ERS equipment reliability services inc.

Geneva Nitrogen LLC Weatherly Plant Cooler Condenser E-610	SPECIFICATION NO. 2007-11-HE-002	Page 1 of 9
	Specification for a Nitric Acid Cooler Condenser – Tube Bundle Replacement with Zirconium	

BY	APPROVED	ISSUE DATE	REV. NO.	DATE
BCS		**11/01/07**	**2**	**11//14/07**

1. SCOPE

1.1. This specification and all attachments referenced herein define the minimum requirements for the engineering, design, procurement, fabrication, testing, painting, inspection, and delivery of a replacement Cooler Condenser Tube Bundle and Shell for the Weatherly Nitric Acid Plant at Geneva Nitrogen LLC in Orem, UT. The existing 304L SS Channel heads shall be reused and shipped to the Seller by Geneva Nitrogen for hydro testing and installation. The replacement tube bundle and shell shall be in- kind except for the following:

1.1.1 The tube material shall be Zirconium SB-523 R60702

1.1.2 The tube sheets shall be SA-240 TP 304L w/ SB-551 R60702 Clad

1.1.3 The shell, expansion joint, nozzles and all attachments and support materials shall be SA-240 TP 304L.

1.2. Where discrepancies exist between this specification, the attachments listed in paragraph 2.0, the data sheets(s) and Codes (industrial, local, state and federal), the Seller shall request an interpretation by the Purchaser. Seller shall not assume which document governs.

1.3. The term Contractor, Manufacturer and/or Vendor shall be taken to mean Seller; the term Company, Owner, and/or Purchaser shall be taken to mean Geneva Nitrogen LLC.

1.4. It is the Vendor's responsibility to identify every item in this specification, and all attachments, with which the Vendor takes exception. Failure to take specific exception to an item will be taken as agreement to that item.

2. ATTACHMENTS

2.1. E610 Process Conditions. JPG

2.2. 122-1214 Weatherly Acid Plant Cooler Condenser. PDF

2.3. 122-1212 Weatherly Acid Plant Heat Exchanger Tube Layout. PDF

2.4. E610 U-1 Form Sheet 1.JPG

2.5. E610 U-1 Form Sheet 2.JPG

2.6. E-15347 Cooler Condenser. PDF

2.7. E610 Data Plate. PDF

2.8. E610 Original Data Sheet. PDF

3. REFERENCES

3.1. ASME Section VIII Division 1, “Boiler and Pressure Vessel Code”, current edition including latest addenda.

3.2. TEMA Standard – Tubular Exchanger Manufacturers Association, eighth edition

3.3. API 660/ISO 16812 Shell and Tube Exchanger Data Sheets or equal

4. WORK INCLUDED

4.1. Replacement Tube Bundle and Shell design and fabrication including Thermal and Mechanical Rating to replace the existing tube bundle with Zirconium tubes and 304L/Zirconium clad tube sheets and replacement of shell and expansion joint for 304L material.

4.2. Rerating of tube side to 150 psig, including calculations and testing for the supplied channel heads.

4.3. Installation of all internal parts including tubes, baffles, tubesheets, etc..

4.4. Inspection and all required non-destructive examinations (NDE).

4.5. Assembly of new tube bundle and new shell with existing channel heads. The assembly is to include new bolting and gaskets.

4.6. Hydrostatic Testing as required, including rerate requirements for the existing channel heads.

4.7. Shipping of assembled Condenser to Geneva Nitrogen. Shipment to include a spare set of channel head gaskets.

4.8. Vendor data and other technical information required by specification. To include an electronic copy of all data. Includes a completed data sheet with all thermal, process, and mechanical data.

5. WORK EXCLUDED

5.1. Fabrication of a new channel heads.

5.2. Shipment of existing channel heads to Fabricator’s facility

6. SCOPE OF WORK AND GENERAL REQUIREMENTS

6.1. The Vendor shall provide a proposal to replace the Nitric Acid Cooler Condenser Tube Bundle and shell per the attached fabrication drawings. The Vendor shall provide proposals as follows:

6.1.1. Shop fabricated “in kind” per the attached fabrication drawings except for the following:

6.1.1.1. Tube side design pressure shall be 150 psig.

6.1.1.2. The tube side rerate shall include any rerate requirements for the condenser heads and flanges. Calculations shall be provided to the Purchaser for approval.

6.1.1.3. Tubes shall be Zirconium SB-523 R60702- 3/4" OD by 0.065" wall thickness. Unless the design by the Vendor proposes a different wall thickness.

6.1.1.4. The tube sheets shall be SA-240 TP 304L w/ SB-551 R60702 Clad. Tube sheet thickness shall be based on the tube side design of 150 psig and the current ASME code.

6.1.1.5. The shell shall be SA-240 TP 304L, including all nozzles, supports, and attachments.

6.1.1.6. The shell expansion joint shall be as required by the mechanical design and shall be SA-240 TP 304L or other alloy compatible with nitric acid.

6.2. The heat transfer shall be calculated and indicated on the Vendor supplied data sheet along with all applicable process data, including fouling factors, pressure drop, minimum velocities, and acceptable flux rate.

6.3. Acoustical and flow induced vibrations shall be analyzed. Results shall be provided to the Purchaser for review.

6.4. The Vendor shall provide other design alternatives including material considerations for Cooler Condensers in Nitric Acid Plant service.

6.5. This exchanger shall be engineered, designed, fabricated, tested, inspected, and stamped in accordance with the ASME Section VIII Division 1, "Boiler & Pressure Vessel Code", latest edition including the latest addenda.

6.6. The Critical Exposure Temperature (C.E.T.) is -20°F. The Minimum Design Metal Temperature (MDMT) shall not be greater than the CET.

6.7. The exchanger shall be stamped for the calculated Maximum Allowable Working Pressure (MAWP). The MAWP shall not be limited by nozzle wall thickness, nozzle reinforcement, or supports attached to the shell (i.e. saddles, legs, etc.). The design pressure shall be applied at the highest point in the exchanger and shall include the static head of liquid as shown on Purchaser's drawings with a specific gravity of 1.0.The limiting component shall be determined and clearly noted on seller's drawing and calculations.

6.8. If there is no external design pressure shown on Purchaser's drawings, the Seller shall calculate the maximum allowable vacuum rating at 500°F and stamp the nameplate with this vacuum rating.

6.9. Seller shall calculate and show the fabricated weight of the exchanger (shell, tube bundle, heads, and assembled) on the fabrication drawings.

6.10. Lifting lugs shall be provided for the shell, channel heads, and all removable items required for maintenance.

6.11. Tube sheet cladding procedures shall be reviewed and approved by the Purchaser prior to fabrication. Discussion with the Fabricator may warrant additional NDE.

6.12. The minimum thickness of cladding on tube sheets shall be 3/8”.

6.13. Nozzles:

6.13.1. Flanged nozzles shall be raised face weld neck per ANSI B16.5.

6.13.2. Nozzles shall be of the same nominal composition as the exchanger shell and heads with minimum thicknesses as shown on the Purchaser’s drawings and shall be of seamless construction. If nozzle necks are fabricated from rolled plate, the long seam shall be 100% RT NDE.

6.13.3. All flanged connections shall have bolt holes straddling normal exchanger centerlines. Bolt holes for flanged connections on exchanger heads shall straddle the 0°-180° centerline of the head.

6.13.4. All nozzle inside projections shall be ground flush with the inside surface of the shell or head except where the nozzle is attached to an internal pipe. Flush nozzles up to and including 2” NPS shall have a 1/8” radius on the inside corner. Flush nozzles 3” NPS and larger shall have a 1/4”.

6.13.5. Nozzle reinforcing pads shall be of the same grade material as the exchanger shell or head.

6.13.5.1. All nozzles shall be calculated for reinforcement per the ASME Code rules with the additional requirement that no credit shall be taken for excess area in the exchanger wall and internal projection of nozzle necks (i.e., A1=0, A3=0). ASME Code exemptions for calculating reinforcement may be taken for 2” and 3” NPS nozzles.

6.13.6. Tapped tell-tale holes of 1/4" IPS shall be provided as follows for all reinforcing pads:

6.13.6.1. One hole in all reinforcing pads around openings up to 12" nominal pipe size.

6.13.6.2. Two holes in all pads around openings 12" and larger, spaced 180° apart.

6.13.6.3. One hole in each section of split reinforcement pads.

6.13.7. Exchanger design calculations package shall include a WRC-107 calculation for each process nozzle indicating the maximum loadings.

6.13.8. Stress in any part of the exchanger, including flanges and bolts resulting from hydrostatic test pressure, shall not exceed 0.9 times the minimum yield stress at 100ºF.

6.13.9. Provisions to allow for shell movement due to thermal expansion shall be incorporated in the supports and identified on the drawings. The predicted movement and direction shall be clearly identified.

6.13.10. Due to the fixed tube sheet design with Zirconium tubes, 304L/Zr clad tube sheet, and 304LSS shell, the exchanger stresses and the design of the shell expansion joint are critical. A thorough review of the design shall be required between the Purchaser and the Fabricator prior to beginning fabrication.

6.13.11. Test gaskets for shop fabricated flanges and all flanges larger than 18" shall be of the same size, material and type as those specified for the operating conditions.

6.14. Fabrication, Welding and Radiography

6.14.1. Surfaces exposed to exchanger contents, its vapor, or condensate, shall be free of gouges, deep scratches, pits, cracks or other surface defects. Seller shall avoid crevices, holes, pockets, weld craters, depressions, etc.

6.14.2. Only welders qualified in accordance with the requirements of Section IX of the ASME Code shall be employed for fabrication of any portion of the exchanger including attachments and supports.

6.14.3. Seller shall provide a weld procedure map identifying the type, size, and location. Weld maps shall be submitted to the Purchaser for approval a minimum of two (2) weeks prior to the start of fabrication along with the applicable WPS's and PQR's.

6.14.4. Clad overlay procedures shall be provided for review and approval.

6.14.5. Spot radiography to obtain a joint efficiency of 85% is the minimum requirement for all exchangers. Note: As an option, Seller may elect to perform 100% RT NDE and take credit for 100% joint efficiency provided the material thicknesses are per the ASME Code and Purchaser's specifications where applicable.

6.14.6. Location of spot RT will be selected by the Purchaser's inspector or by the Code authorized inspector. All RT NDE shall meet ASME Code requirements.

6.14.7. Tube to tube sheet joints shall be per a qualified procedure. The Fabricator shall provide a tube to tube sheet joint procedure for review and approval by Geneva Nitrogen.

6.14.8. Tubes and tube holes shall be cleaned with an abrasive pad and wiped with solvent to remove all dirt, debris, and oil residue.

6.14.9. Tube walls shall be limited to a 3-5% reduction in the tube wall thickness after expansion of the tube into the tube hole is completed.

6.14.10. Tube wall reduction calculations are required on the first five (5) tubes and a random check of 10% of the total tubes. Documentation of tube wall reduction testing is required.

7. INSPECTION AND TESTING

7.1. Supplemental inspection shall be made by a representative of the Purchaser whose decision as to rejection of material or workmanship for non-compliance with this specification and/or purchase order requirements shall be final. Acceptance by the Purchaser's representative will not relieve the Seller of his responsibility for workmanship and materials conforming to this specification. Compliance with this specification shall not relieve the Seller of his responsibility to follow sound engineering and design practice throughout.

7.2. Fabricator inspection shall be performed per an inspection and test plan provided by the fabricator.

7.3. The Purchaser requests inspection hold points at:

7.3.1. Tube to tube sheet welding

7.3.2. Bundle insertion

7.3.3. Hydro test

7.4. Hydrostatic Testing Procedure

7.4.1. The water used for hydrostatic testing shall be clean tap water with chloride content not to exceed 150 ppm. Following the hydrotest, the water shall be drained and the exchanger dried.

7.4.2. All hydrostatic tests shall be made in the presence of an authorized inspector and with his approval. Exchangers shall not be pre-tested by Seller.

7.4.3. All welded attachments provided with tell-tale holes shall be pneumatically tested with 15 psig air and soap suds examined prior to thermal stress relief and/or hydrostatic test of the exchanger.

7.4.4. The Seller shall hydrostatically test this exchanger in accordance with ASME Section VIII Division 1. Calculations shall be developed and submitted to the purchaser for review/approval to verify that no part of the exchanger will be stressed beyond 90% of the yield strength of the material used.

7.4.5. Prior to hydrostatic testing, all flange bolts for blinded nozzles shall be lubricated with a high temperature thread lubricant such as FEL-PRO C-102.

7.5. Positive Material Identification (PMI) shall be provided for exchangers made of all metallic alloy materials. Carbon content must be verified during PMI check for all “L” grade stainless steels. Non-pressure alloy components shall be PMI checked using ID mode only. Studs and nuts are exempt from PMI provided proper MTR verification is available.

7.6. Tubes shall be 100% eddy current tested.

7.7. Tube sheets shall be ultrasonically tested for any imperfections (cracks etc.) after forming prior to drilling of tube holes.

7.8. All tube to tubesheet welds shall be Dye Penetrant Tested after welding to check for any surface imperfections

7.9. Weld overlay shall be 100% examined by UT for bond integrity in accordance with ASME SA 578-S7. Explosive bond clad overlaid tube sheets shall be examined before and after Hydrotest.

8. VENDOR DATA REQUIREMENTS

8.1. Required vendor drawing and data requirements include three (3) copies of all fabrication drawings, ASME Code data, MTR's, NDE reports, PWHT charts, WPS/PQR, and Hydrotest Certification.

8.2. A completed data sheet equal to API 660 shall be provided.

8.3. The vendor shall submit with the proposal a production schedule showing the target dates for all deliverables (i.e. approval drawings, certified drawings, etc.).

8.4. A nameplate constructed of a 300 series stainless steel material shall be provided and mounted conspicuously on each unit. The nameplate shall give the following information. The information shall be stamped with 1/4" high letters.

8.4.1. Manufacturer's Name/Location.

8.4.2. All required ASME Section VIII Code Information not mentioned herein.

8.4.3. MAWP/External Design Pressure/MDMT/Design Temperature.

8.4.4. Hydrotest Pressure - Field/Shop - if applicable.

8.4.5. Purchaser's Equipment Number, Purchase Order Number

8.4.6. Year Built Manufacturer's Serial Number and National Board Registration Number.

9. PREPARATION FOR SHIPMENT

9.1. Water, oil, or other liquids used for hydrostatic testing and cleaning shall be drained from all units. All units shall be dried before packing. Internal and external surfaces are to be free from loose scale and other foreign material. All openings shall be covered securely with blind flanges or plugs of suitable design, and the unit shall be made airtight. All units shall be carefully boxed or braced to prevent damage during shipment. The purchase order number and exchanger identification number shall be prominently marked with paint in legible block letters (at least 3 inches high) on the side of the exchanger.

9.1.1. All carbon steel and low alloy steel bolting shall be lubricated with FEL-PRO C-102 or JET LUB SS-30.

9.1.2. All machined surfaces (such as flange faces, etc.) shall be coated with an easily removable rust preventative such as RUST BAN 326.

9.2. Equipment item number and shipping weight shall be painted on appropriate end of exchanger.

9.3. If special handling in the moving of a exchanger is required, lift points and/or any special instructions deemed necessary shall be clearly marked in the exchanger with paint in letters at least two (2) inches high, such as: “Post Weld Heat Treated, No Welding Permitted”.

10. INFORMATION REQUIRED WITH PROPOSAL

10.1. Proposal to be sent to:

10.1.1. Geneva Nitrogen LLC
1165 North 1600 West
Vineyard, Utah 84057
Attn: Steve Olsen
Technical Manager
solsen@gninc.net

10.2. Unless Seller takes particular exception to the bid documents, conformance is implied and will be enforced. Alternate proposals will be permitted and encouraged; however, alternate proposals shall be submitted in addition to proposals meeting all requirements of this specification. Alternate proposals will be acceptable provided the main intent of this specification is satisfied and deviations clearly stated in the proposal.

10.3. Proposal
Seller’s proposal shall include the following information:

10.3.1. Cost of Fabrication and delivery.

10.3.2. Thermal and Mechanical calculations required to confirm the Shell and Tube Specification design shall be submitted with the proposal.

10.3.3. Number of weeks after Seller receives purchase order to deliver approval drawing(s) to Purchaser.

10.3.4. Number of weeks after Seller receives approval drawing(s) to deliver equipment to Purchaser's facility.

10.3.5. Full description of any deviation from or exception to this specification.

10.3.6. Furnish the required number of drawings or cut sheets.

10.3.7. List of materials and equipment furnished including necessary special installation and maintenance tools.

10.3.8. Proposed arrangement drawings with dimensions:

- General layout.
- Thicknesses of all components.
- Erection weight.