that conduct electricity. It has a bed size of 3000x1500x200mm (xyz), so can handle most standard sheet sizes. A CNC (Computer Numerical Control) router machine is a flat table, with a moving gantry above it (the "x" axis). On the gantry is a cutting head called a spindle motor. This moves along the gantry and is the "y" axis. These two axis are perpendicular to each other. The positioning of the cutting head is based on an x and y coordinate called a cartesian system (like plotting coordinates on a map, or graph), there is also another axis called "z" for a position in height. The x, y and z axis are positioned accurately by drive motors, whose position, direction and speed, are all controlled by dedicated hardware and a computer. The spindle motor is expected to spin a cutting bit at high speed - up to 12,000 rpm. The type of cutting bit used is dependent on what is being cut. The cutting bit is similar to a drilling bit, but it is designed to cut sideways as well as various tip shapes. A small bit can cut (plunge) into the material, and then cut a larger round hole by following a circular path to cut the hole.
By purchasing a coordinate table VMC is able to provide more opportunities to its members, and the others. It is estimated that additional functionalities will increase three fold a number of companies using these services and will offer 2-3% savings in production costs which will make them more competitive in the market.

Arpel Automation, Belgrade (successful offeror) has completed deliverables in line with the subcontract no SUB03IMCDNS03 – Supply of CNC Plasma Cutting Coordinate Table. The following has been completed in good quality manner:

1. CNC Plasma Cutting Coordinate Table with technical characteristic described in the SOW delivered FRANKO VMC premises Novosadska bb, 21235 Temerin;

2. CNC Plasma Cutting Coordinate Table installment, testing and putting into operation completed;
3. 40 hours training delivered to 2 VMC operators;
4. Online help to the operator after installing the system provided; Warranty for three years provided. Written confirmation of after – sales service provided.

Activity 3 – Development of innovative cluster-wide product

In order to reinforce capacity of the VMC to contribute to development of a competitive, cluster-wide product, lead joint market research, design and development process, this activity aims to support development of the first such product – an underground container for primary collection of municipal waste. Experts from the member companies/organizations participated in the development of technical-technological documentation.
The first parameters were considered in order to determine:

- Type and size of the container;
- Number of containers;
- Mechanism of opening deposit bin (by hand or foot);
- The way of lifting up the container (electric or hydraulic);
- The way of handling the platform (vertical sliders od scissors);
- The way of managing lifting up/ down;
- Potential safety problems in handling the container

The conclusion was to design platform with three standard containers, volume 1,1m3. Deposit bin should be capable of independent opening by hand and foot. Regarding the ways of handling the platform, it was agreed to try with a multiple set of vertically mounted scissors. Regarding the drive, it was decided to be hydraulic. As a source of energy, we would use hydraulic drive from a truck that empties containers. For safety reasons, hydraulic and mechanical blockage of the upper position will be provided.

Hydraulic scheme was determined and the following necessary technical documentation was made:

- ✓ drawings of assemblies;
- ✓ drawings of subassemblies;
- ✓ workshop drawings;
- ✓ components, and
- ✓ list of materials

All positions were divided into two groups:

I. Standard elements, and
II. Elements that were made.

Based on defined technical-technological documentation and made material list, tender procedure was conducted in order to purchase material needed for production of underground container. Budget line 3.1. was divided into 4 categories:

1. Basic raw materials
2. Hydraulics
3. Standard positions
4. Paints and varnishes

This division made the tender procedure easier for understanding and its implementation. Requests for Proposals were sent to the following addresses:

1. When it comes to 1st category – Basic raw materials

- Industrometal, Valjevo (industrometal@opentelekom.rs)
- SIM, Novi Sad (simdoo.ns@gmail.com)
- Metalmanija, Kanjiza (metalmaniamp@gmail.com)
- ZENIT KOP, Beograd (office@zenitkop.co.rs)
- Metal Centar, Vojka (info@metal-centar.rs)
- CIT Commerce, Temerin (+381 21 845452)
- Feriti, Beograd (anag@jeepcommerce.rs)

Selected supplier was 'SIM' from Novi Sad who offered the most favorable conditions: the goods were 'Free delivered' VMC workshop, Temerin thus saving transport costs, the goods were successively delivered according to the needs of production since the workshop space is small and storage of all materials required would only disrupt the process of work.

2. When it comes to 2nd category – Hydraulics

- Orlikon, Stulac (orlikonoffice@gmail.com)
- Hidraulika biznis, Lacarak (prodaja@hidraulika.biz)
- Prva Petoletka, Trstenik (ppthidraulika@open.telekom.rs)
- Zarkom, Kraljevo (zarkomkv@open.telekom.rs)
- Sanvi, Trstenik (office@sanvi.co.rs)
- Micron, Kikinda (info@mikron.rs)

Selected supplier was 'Žarkom' from Kraljevo who offered the best value for the money.

The category 'standard positions' was divided into 5 groups because one tenderer could not be able to deliver all items required. The groups are: bolts, chain and sprocket, gear, bearings and linear guides.

Group 1 - Bolts:

- Stanojevic, Valjevo (stanojevicdoo@open.telekom.rs),
- Euromib, Temerin (milenko.buvac@gmail.com),
- Wurth, Beograd (jasmina.jankovic@wurth.rs),
- Neptun, Temerin (office@neptundoo.rs)

Selected supplier was 'Euromib' from Temerin who offered the best value for the money.

Group 2 - Chain and sprocket:

- Lagerton, Niš (toni.lagerton@gmail.com),
- Kumakis, Beograd (info@kumakis.rs),
- Demetra Lanci, Stara Pazova (prodaja@demetralanci.com),
- Beotehnika, Beograda (info@beotehnika.rs)

Selected supplier was 'Lagerton' from Niš who offered the best value for the money.

Group 3 - Gear:

- Belt, Zemun (office@belt.co.rs),
- Alco, Aleksandrovac (office@alco.co.rs),
- Lagerton, Niš (toni.lagerton@gmail.com),
- Zupčanik, Ada (zupcanik@eunet.rs)
- K-Efekt, Ada (k-efekt@adanet.rs; k-efekt@gmail.com)
- Beotehnika, Beograd (info@beotehnika.rs)

Selected supplier was 'Belt' from Zemun who offered the best value for the money.

Group 4 - Bearings:

- Kuglager, Novi Sad (kuglageri@gmail.com),
- Optima, Zrenjanin (optima@eunet.rs),
- Premi trade, Novi Sad (office@premitrade.com),
- Timpex, Novi Sad (office@timpex.co.rs)

Selected supplier was 'Kuglager' from Novi Sad who offered the best value for the money.

Group 5 – Linear guides :

- Kleemann, Šimanovci (marko@kleemann.rs) - after market research, this was the only one who could deliver what we had asked for.

The following step was to prepare the ground for starting producing the prototypes. The objective is to include as many cluster members as possible to actively participate in joint product. For that purpose, we have divided Activity 3.2. into few phases of production: production, surface protection and assembly. What is more, Request for Proposals was divided into 5 lots: production of bins, production of platforms, production of vertically mounted scissors, surface protection and assembly. Even though one company could provide all services requested, we made decision to include more members in the process of developing the container. So, based on production capacities and the most favorable bid, VMC selected 5 companies, the cluster members.

We sent Requests for Proposals to more than 3 addresses through VMC CRM software:

- ZARKOM, Kraljevo,
- PELET C MASINE, Temerin,
- KOLOS, Temerin,
- AGRO FEROCOOP, Temerin,
- TEHNOLINK, Cenej - Novi Sad.

Each offeror was selected for one item only taking into account the best value for the money.
Each of them produced certain part of the container. Final product was assembled in VMC Workshop. As it was defined in project application, VMC made three pieces of underground container. At first, there were produced two pieces and later on one more with necessary corrections.
During the production process and after it was completed, testing was conducted in order to assess its functionality. All three produced prototypes were tested. The main goal of testing was to assess the functionality of the container. It consisted of:

- Testing of opening/ slow closing of deposit bin;
- Testing of emptying process;
- Testing of design function and laying of the platform;
- Testing of maximum weight;
- Testing of mechanical damage impact.

On April 31, 2015 we sent Request for Proposals - Services of internal testing of prototype products "underground container". Successful tenderer was 'ConsAct', Kanjiža that gave the most favorable bid taking into account the best value for the money.

Time needed for production and testing was about 10 days.
The first prototype was completed on April 30,2015. <u>Testing of the 1st prototype was conducted on May 05.</u>
First test (Kinematics of motion without load) fully met designed parameters.
Second test (Kinematics of motion with load) consisted of placing load on the platform. Weight of the load used for the testing was 3000kg divided in three 1000kg loads. The loads were placed on the platform gradually, load by load on different sections of the platform.
The first 1000kg load was placed to the section next to sliding bearing/support. The platform was lifted up to 610mm height and the result was deformation of PTO support on the opposite side of the load placement. The conclusion was that construction did not meet the requirements.

The Committee conclusion is that the problem could be resolved by using to additional L shape profiles 50X50mm to connect PTO and slide support.
Testing was continued by placing additional 1000kg load on the middle segment of the platform. Beam deflection of 56mm was recorded.
The beam deflection increased to 70mm when placing the last 1000kg load on the third segment of the platform leading to deformation of beam and upper grid and permanent deformation of the structure.
The Committee concluded that the following construction changes should be made:

- ✓ Make new beam and upper grid.
- ✓ Make the beam stronger by placing UNO-100 profile
- ✓ Check dimension and functionality of hydraulic
- ✓ Increase capacity of hydraulics cylinders
- ✓ Determine weight of the load for the next testing in line with the maximum container capacity and maximum waste load weight 400kg+15% per container. The weight of load used for testing was unrealistically large.

Testing plan should be in line with valid standards and directives.

The second prototype was completed on May 16, 2015. <u>Testing of the 2nd prototype was conducted on May 18, 2015.</u>
The Committee noted that the second prototype was made in line with the construction changes recommended during the first prototype testing.
Testing was done according to test plan.
First test (Kinematics of motion without load) fully met designed parameters.
Second test (Kinematics of motion with load) consisted of placing load on the platform. Weight of the load used for the testing was 2175kg divided in three 725kg loads. The load weight was reduced in line with determined maximum container weight. The loads were placed on the platform gradually, load by load on different sections of the platform.
All measured parameters were in line with specific limits. Stability of the construction during placement of load to different sections of the platform was recorded.

Two additional tests were conducted:

- ✓ Testing if the lifted platform under maximum load will keep the position (height)
- ✓ Testing of the lifted platform will remain stable when sections of the load are removed

The Committee concluded that during the first test in 10 minutes the construction went down for 1mm which is acceptable and remained stable during the second test.

The Committee concluded that the following should be completed for the testing of the third prototype:

- ✓ Make and install container cover
- ✓ Replace flexible hydraulic pipes with metal pipes attached to the contruction
- ✓ Make mechanic safety switch for platform in lifted position
- ✓ Replace steel top of the platform with aluminum
- ✓ Make new bin for collection of waste and place it on the top of the platform
- ✓ Make new hydraulic pool for hydraulic connection profile 160X100mm
- ✓ Make new subcontracting enabling adjustment to be made to the platform when in down position
- ✓ Make and install safety side fence

The third (final) prototype was completed on June 11, 2015. <u>Testing of the 3rd prototype was conducted on June 12, 2015.</u>

The Committee noted that the platform with three containers for municipal waste was fully completed in accordance with project documentation and in line with the construction changes recommended during the second prototype testing.

During the third testing, the emphasis was on deposit bins. We were testing necessary force on human foot while opening deposit bin. Envisaged force was F=70 N, but testing showed that force of up to 62 N was enough to open deposit bins.

The following step was testing the closing of deposit bins. According to the project, there are two conditions of closing. The first is that after letting go a foot pedal the bin must not remain open, and the other that while it is closing there must not occur shock, but slow closing. We were testing 100 consecutive cycles of opening and closing and each cycle met projected requirements. As an additional safety measure, we were testing the use of deposit bin by 12-year-old child. Emphasis was on the possibility of using bins by juveniles, and their safety during opening and closing the same.
The Committee concluded that underground container fully met determined parameters and could proceed with certification of the product by certified bodies.

Achievements and Challenges

After we had purchased basic construction materials, hydraulics, standard positions and paintwork we prepared the ground for starting producing the prototypes and involved members of the cluster in the production. The production was running according to the action plan. We have put parts together and tried to lift the platform (test version). The platform lost its stability, thus causing curvature and leading to distortion and cracking of the cylinder. The main reason was that the ground where platform was standing was not adequate. It was uneven and soft, and we were not able to fix it firmly. Due to this, we had to prepare the new ground for testing and purchase the other cylinder which would prolong our production of other prototypes at least 15 days more. For that reason, asked USAID's approval for grant extension to be at no-cost.

Activities Planned for Next Period

After conclusion that underground container fully meets determined parameters, the next step is installation, testing and certification in real time and environment.
The underground container (prototype) will be put in backyard of the residence building (24 apartments) in order to test its exploitation in real environmental conditions. Installation will require digging the hole in the ground and concreting the same taking into consideration impact on environment and ecology issues. The concrete bunker will be completely watertight, preventing penetration of water and escape of leachates contaminating the surrounding soil. There potential buyers will be presented how the underground platform works and looks like. We will design brochure with photos, technical specifications and other descriptions needed. Brochures will be distributed to the Public utilities companies and potential investors. Furthermore, we will participate at different fairs or public events in order to promote the importance of collecting, separating, and disposal of municipal waste.

Report submitted by:

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