**PROJECT DOCUMENTATION**

**SUBJECT OF THE ORDER:**

**Reconstruction of the Heat Exchanging Surfaces of K1 and K2 Boilers at ZEVO Plant,**

**OLO a.s., Bratislava**

Bratislava, 10th December 2021

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Director EGP EDS Ltd.

# 

# **Document Content**

Part I. General Information

Part II. Documentation

Part III. Drawings

**Part I.**

**General Information**

**1. Identification of the Buyer**

Odvoz a likvidácia odpadu, a.s., shortened form OLO, a.s.

Ivanská cesta 22, 821 04 Bratislava 2

INO: 681300

Contact point of the buyer: ZEVO Bratislava, Vlčie hrdlo 72, 821 07 Bratislava

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**2. Subject of the Order**

Subject of the Order of the Reconstruction of the Heat Exchanging Surfaces of K1 and K2 Boilers for Energy Recovery from Municipal Waste at ZEVO Plant Vlčie hrdlo is:

1. Delivery of services and works related to :

* Preparation of implementation and construction documentation for the reconstruction and/or work
* Preparation and provision of supporting documents for the preparation, approval and coordination of execution of the reconstruction and/or work
* Installation of the technological part of the work
* Proof of quality of materials supplied and works performed
* Testing, commissioning/start-up, handover and takeover of the work

1. Delivery of the technological part of the work

Scope of reconstruction of the heat exchanging surfaces of boilers is shown in No.101a, 101b “Drawing of the boiler with marking of reconstructed sections“

**3. Brief Description of the Reconstructed Equipment**

Two steam boilers (K1 and K2) intended for municipal waste incineration are installed in ZEVO Plant.

**Steam Boiler** – is a technological equipment for generation of superheated steam in the pressure aggregate of the boiler (economizer, evaporator, superheater) by combustion of fuel on the grate in the combustion chamber whereby the steam is intended for use beyond this equipment. The purpose of ZEVO technological equipment is a thermic disposal of imported municipal waste that cannot be utilized otherwise, on waste-to-energy principle – generation of electric power and heat. Each boiler is interconnected with other technological systems forming together an independent line generating steam for the turbo generator.

Steam boilers (2 pcs.) available at ZEVO were manufactured by top German manufacturers – Martin GmbH Munich and Wehrle Werk AG Emmendingen. Both boilers of identical parameters are steam boilers, single drum with membrane walls, radiant with natural water circulation, three draught system.

**Designed specifications of the boilers**:

|  |  |  |  |
| --- | --- | --- | --- |
| Manufacturer | | Wehrle Werk AG | |
| Type  K1 Boiler – year of manufacture: 2001  Production number: 7360  K2 Boiler – year of manufacture: 2001  Production number: 7361 | | Steam, single drum boiler with membrane walls, radiant with natural circulation, three draught system | |
| Boiler heat delivery surface | | 3430 | m2 |
| Nominal steam output | | 27,70 | t.hour-1 |
| Nominal heat output | | 25 | MWt |
| Feed water nominal temperature | | 130 | oC |
| Steam nominal temperature | | 400 | oC |
| Steam nominal pressure | | 4,00 | MPa |
| Fuel type | Basic | Unsorted solid waste | |
|  | Auxiliary | Natural gas associated STN 38 6110 | |

**Part II.**

**Documentation**

**Documentation includes:**

1. Scope of works and services provided by the Buyer
2. Scope of deliveries, removal and assembly works forming the scope of fulfilment of the Supplier.
3. Requirements on technological procedure of K1, K2 Boilers reconstruction
4. Requirements on quality of delivered materials
5. Requirements related to waste treatment
6. Requirements related to work safety and protection of environment
7. Required scope of calculations necessary for the work.
8. Required scope of revisions and checks
9. Official pressure tests after the repair (SPO) K1, K2 boilers
10. Requirements on compliance with applicable technical standards and relevant legislation documents of the SR
11. Requirements on content of the time schedule of the Supplier
12. Requirements on documentation submitted by the Supplier.
13. Other requirements of the Supplier
14. Deliveries by the Buyer party

**1. Scope of Works and Services Provided by the Buyer**

* + 1. **Reconstruction of the heat exchanging surfaces of K1, K2 boilers**

1. ***Erection and removal of work scaffolding(-s)***

Provision, erection and removal of construction (erection) scaffoldings in the combustion chamber in the 2nd and 3rd boiler draught and in convection draught of the boiler between pipe bundles of superheaters and economizer according to Supplier´s proposal, in order to perform cleaning of pipe surfaces by sand blasting, carry-out subsequent checks of the condition of pipes and perform the entire reconstruction of the heat exchanging surfaces of the boilers.

Scaffolding in the combustion chamber will be erected on the combustion grate.

1. ***Cleaning of boiler and demolition of refractory lining (sand blasting works)***

Sand blasting of the surface of refractory lining in the combustion chamber – 1st draught of the boiler. Sand blasting to SA2 cleanliness grade in the combustion chamber above the refractory lining, in the 2nd and 3rd boiler draught, surfaces in convection draught – superheaters, evaporator and economizer.

SA2 cleaning – sand blasting of surfaces of the membrane walls in the combustion chamber and in the 2nd draught of the boiler. Demolition of refractory lining according to Supplier´s specifications and subsequent sand blasting of points of connection of membrane walls to SA 2.5 cleanliness grade. SA2 cleaning – sand blasting in the combustion chamber at the spots of NiCr625 cladding as well as at the spots of local NiCr625 repairs in the combustion chamber and in the 2nd and 3rd draught of the boiler to SA 2.5 cleanliness grade.

1. ***Removal and installation of outer heat insulation of boiler at erection area***

Scope according to drawing No. 102

Disassembly of the external insulation jacket of the boiler at the erection area. Removal of boiler metal sheathing and mineral wool. Packing of removed mineral wool in PA-bags, sealing and handover to waste disposal. Professional removal of sub-structure.

Insulation jacket / metal sheathing and sub-structure will be reused. Mineral wool will be replaced by a new one.

Erection of the sub-structure and professional laying of mineral wool with one side reinforced by zinc-galvanized wire netting. 2-layers (2 x 100 mm), laying with offset joints, with aluminium interlayer and air gap of 250 mm. Joints of the heat insulation will be covered by a tape. Overall thickness of the heat insulation 450 mm.

Installation of insulation jacket as it was originally. Treatment of intrusions at the area of measuring points and inspection doors.

1. ***Works on refractory lining (minor repairs)***

Repair of refractory lining around burner linings, inspection doors and various minor repairs. Restore to original state, with sealing compounds, spraying and ramming compounds of highest possible quality. Monolithic refractory lining with phosphate bond, i.e. not hydraulic bond, is presumed to be used.

Complete delivery of materials and erection of refractory lining including necessary anchorage. Removal of existing and welding/cladding of new lining anchors – steel of 1.4828 material of AISI 309 standard, EN marking X15CrNiSi20-12. Assembly to the state of readiness for use.

Delivery of refractory lining will include the documentation of works on the lining, time schedule of cold and warm drying of the lining and coordination of lining works with other works of the reconstruction of heat exchanging surfaces of the boilers.

**2. Scope of deliveries, removal and installation works forming the scope of fulfilment of the Supplier party.**

* 1. **Reconstruction of membrane walls of K1, K2 boilers in the boilers´ combustion chambers**

***a.) Delivery of material and components of the reconstruction of membrane walls of the boiler***

The elements of the membrane wall for the replacement of the front wall, part of right and left side walls (walls surface approx. 101m2) will be manufactured from seamless pipe Ø 60.3 x 5, axial spacing of pipes t = 78, steel class St 35.8I with partial NiCr625 (Inconel 625) cladding, layer thickness ≥ 2 mm.

Replacement of the front membrane wall from the altitude of +21.300 m to the altitude of +16.007 m. The surface of the membrane wall will be treated (workshop treatment) with NiCr625 cladding, layer thickness ≥ 2 mm, from ground elevation of +21.300 m to ground elevation of +18.100 m. Remaining surface of the membrane wall from ground elevation of +18.100 m to ground elevation of +16.007 m **will not** be treated with NiCr625 cladding.

Replacement of the right and left side membrane wall from the altitude of +21.300 up to approx. 350 mm above the upper edge of irrigation chamber of the side wall according to drawing No.103. Surface of both side walls will be treated (workshop treatment) with layer of NiCr625, layer thickness ≥ 2 mm, from ground elevation of +21.300 m to ground elevation of +18.100 m and from ground elevation of +15.500 m to the tilted irrigation chamber. NiCr625 layer at least 2 mm thick will be welded/cladded (onsite) on the surface of existing pipes of membrane walls of tilted irrigation chambers of the left and right side wall to the point of connection of new side membrane walls.

Remaining surface of the side membrane walls (from the altitude of +18.100 m to the altitude of +15.500 m) **will not** be treated with NiCr625 cladding.

Material St. 35.8I/P235GH TC.1 and/or TC2, ready for assembly with welding edges and partially built-in bends for 2 pcs. burners, 4 pcs. testing measuring points, 1 pc. sight opening at +19.625 m, 2 pcs. IR-pyrometers, 20 pcs. SNCR nozzles, 2 pcs. sight openings at +13.225 m and 2 pcs. scaffolding openings.

All burner bends as well as all burner shunts on the right and left wall will have NiCr625 cladding, layer thickness > 2 mm +/-0.2.

Cast iron jacket with inspection door flap and other accessories will be reused.

Supplier shall provide to the Buyer the construction implementation documentation, draft of tests, welding plans – WPS, draft of quality control measures/procedures.

***b.) Removal and installation***

* Preparation of construction/erection area
* Dismantling of the existing membrane walls and their transport within the ZEVO complex, to the place designated by the Buyer
* Removal of existing membrane walls
* General preparation of seam welds
* Assembly/installation of parts of walls
* Installation of seals
* Recoating of membrane wall joints with NiCr625 thickness ≥ 2 mm
* Adjustment and assembly of sealing boxes
* Removal of accessory components
* Cleaning of construction/erection area

**2.2. Treatment of joints between new membrane walls**

* Welding and treatment of joints in the area of renovation, double layer cladding
* 1st layer: standard manual welding of the area between original and new membrane walls (circumferential welding)
* 2nd layer: manual NiCr625 cladding on the entire circumference of the weld in the internal part of the combustion chamber

During NiCr625 layer cladding the boiler will be filled with feed water in order to cool the walls of the boiler and the boiler´s combustion gases fan will be switched-on.

During the entire cladding of NiCr625 coating it shall be necessary to maintain:

Fe content in auxiliary material ≤ 1%

Fe content on cladded surface < 7 %, in case of manual welding < 10 %

Perform welding in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards.

Supplier shall provide to the Buyer the construction implementation documentation, draft of tests, welding plans – WPS, draft of quality control measures/procedures.

**2.3 Cladding of NiCr625 layer on existing surfaces of membrane walls in the combustion chambers of K1, K2 boilers**

***a) Cladding of NiCr625 layer on the parts of the rear membrane wall***

A part of the rear membrane wall above the slag roll where the refractory lining is located at present. Cladding starts at the point of beginning of the present lining above the slag roll and ends at the altitude of +15.500 m. Area of secondary nozzles on the rear membrane wall forms the part of cladding, too.



*Secondary air nozzles on the rear membrane wall*

Scope of cladding on existing surfaces of membrane walls of the combustion chamber according to the drawing No. 105

Cladding area will be approx. 23m2 (designed). Membrane walls at the point of cladding must be treated by sand blasting to SA 2,5 quality. Supplier will check and approve the quality of sand blasting of boilers membrane walls. Subsequently, immediately after sand blasting and takeover, the surface of the membrane walls will be treated (by the Supplier) with special coating protecting against corrosion until the start of cladding of NiCr625 layer.

Cladding will be performed on existing surfaces of membrane walls onsite at ZEVO, by automatic and manual welding.

A record will have to be made on measurements of layer thickness > 2 mm. Measurement shall be carried out on every second pipe every 500 mm.

A condition applies that pipes of the membrane walls at the beginning of welding/cladding will have a residual wall thickness of minimum 3 mm.

In order to cool down the walls of the boiler during cladding with layer of NiCr625 the boiler will be filled up with feeding water and the fan of boiler waste gases will be switched on.

By the entire cladding of surfaces of NiCr625 pipes it will be necessary to observe the following:

Fe content of the welding filler ≤ 1 %

Fe content on cladding surface < 7 %, in case of manual welding <10 %

Perform welding in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards.

Supplier shall provide to the Buyer the construction implementation documentation, draft of tests, welding plans – WPS, draft of quality control measures/procedures.

***b) Cladding of NiCr625 layer in the area of secondary nozzles on the front membrane wall***

A repair of the area of endings of secondary nozzles on the front membrane wall from the altitude of +15.080 m to the altitude of +14.780 m.

Scope of cladding on the existing area of vertical pipes of secondary air inlet according to the drawing No. 105

Obrázok, na ktorom je drevené, staré

Automaticky generovaný popis

*Endings of secondary air nozzles on the front membrane wall*

Cladding will be performed on existing surface of air pipes of secondary air inlet, onsite at ZEVO, by automatic and manual welding.

A record will have to be made on measurements of layer thickness > 2 mm. Measurement will be carried out on every second pipe every 500 mm.

The area of secondary air inlet on the front membrane wall at the spot of cladding must be treated by sand blasting to the quality of SA 2,5. The Supplier will check and approve the quality of sand blasting of boilers membrane walls. Subsequently, immediately after sand blasting and takeover, the surface of the membrane walls will be treated (by the Supplier) with a special coating protecting against corrosion until the start of cladding of NiCr625 coating.

A condition applies that vertical pipes of the secondary air inlet at the beginning of cladding will have a residual wall thickness of minimum 3 mm. In order to cool down the walls of the boiler during cladding with layer of NiCr625 the boiler will be filled up with feedwater and the fan of boiler waste gases will be switched on.

By the entire NiCR625 cladding of pipes surfaces it will be necessary to observe the following:

Fe content of the welding filler ≤ 1 %

Fe content on cladding surface < 7 %, in case of manual welding <10 %

Perform welding in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards.

Supplier shall provide to the Buyer the construction implementation documentation, draft of tests, welding plans – WPS, draft of quality control measures/procedures.

**c) Cladding of NiCr625 layer in the area above the infeed table**

Cladding of NiCr625 layer on the ceiling above the infeed table. Cladding area approx. 4.5 m2 (designed), see picture below.

Scope of cladding on existing surfaces of membrane walls above the infeed table according to the drawing No. 105

Obrázok, na ktorom je vnútri, rúra, varí, uvarené

Automaticky generovaný popis

*Marked area of the repair of the infeed table ceiling*

Cladding will be performed on existing surfaces of membrane walls above the infeed table onsite at ZEVO, by automatic and manual welding. Membrane walls at the spot of cladding must be treated by sand blasting to the quality of SA 2,5. The Supplier will check and approve the quality of sand blasting of boilers membrane walls. Subsequently, immediately after sand blasting and takeover, the surface of the membrane walls will be treated (by the Supplier) with a special coating protecting against corrosion until the start of cladding of NiCr625 coating.

A record will have to be made on measurements of layer thickness > 2 mm. Measurement shall be carried out on every second pipe every 500 mm.

A condition applies that pipes of the membrane walls at the beginning of cladding will have a residual wall thickness of minimum 3 mm. In order to cool down the walls of the boiler during cladding with layer of NiCr625 the boiler will be filled up with feeding water and the fan of boiler waste gases will be switched on.

By the entire cladding of surfaces of NiCr625 pipes it will be necessary to observe the following:

Fe content of the welding filler ≤ 1 %

Fe content on cladding surface < 7 %, in case of manual welding <10 %

Perform welding in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards.

Supplier shall provide to the Buyer the construction implementation documentation, draft of tests, welding plans – WPS, draft of quality control measures/procedures.

***d) Local repairs of NiCr625 layer in combustion chambers, in second and third draught of K1, K2 boilers***

Local repairs of cladding will be performed in the whole combustion chamber, in the whole second draught and a part of third draught (in the direction of waste gases flow).

The scope of cladding will be determined on basis of inspection of actual scope of damage of the original cladding.

Obrázok, na ktorom je drevené

Automaticky generovaný popis

*Example of spots for performance of local repair*

Cladding will be performed on existing surface of the membrane walls, onsite at ZEVO, by automatic and manual welding, after grinding and cleaning of damaged locations. Membrane walls at the spot of cladding must be treated by sand blasting to the quality of SA 2,5.

The Supplier will check and approve the quality of sand blasting of boilers membrane walls. Subsequently, immediately after sand blasting and takeover, the surface of the membrane walls will be treated (by the Supplier) with a special coating protecting against corrosion until the start of cladding of NiCr625 coating.

A record will have to be made on measurements of layer thickness > 2 mm. Measurement shall be carried out on every repaired pipe.

A condition applies that pipes of the membrane wall at the beginning of cladding will have a residual wall thickness of minimum 3 mm.

In order to cool down the walls of the boiler during cladding with layer of NiCr625 the boiler will be filled up with feeding water and the fan of boiler waste gases will be switched on.

By the entire cladding of surfaces of NiCr625 pipes it will be necessary to observe the following:

Fe content of the welding filler ≤ 1 %

Fe content on cladding surface < 7 %, in case of manual welding <10 %

HPO approval from the manufacturer and certificates of welders

Supplier shall provide to the Buyer the construction implementation documentation, draft of tests, welding plans – WPS, draft of quality control measures/procedures

**2.4 Optimization of combustion process in K1, K2 boilers after change of scope of refractory lining**

Adjustment and optimization of combustion process in boilers after the reconstruction performed. Respective reconstructions performed will apparently affect heat passage through membrane walls and heat inertia of the boilers, as well as the entire combustion process.

Optimization of the combustion process will depend on setting of the existing program control of the combustion process at ZEVO and/or rearrangement of the equipment relating and supporting the process of combustion (e.g. amount and parameters of primary and secondary air, speed of grates, volume and parameters of waste gases, pressure relations in the combustion chamber, SNCR parameters etc.)

Optimization of the combustion process depends on adjustment of the following parameters:

1. Denox control (SNCR)

2. Fuel feed control

3. Grates motion control

4. Slag roll motion control

5. Combustion output control – inlet of fuel

6. Oxygen amount control on boiler outlet

7. Primary air control

8. Secondary air control

**2.5**  **Replacement of the steam superheater No. I/1 in K1 boiler**

Scope of reconstruction of the steam superheater No. I/1 in K1 boiler according to drawing No. 106

1. ***Technical processing***

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

1. ***Delivery of material and production of necessary components***

6 pcs. pipe rows on steam superheater No. I/1 comprising of 40 pcs. of straight pipes and 40 pcs. of bent pipes with 180° elbow. Seamless pipes Ø 44.5 x 5, material 15Mo3(16Mo3) with APZ 3.2. Components will be delivered to ZEVO bent and ready for assembly with 30° welding angle. Scope of delivery includes also 40 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

36 pcs. Suspension clamp Ø 12 x 272 material X10CrAI7 with thread

4 pcs. Suspension clamp Ø 12 x 322 material X10CrAI7 with thread

1. ***Removal and installation***

* Removal of existing pipes of the superheater
* General preparation of welds
* Installation of components described in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.6 Replacement of the steam superheater No. I/1 in K2 boiler**

Scope of reconstruction of the steam superheater No. I/1 in K2 boiler according to drawing No. 107

***a) Technical processing***

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

1. ***Delivery of material and production of necessary components***

6 pcs. pipe rows on steam superheater No. I/1 comprising of 40 pcs. of straight pipes and 40 pcs. of bent pipes with 180° elbow. Seamless pipes Ø 44.5 x 5, material 15Mo3(16Mo3) with APZ 3.2. Components will be delivered to ZEVO bent and ready for assembly with 30° welding angle. Scope of delivery also includes 40 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

36 pcs. Suspension clamp Ø 12 x 272 material X10CrAI7 with thread

4 pcs. Suspension clamp Ø 12 x 322 material X10CrAI7 with thread

1. ***Removal and installation***

* Removal of existing pipes of the superheater
* General preparation of welds
* Installation of components described in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.7 Reconstruction of the steam superheater II of K1 boiler**

Scope of reconstruction of the steam superheater No. II of K1 boiler according to the attached drawing No. 106

1. **Technical processing**

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

1. **Delivery of material and production of necessary components – material partially delivered from OLO, a.s. warehouse stock**

7 pcs of pipe rows of the steam superheater II comprising of 34 pcs. of straight pipes and 102 pcs of bent pipes with 180° elbow. Seamless pipes Ø 44.5 x 5, material 15Mo3(16Mo3) with APZ 3.2. Components will be delivered to ZEVO bent and ready for assembly with 30°welding angle. Scope of delivery also includes 102 pcs of suspension clamps for the attachment on the ceiling.

Necessary material:

102 pcs. seamless pipes with 180° elbow, Ø 44.5 x 5, length 5480 mm, **their ends are without 30° welding bevel,** material 15Mo3(16Mo3) with APZ 3.2; will be delivered by OLO, a.s. (warehouse stock)

30 pcs. of straight pipes Ø 44.5 x 5, length 6080 mm, one end with welding bevel of 30°, **second end without welding bevel of 30°,** material 15Mo3(16Mo3) with APZ 3.2; will be delivered by OLO, a.s. (warehouse stock)

4 pcs. straight pipes, Ø 44.5 x 5, material 15Mo3(16Mo3) with APZ 3.2; will be delivered by the Supplier

Specification of suspension brackets:

90 pcs. Suspension clamp Ø 12 x 272, material X10CrAI7 with thread – will be delivered by the Supplier

6 pcs. Suspension clamp Ø 12 x 320, material X10CrAI7 with thread – will be delivered by the Supplier

6 pcs. Suspension clamp Ø 16 x 295, material X10CrAI7 with thread – will be delivered by the Supplier

1. **Removal and installation**

* Removal of existing pipes of the steam superheater No.II, its second half in the direction of waste gases flow (pipe row 8 – 14)
* General preparation of welds
* Installation of components stated in b) on steam superheater, in particular its second half in the direction of waste gases flow (pipe row 8 – 14)

*\*****Note:*** First half of steam superheater No.II of K1 boiler (i.e. pipe row 1 – 7) in the direction of waste gases flow was replaced in 10/2021.

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.8 Reconstruction of the steam superheater No. II of K2 boiler**

Scope of reconstruction of the superheater No. II of K2 boiler according to the attached drawing No. 107

1. ***Technical processing***

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

1. ***Delivery of material and production of necessary components***

14 pcs. of pipe rows on the steam superheater No. II comprising of 68 pcs. of straight pipes and 204 pcs. of bent pipes with 180° elbow. Seamless pipes Ø 44.5 x 5, material 15Mo3 (16Mo3) with APZ 3.2. Components will be delivered to ZEVO bent and ready for assembly with 30°welding angle. Scope of delivery also includes 204 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

180 pcs. Suspension clamp Ø 12 x 272, material X10CrAI7 with thread

12 pcs. Suspension clamp Ø 12 x 320, material X10CrAI7 with thread

12 pcs. Suspension clamp Ø 16 x 295, material X10CrAI7 with thread

**c) *Removal and installation***

* Removal of existing pipes of the superheater
* General preparation of welds
* Installation of components stated in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.9 Reconstruction of the steam superheater No. I/2 of K1 boiler**

Scope of reconstruction of the superheater No. I/2 of K1 boiler according to drawing No. 106

***a) Technical processing***

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

***b) Delivery of material and production of necessary components***

16 pcs. of pipe rows on the steam superheater No. I/2 comprising of 68 pcs. of straight pipes and 238 pcs. of bent pipes with 180° elbow. Seamless pipes Ø 44.5 x 5, material 15Mo3 (16Mo3) with APZ 3.2. Components will be delivered to ZEVO bent and ready for assembly with 30° welding bevel. Scope of delivery also includes 238 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

210 pcs. Suspension clamp Ø 12 x 272, material X10CrAI7 with thread

14 pcs. Suspension clamp Ø 12 x 320, material X10CrAI7 with thread

14 pcs. Suspension clamp Ø 16 x 295, material X10CrAI7 with thread

**c) *Removal and installation***

* Removal of existing pipes of the superheater
* General preparation of welds
* Installation of components stated in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.10 Reconstruction of the steam superheater No. I/2 of K2 boiler**

Scope of reconstruction of the superheater No. I/2 of K2 boiler according to drawing No. 107

***a) Technical processing***

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

***b) Delivery of material and production of necessary components***

16 pcs. of pipe rows on the steam superheater No. I/2 comprising of 68 pcs. of straight pipes and 238 pcs. of bent pipes with 180° elbow. Seamless pipes Ø 44.5 x 5, material 15Mo3 (16Mo3) with APZ 3.2. Pipe rows 1 – 9 in the direction of waste gases flow will be treated with NiCr625 cladding with thickness of ≥ 1 mm in the whole length of the outer surface of the pipes. Pipe rows 10 – 16 in the direction of waste gases flow will be without NiCr625 cladding. Components will be delivered to ZEVO bent and ready for assembly with 30° welding bevel. Scope of delivery also includes 238 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

210 pcs. Suspension clamp Ø 12 x 272, material X10CrAI7 with thread

14 pcs. Suspension clamp Ø 12 x 320, material X10CrAI7 with thread

14 pcs. Suspension clamp Ø 16 x 295, material X10CrAI7 with thread

**c) *Removal and installation***

* Removal of existing pipes of the superheater
* General preparation of welds
* Installation of components stated in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.11**  **Reconstruction of the economizer (ECO) of K1 boiler**

Scope of reconstruction of the economizer (ECO) of K1 boiler according to drawing No. 106

1. **Technical processing**

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

1. **Delivery of material and production of necessary components**

25 pcs. of bent pipe coils with 180° elbows. Seamless pipes Ø 33.7 x 4, material St 35.8I (P235 GH TC2) with APZ 3.1 takeover certificate.

Components will be delivered to ZEVO bent and ready for assembly with 30° welding angle. Scope of delivery includes 25 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

25 pcs. Suspension clamp Ø 10 x 236, material X10CrAI7

1. **Removal and installation**

* Removal of ECO existing pipes
* General preparation of welds
* Installation of components stated in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.12 Reconstruction of the economizer (ECO) of K2 boiler**

Scope of reconstruction of the economizer (ECO) of K2 boiler according to drawing No. 107

1. ***Technical processing***

Construction processing, draft of tests, welding plans - WPS, draft of quality control procedures.

1. ***Delivery of material and production of necessary components***

25 pcs. of bent pipe coils with 180° elbows. Seamless pipes Ø 33.7 x 4, material St 35.8I (P235 GH TC2) with APZ 3.1 takeover certificate. Components will be delivered to ZEVO bent and ready for assembly with 30° welding angle. Scope of delivery includes 25 pcs. of suspension clamps for the attachment on the ceiling.

Specification of suspension brackets:

25 pcs. Suspension clamp Ø 10 x 236, material X10CrAI7

1. ***Removal and installation***

* Removal of ECO existing pipes
* General preparation of welds
* Installation of components stated in b)

Perform welding only in compliance with STN EN ISO 3834-2, STN EN 12952-5 standards

**2.13 Production, installation and removal of carrying brackets of the scaffolding in 2nd and 3rd draught of K1 and K2 boilers**

Scaffolding in 2nd and 3rd draught of K1 and K2 boilers must be installed on special carrying brackets. Number of pcs – 8 per boiler.

Carrying of weldable construction steel will be prepared onsite at ZEVO. They will be attached by welding on carrying brackets of membrane walls and located at proper vertical spot for safe and accessible base of the scaffolding.

**2.14. Technical gases**

Supplier shall provide a list, required amount and types of technical gases necessary for the reconstruction of K1 and K2 boilers 60 days prior to start of implementation.

Buyer shall procure at his own cost required amount and type of technical gases available on the territory of the SR.

1. **Requirements on technological procedure of the reconstruction of K1 and K2 boilers**

Written technological procedure of the reconstruction must be designed so that no damage is caused to the other parts of the boiler nor to the boiler room equipment untouched by the reconstruction.

Technological procedures shall be submitted for approval to the Buyer, **minimum 60 days** prior to the start of the implementation, in (2) hard copies (i.e. in paper form) and in (1) copy electronically (\*.doc, \*.xls, \*.pdf – text part), (\*.dwg, \*.dgn, \*.pdf – drawings) on CD and/or USB key; all documents and other written material forming supporting documentation must by produced in Slovak language and/or as an official translation into Slovak language.

*Buyer requires delivery of:*

* Plans of scaffoldings in interior as well exterior areas of the boilers
* Plans of demolition of the refractory lining
* Plans of cutting of the membrane walls
* Plans of transport routes

1. **Requirements on quality of materials delivered**

**4.1. Reconstruction of membrane walls in the combustion chambers of K1, K2 boilers**

Membrane wall Ø 60.3 x 5 Material St. 35.8I/P235GH TC.1 and/or TC2

**4.2. Cladding of surfaces of membrane walls in the combustion chamber of K1, K2 boilers in 2nd and 3rd draught**

Material Inconel (Alloy) 625, e.g. EN 2.4856 - NiCr22Mo9Nb, provable cladding thickness ≥2 mm

Guaranteed Fe content in the filler material (Inconel (Alloy) 625, e.g. EN 2.4856 – NiCr22Mo9Nb) ≤ 1 %

Guaranteed Fe content on a surface cladded automatically < 7 %

Guaranteed Fe content on a surface cladded manually < 10 %

**4.3. Reconstruction of the steam superheater No. I/1 of K1, K2 boilers**

Seamless pipes Ø 44.5 x 5, material 15Mo3 (16Mo3) with APZ 3.2.

**4.4. Reconstruction of the steam superheater No. II of K1, K2 boilers**

Seamless pipes Ø 44.5 x 5, material 15Mo3 1(16Mo3) with APZ 3.2.

**4.5.** **Reconstruction of the steam superheater No. I/2 of K1, K2 boilers**

Seamless pipes Ø 44.5 x 5, material 15Mo3 (16Mo3) with APZ 3.2.

**4.6. Reconstruction of the economizer (ECO) of K1, K2 boilers**

Seamless pipes Ø 33,7 x 4, material St 35.8I.

1. **Requirements related to waste treatment**

Treatment of waste (sorting, collecting, disposal) resulting from fulfilment of the contract is provided by the Supplier at his own costs. Supplier will thereby follow the Act No. 223/2001 Coll., on Waste, as amended, related legal regulations and internal regulations of the Buyer.

Site for deposition of waste will be determined prior to the start of the works. Supplier shall subsequently perform the disposal of waste except for metal waste which will be made scrappable by the Supplier and deposit in the respective container of the Buyer. Takeaway of the metal scrap will be provided by the Buyer.

Collecting of waste (including waste bins) produced by the activity of the Supplier or his sub-suppliers during fulfilment will be provided by the Supplier only at handover-site unless agreed otherwise in the daily log or in the supplement to the contract.

Supplier is obliged to keep the workplace clean during performance of the work and its completion. Supplier shall continuously remove waste from the workplace and routes and shall act in compliance with the regulations on waste treatment.

Supplier is obliged to secure waste against theft and/or damage.

**6. Requirements related to work safety and protection of the environment**

1. Supplier is responsible for BOZP (= OHS - Occupational health and safety) of his employees in terms of the Act of the NC of the SR No. 124/2006 Coll. on occupational health and safety, as amended, and of the Act of the NC of the SR No. 314/2001 Coll. on fire protection, as amended. Supplier will perform works at his own risk. Uninstructed employees of the supplier and his conceivable sub-suppliers will not attend the reconstruction works at ZEVO. All employees of the Supplier and his conceivable sub-suppliers will undergo a briefing of the Buyer on local conditions prior to their first start of the works at the premises of the Buyer. Supplier will provide personal protective equipment for his employees and his conceivable sub-suppliers.

2. If the Supplier violates safety regulations applicable for the respective workplace provably announced to the supplier by the Buyer, the Buyer is justified to give an order to stop the works until the Supplier performs a corrective action whereby this interruption will not result in any change of deadlines of the works.

3. Supplier and his conceivable sub-suppliers are committed to observe general principles of BOZP (= OHS - Occupational health and safety), especially the principles of the Decree No. 508/2009 Coll. laying down the details for occupational safety and health in working with pressure, lifting, electric and gas technical equipment and specifying technical equipment considered as classified technical equipment and in regard of specific conditions of the Buyer. Equally, the Supplier and his conceivable sub-suppliers are obliged to observe regulations on fire protection and respect instructions of the safety technician and the fire protection technician of the Buyer. During performance of the works the Supplier and his conceivable sub-suppliers are obliged to handle the tools, material and technical equipment so that no harm is caused to buildings and/or premises and other property of the Buyer, and to health of the employees of the Buyer. The safety technician and the fire protection technician of the Buyer will perform inspections of the workplaces during performance of the works in respect of observance of safety and fire preventive regulations. In case of discrepancies a record will be made in the installation daily log. Any handling of equipment in operation may be carried out only by the employees of the Buyer. The Supplier is responsible for any conceivable damage caused to the Buyer or to third parties if this damage was caused by him during provision of works in terms of Commercial Code. The Supplier is obliged to maintain the workplace and surrounding areas clean and tidy during performance of the works. The Supplier will hand the workplace over to the Buyer after completion of works.

4. Prior to commencement of the works on the premises of the Buyer the Supplier is obliged to submit to the Buyer a list of employees of the Supplier and his conceivable sub-suppliers stating name, surname and ID number and license plate numbers of mechanical equipment (vehicles). Employees of the Supplier and his conceivable sub-suppliers are restricted to roam the premises of the Buyer which do not relate to the fulfilment of their contractual duties. Supplier shall provide visible and permanent marking of the clothing of his employees and his conceivable sub-suppliers with his company logo.

5. Supplier is bound to replace immediately an employee against whom the Buyer raised objections regarding professional or moral aspects as well as for gross violation of BOZP (= OHS - Occupational health and safety) and OPP (personal protective equipment) regulations, and for alcohol abuse at the workplace.

6. In case of any work injury on Supplier´s side or in case of a hazardous event the Supplier of works is obliged to notify this event immediately, in addition to respectively acting institutions (Work Inspectorate, Police, HaZZ = Fire Rescue Brigade, Ambulance Service), to the employee of the Buyer (operation manager, foreman, safety technician and fire protection technician). Maintain place of the event in original state, follow instructions of the Buyer.

7. In case of fire the Supplier is obliged to perform reasonable measures to fight the fire. In case of failure to eliminate the fire, the Supplier is obliged to notify this event to telephone number 150 or 112, and subsequently to the employee of the Buyer.

8. In case of rescue works and conceivable evacuation the Supplier is obliged to cooperate with the employees of the Buyer.

9. In case the Supplier uses certain premises of the Buyer as a storage the Supplier is obliged to follow the agreement on use of the premises which (agreement) will be signed by the authorized representatives of both parties prior to handover of the premises.

10. The Supplier will start agreed works only after signing of the contract by both parties on the contractually agreed date.

11.Prior to the start of the work the employees of the Supplier must report to the authorized employees of the Buyer.

12.Upon departure of the area of the Buyer all motor vehicles must undergo an inspection of the load compartment. Inspections are performed by the employees of SBS (security service). In case of export of material and/or tools it is necessary to fill-in a Dispatch Note of material exported via gate house.

13.In case the Supplier performs works with open fire, welding, cementing, etc. at the premises of the Buyer the Supplier is obliged to ask an employee of the Buyer to issue a Permit to perform these works, i.e. Welding and Hot Work Permit.

**7. Required scope of calculations necessary for the work**

All existing parameters of the boiler: amount of superheated steam on the boiler outlet, heat output of the boiler, temperature and pressure of superheated steam on the boiler outlet, temperature of waste gases behind the combustion chamber, temperature of waste gases on the boiler outlet etc. must remain unchanged after the reconstruction of the heat exchanging surfaces.

7.1. Buyer requests that within technical documentation of the reconstruction of the boilers the Supplier submits also heat technical calculations proving that existing parameters of the boiler were maintained after the reconstruction.

7.2. The supplier will provide all necessary calculations required during the implementation of the work (Optimization of the combustion process, see 2.4.)

**8. Required scope of revisions and checks**

Supplier will provide all required revisions and checks necessary for the implementation of the work and in order to prove quality of implemented work within the scope and at the conditions required by the contract.

**8.1. *Within the implementation of the work / reconstruction of boilers the Supplier shall at his own cost ensure performance of tests, examinations or measurements necessary to prove:***

- Thickness of NiCr625 cladding ≥ 2 mm on the surface of pipes of membrane walls. Measurement shall be performed on every second pipe, every 500 mm

- Thickness of NiCr625 cladding ≥ 1 mm on the surface of pipes of a part of the superheater No. I/2 in K2 boiler

- Fe content in the filler (Inconel (Alloy) 625, e.g. EN 2.4856 – NiCrr22Mo9Nb) ≤ 1 %

- Fe content on the surface cladded automatically < 7 %

- Fe content on the surface cladded manually < 10 %

As a part of execution of the work the Supplier shall handover to the Buyer protocols on positive results of tests, examinations or measurements.

**8.2. *Within the implementation of the work / reconstruction of boilers the Supplier shall at his own cost ensure performance of RTG tests of 10% of all welds performed –*** unless a (state) body approving the reconstruction of boilers rules in its conditions otherwise.

In case the results of RTG tests of welds will not be acceptable due to reasons on Supplier´s side the Supplier shall ensure performance of additional RTG tests (and repairs of welds) at his own costs. A need to perform additional RTG tests will not result in any change of the deadline of completion of the work.

As a part of execution of the work the Supplier shall handover to the Buyer protocols on positive results of RTG tests of welds.

**8.3. *As a part of execution of the work the Supplier will submit to the Buyer*:**

* Certificates of quality, origin, tests and materials used by the reconstruction of the heat exchanging surfaces of boilers
* Protocols on the course of individual kinds of works and completeness of works, by the reconstruction of the heat exchanging surfaces of boilers
* Protocols from all tests performed – including the unsuccessful ones, within the reconstruction of the heat exchanging surfaces
* Other authorizations, revision reports, protocols, permits, audits, approvals, certificates etc.
* Welding authorizations (licences) of welders performing reconstruction works at ZEVO.

**9. Official pressure test after repair (SPO) of K1, K2 boilers**

The buyer will ensure at his own costs a performance of a first official pressure test of the boiler after the repair (SPO).

In case this official pressure test will be unsuccessful due to reasons on Supplier´s side the Buyer will ensure a performance of another official pressure tests at the costs of the Supplier. The need to perform additional pressure test(-s) will not result in any change of the deadline of completion of the work.

**10. Requirements on compliance with technical standards and applicable legislation documents of the SR**

The work must be implemented so that it complies with all applicable Slovak legal regulations, decrees of the Government of the SR, Slovak technical standards STN EN and internal directives of the Buyer. In case foreign national legal regulations, manuals and technical standards shall be applied the Buyer must provably and in advance approve their use. For this reason the Supplier must submit to the Buyer an original text and a Slovak translation of such regulation.

**11. Requirements on content of the time schedule of the Supplier**

In this part the Supplier will present basic data on organization of the construction and installation (construction site equipment, number of employees, special arrangements), including a brief description of the installation and the time schedule of decisive deliveries and activities.

The Supplier shall submit to the Buyer (in Slovak language) for his approval a time schedule of works within 30 calendar days after signing the contract on performance of the Work.

**12. Requirements on documentation delivered by the Supplier**

Content of construction and accompanying technical documentation is determined by the Decree of the MPSVR SR (Ministry of Labour, Social Affairs and Family of the Slovak Republic No. 508/2009 Coll. in its Annex No. 2 and  3 and respective technical standards.

In order to comply with the conditions stipulated by the Decree 508/2009 Coll. we specify more precisely the scope of the technical documentation to be provided by the selected Supplier of the construction by the installation of VTZ (= classified technical equipment):

1. Authorization of organization in terms of § 15 sec. 1 of the Act No. 124/2006 Coll. on installation, reconstructions and repairs of VTZ (= classified technical equipment),
2. Certification of professional employees to perform professional inspections and professional tests, certification of employees to check welded joints,
3. Certificate of construction documentation issued by the Technical Inspection,
4. Declaration by the manufacturer on Conformity of his technical equipment with technical safety requirements,
5. Construction and pressure test of strength and tightness of connected pipelines,
6. Attestations and certificates of protecting equipment (e.g. certificate of construction documentation and Declaration of Conformity of safety valve), description of approved exemptions,
7. Attestations and technical specification of pipe components used, with the respective number of attestation,
8. Attestations of materials used, including accessory materials used for welding,
9. Documentation of welded joints, drawings with marking of welded joints,
10. Record sheets of welds, protocols on radioscopy of welded joints, protocols on visual inspection of welded joints, protocol of check of welded joints arrangement, protocol of check of observance of technological discipline,
11. List of welders who have performed welding works including type and validity date of the test, with the number of assigned welding die, certificates of official tests of the welders,
12. Welding procedures of the manufacturer, authorization/assignment of welding technologist,
13. Protocol of check of internal cleanliness of the pipeline,
14. Protocol of flushing or blowing of pipelines,
15. Protocol of completion of coatings and insulations,
16. Daily log of the course of installation works,
17. Drawings of actual implementation with dimensioning and location of all main components – red mark up, as built),
18. Time schedule of implementation of the Work,
19. Results of professional inspections and revision reports in cases determined by applicable legal regulations, especially by the Decree of the Ministry of Labour, Social Affairs and Family of the Slovak Republic No. 508/2009 Coll. laying down the details for occupational safety and health in working with pressure, lifting, electronic and gas technical equipment and specifying technical equipment considered as classified technical equipment,
20. Documentation of handling of chemical substances
21. The Supplier shall deliver technical drawings of actual implementation (red mark up, as built),

all in two (2) hard copies (i.e. paper form) and one (1) copy in electronic form [(\*.doc,\*.xls, \*.pdf – text part), (\*.dwg, \* .dgn, \*.pdf – drawings) on a CD, and/or USB key; all documents and other written material forming accompanying documentation must be provided in Slovak language and/or official translation in Slovak language.

**13. Other requirements on the Supplier**

In addition to the items indicated in the “Deliveries/Obligations of the Buyer” the following forms integral part of the delivery of the Supplier:

**13.1.** All installation mechanical equipment, instruments, tools and means, welding instruments and welding equipment necessary to complete implementation of the Work / reconstruction of the boilers to the site of implementation of the Work / reconstruction of the boilers

**13.2.** All connectingmaterial, welding and accessory (filler) materials and other auxiliary materials necessary to complete implementation of the Work / reconstruction of boilers to the site of implementation of the Work / reconstruction of the boilers

**13.3.**  Container(-s) for transport of above stated mechanical equipment and material to the site of implementation of the Work / reconstruction of the boilers and their storage on site of implementation of the Work / reconstruction of the boilers

**13.4.** All personal protective equipment of the employees of the Supplier to ensure their safety and health protection during the entire period of implementation of the Work / reconstruction of the boilers to the site of implementation of the Work / reconstruction of the boilers, at least within the scope and in terms of the Act of the NC of the SR No. 124/2006 Coll. on occupational health and safety, as amended (“Act on BOZP”) and the Decree of the government of the Slovak Republic No. 395/2006 Coll. on minimum requirements on provision and use of personal protective equipment

**13.5.** Transport of all above stated containers, mechanical equipment and materials to the site of implementation of the Work / reconstruction of the boilers

**14.** **Deliveries/Obligations of the Buyer**

1. Sanitary and cloakroom container for the staff according to the requirements of Supplier
2. Insulation works
3. Work scaffoldings
4. Cleaning of the boiler and demolition of masonry and SA 2.5 sand blasting
5. Installation of refractory lining
6. Ventilation of the boiler by artificial draught.
7. Scrap container (near boiler room)
8. Waste disposal
9. Electric power, water, compressed air for facilitation of the reconstruction
10. Technical gases available on the territory of the SR according to requirement and specification of the Supplier
11. Cooling of the walls of the boiler by feeding water
12. Pressure test (first official pressure test of boilers after repair)
13. Disassembly, assembly and restart of the burners
14. Check of pressure complex and performance of official pressure tests with participation of TISR (Technical Inspection of the SR), CiO SR
15. After-installation cleaning operations (flushing, blowing of pipes of superheaters) in cooperation and participation of the Supplier
16. Assistance by unloading of delivered components of the boiler
17. Forklift truck for moving
18. Provision of storage premises for storing of delivered parts of the membrane walls and pipes of the superheaters
19. Implementation and drying of the refractory lining

**Part III.**

**Drawings**

Drawings include:

1. Drawing of K1 boiler in longitudinal section by side view with marking of reconstructed sections Drawing No.101a.

2. Drawing of K2 boiler in longitudinal section by side view with marking of reconstructed sections Drawing No.101b

3. Partial drawings of individual parts of the boiler related to the reconstruction:

* Removal of heat insulation drawing No.102
* Demolition of lining and replacement of membrane walls drawing No.103
* Demolition of lining and replacement of membrane walls-

Front wall drawing No.104

* Inconel Cladding drawing No.105
* Reconstruction of superheater I/1, II, I/2 and EKA boiler K1 drawing No.106
* Reconstruction of superheater I/1, II, I/2 and EKA boiler K2 drawing No.107