

Proposal for:

The Trane Company

Ingersoll Rand
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Clarksville, TN 37040
850-890-8002 Mobile

Coil Auto Braze System

Proposal # 986

9/1/2017

*Prepared for
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- **Overview**

Design and build of an Automated Coil Brazing Line. Depending on Options taken, this line may incorporate the following:

1. Horizontal to Vertical Load/Unload Lift Stations
2. Optional Bar Code Scanner to Select Coil Program and Adjust Conveyor and Burners
3. Optional automatic burner alignment up/down, in/out, rotate
4. Mass flow meters are standard but optional Waukee Valve-Tronic electronic flow controllers with visual calibrated gauges
5. Operator-attached Nitrogen Purge System
6. Four Adjustable Braze Manifolds with Independent Combustion Systems and Gasflux Units
7. Air-drawn Part Cooling System
8. Continuous belt conveyor system
9. Optional Mezzanine for Operator Circuiting Process
10. Optional Freight FOB Trane, Clarksville, TN
11. Unloading, placement and utility connection of machine not quoted.

- **Conveyorized Coil Brazing System** – designed to braze coils with the following specifications:

- Coil height (header to header) 100" – 120"
- Number of rows wide (staggered) 2 – 6 rows
- Machine length 20 feet plus load and unload stations
- Machine width 12 feet (estimated) depending on options
- Machine height 18 feet (estimated)
- Ceiling height required 25 feet (estimated)
- Allen Bradley control interface with messaging

- **The Machine Specifications are as follows:**

- **Conveyor and Base Frame** - Our standard design consists of stainless steel inline belt conveyor and heavy duty welded steel base frame. Conveyor speed is variable from 0 - 18 feet per minute, but typical brazing speeds are between 6-16 feet per minute. The combustion zone is surrounded by a stainless steel shrouding to contain the heat, noise and gases. This provides for operator comfort and safety and assures a consistent brazing environment. Large windows on both sides of braze zone allow for close inspection of brazing process in real time. A stainless steel vent hood is mounted on top of the shrouding and incorporates a 14 inch diameter flange connection for easy coupling to exhaust ducting. The customer must provide exhaust ducting and a temperature rated exhaust blower at 2,500 cubic feet per minute (71 cubic meters per minute).
- **Cross Fire System** – This combustion system is a gas/air venturi system capable of operating with natural gas (CH₄) or propane (C₃H₈). The heating chamber for the combustion system is 5 feet long and contains 4 crossfire burner manifolds with AB189 tips capable of producing approximately 2,000,000 BTU's of heat output per hour. Several safety devices are included in the system to assure safe, trouble-free operation.

The fuel gas train includes gas/pressure interlocks and a purging system to prevent a hazardous buildup of combustion gases during machine startup and shutdown.

The combustion zone is surrounded by a stainless steel shrouding to contain the heat, noise and gases. This provides for operator comfort and safety and assures a consistent brazing environment.

A stainless steel vent hood is mounted on top of the shrouding and incorporates a 14 inch diameter flange connection for easy coupling to exhaust ducting. The customer must provide exhaust ducting and an exhaust blower rated at 2,500 cubic feet per minute (71 cubic meters per minute).

Horizontal (in and out) positioning of the burner manifolds is accomplished using hand cranks.

An automatic high-low heat feature is provided. When a coil is about to enter the heating chamber, an electronic device senses its presence and automatically changes the burner manifold from a pilot flame to high heat for a pre-determined amount of time. Conversely, when no coils are present, the burner manifolds are returned to a pilot flame which decreases gas consumption.

The coil is lifted into position. The combustion system goes to high heat and the coil moves along the conveyor through the braze and cooling sections. Once complete, the system returns to pilot heat and the coil is then returned to the horizontal position.

- **Safety Systems** - Several safety devices are included in the system to assure safe, trouble-free operation like UV flame sensors and stack vacuum proof switches.
 - The fuel gas train includes gas/pressure interlocks and a purging system to prevent a hazardous buildup of combustion gases during machine startup and shutdown.
 - Emergency stops are located within easy reach of the operators. When engaged, the conveyor is stopped and gas flow is shut off from the burner manifolds. With the internal combustion air generators remain "on" to purge the system of any fuel gas remaining in the system.
 - All equipment conforms to appropriate United States safety and electrical standards, (i.e. OSHA , JIC, and NFPA 86 2011 standards).
 - Necessary perimeter and point of operation guarding to allow safe operation of the machine will be supplied. These items will be covered in design reviews prior to build of the machine. Any additional requirements identified after the build of the machine become the responsibility of the customer or will be subject to additional charges. Customers requiring CSA and CE marking are responsible for any added importation and certification costs.
- **Control System** - Machine to operate on 480 volts, 3 phase 60 cycle electrical power. We can also accommodate lower voltages.
 - The Control System will contain an Allen-Bradley ControLogix PLC with a single 10" Panelview Plus HMI. All conveyor and gas blower systems will be controlled by Allen-Bradley VFD systems.
 - An automatic high-low heat feature is provided. When a coil is about to enter the heating chamber, an electronic device senses its presence and automatically changes the burner manifold from a pilot flame to high heat for a pre-determined amount of time. Conversely, when no coils are present, the burner manifolds are returned to a pilot flame which decreases gas consumption.
 - The gas system output will be controllable through the PLC by varying each systems blower speed and gas mixture. A mass flow controller will be used to control the combustion gas mixture.

- The control system will be a recipe-based system capable of storing the appropriate variables for up to 50 different recipes. The operator will be responsible for selecting the correct recipe.

- **Machine Paint**

Paint shall be Sherwin-Williams. Paint Colors and designations are specified below:

- Base Equipment – Machine Blue – RAL 5015
- Safety Guarding – Stationary Safety Yellow – RAL 1018
- Safety Guarding – Moving Safety Orange – RAL 2004
- Electrical/Control Cabinets Safety Orange – RAL 2004

- **Machine Runoff**

The machine will be setup and tested at Lean Engineering. A representative from Customer must be present for the runoff. The runoff will consist of the following:

- All machine functions will be demonstrated.
- Machine startup & shut down
- Machine will be cycled for about 4 hours.

Any changes to the machine or to the machine cycle must be addressed during runoff. Lean Engineering will need approximately one week to prepare the equipment for shipping.

- **Machine Documentation**

Lean Engineering will provide Customer with one complete copy of the machine manual. Lean Engineering will also provide a single electronic copy of the manual that will include the following:

- Machine Assembly Drawings with Bills of Materials
- Electrical Schematics
- Utility Schematics
- Copy of machine program
- Operator interface runtime program
- Operator interface Development data
- Preventive maintenance schedule
- 1 CD containing all of the above

- **Installation and Training**

The unloading, placement and utility connection of the machine is not quoted. It will be the Customer's responsibility to contract with contractors (riggers, electricians, plumbers and building contractors) with knowledge of local building codes and procedures to unload and place the machine, bring utilities (gas, air, power, etc.) to the machine, install an exhaust fan on the roof and ductwork to the machine.

Lean Engineering will provide a representative for 3 - 5 days training covering 3 shifts once the equipment is installed and accepted.

PRICING

Design, build, and runoff Coil Auto Braze System: \$147,000

Note: Price does not include State and Local Taxes if applicable.

- **Options**

- **Horizontal to Vertical Load Lift Station** – includes additional conveyor – 2 needed **75,000 each**
- **Optional Forced Air Cooling Station** - This option consists of an integrated air blower that pulls air past the finished brazed joints and the top 4 inches of the fin pack. This allows for fast and efficient cooling of the coils so that they can be safely handled at the discharge end of the brazing line, and also minimizes the emission of fumes. **\$25,000**
- **Core Height Sensor** - This option is for a simple height sensor that consists of a hinged plate that is flipped over onto the flares in the pinning area. It has three positions (too low=red light, too high=yellow light, middle position=green light) the operator is only required to verify the core is in the green light zone before pinning. **\$3,500**
- **Optional Bar Code Scanner to Select Coil Program and Adjust Conveyor and Burners** **\$5,000**

- **Automatic Burner Alignment** – includes motorized adjustment of burners by recipe number **\$50,000**
- **Optional Waukee Valve-Tronic Electronic Flow Controller for each Combustion System** **\$25,000**
- **Optional Mezzanine for Operator Circuiting Process** **TBD**
- **Freight FOB Trane, Clarksville, TN** **4,200**

Delivery: 18 weeks depending on options taken after customer Design Approval and payment

Shipping F.O.B. Port Orange, FL

Payment Terms:

20% down with purchase order*

30% Upon Design Approval*

30% Upon completion of runoff at Lean Engineering, Inc.*

20% Following Installation and runoff at Lean Engineering, inc.*

*Subject to Trane's 75 day invoicing policy

The above pricing is subject to Lean Engineering, Inc. Standard Terms & Conditions.

TERMS AND CONDITIONS

1. Price; Shipping; Cancellation. Prices are subject to change by Seller without notice. Increases in labor, freight and material costs before delivery of the goods or completion of the services, plus applicable overhead, may be invoiced to Buyer. Premium time as required by Buyer will be invoiced as an additional item. Unless otherwise specified in Seller's Terms, all payments are due upon receipt of invoice. Late payments will be subject to finance charges. Buyer shall be liable to Seller for all costs of collection including attorney's fees. All taxes and other charges imposed by local, state, federal, or foreign governments or taxing authorities on the manufacture, sale, shipment, import, export or use of the goods or services (other than Seller's incomes taxes) shall be paid by Buyer. Unless otherwise specified in Seller's Terms, all deliveries are FOB point of shipment, which will be made in accordance with Seller's instructions. Upon delivery of goods to Customer, all risk of loss and damage shall pass to Buyer. All shipping dates are approximate. Seller may ship and invoice for a quantity of up to 10 percent over or under the quantity requested. Buyer agrees to accept and pay for such quantity, and Seller's performance shall be deemed complete. Partial deliveries shall be accepted and paid for by Buyer at agreed prices and in accordance with Seller's Terms. Buyer may cancel this agreement only upon written notice to Seller and payment of all reasonable cancellation charges including, without limitation, (a) the price for goods and services completed prior to Seller's receipt of such notice; (b) all costs previously incurred in connection with uncompleted goods or services together with reasonable profit thereon; and (c) the expenses incurred by Seller by reason of such cancellation. No goods will be accepted for return without a returned materials authorization from Seller. Shipping of returns to be paid by Buyer.
2. Change Orders. Buyer may from time to time request modifications to the description of goods and services (or related specifications, if any) on the front side of this agreement. If Seller agrees to such modifications, the parties shall both execute a written change order detailing the modifications and any related changes to fees and charges (including, without limitation, for expenses incurred by Seller in conforming its performance to the modified description of goods and services). Except as expressly stated in the change order, all other terms and conditions of this agreement shall remain in full force and effect.
3. Seller's Proprietary Rights. All drawings, works of authorship, trade secrets, inventions, improvements or other items made or developed by or for Seller in connection with the performance of its obligations hereunder (the "Works") shall be Seller's property. Buyer hereby assigns all right and title in and to such Works to Seller. Buyer shall not use or disclose any of Seller's trade secrets or other confidential information, whether or not designated as such, except as required in connection with the use of the goods or services covered hereunder.
4. Buyer's Materials. All of Buyer's tooling, goods, raw materials and other property in Seller's possession (the "Materials") shall be fully insured by Buyer, and Buyer releases Seller from all liability for loss or damage to such materials caused by Seller's negligence or otherwise. At any time after three months following completion of this order, Seller may use or dispose of the Materials without notice or liability to Buyer and without having to reimburse Buyer for the Materials. Buyer shall be deemed to have approved any engineering or other specifications provided by Buyer to Seller.
5. Force Majeure. Seller shall not be liable for any default or delay in performance of its obligations under this agreement to the extent such default or delay is attributable to events beyond the reasonable control of Seller. Such events shall include acts of God, fires, explosions, accidents, unusually severe weather conditions, embargoes, wars (declared or undeclared), acts of terrorism, riots, labor disputes, strikes, governmental requirements, shortages of raw materials or labor, transportation delays, and any other similar or different contingencies. In any such event Seller may, without further liability to Buyer: (a) postpone performance; (b) make partial performance, or cancel all or any portion of this agreement; or (c) allocate available quantities among its customers as Seller deems appropriate. Cancellation of any part of this agreement shall not affect Buyer's duty to pay for performance of any other part hereof.
6. Warranty. Seller warrants to Buyer that the goods and services provided under this agreement shall conform with Seller's published or applicable specifications for a period of 30 days from Seller's shipment of the goods and/or provision of the services, as applicable; provided, however, that the foregoing warranties shall not apply if Buyer misuses or mistreats such goods or services. Buyer's sole remedy for a breach of the foregoing warranties, and Seller's sole obligation, shall be for Seller to repair or replace the non-conforming goods, or reperform the services, at no additional cost to Buyer, or, at Seller's option, to refund to Buyer the amounts paid by Buyer for such goods or services. The warranties contained shall only apply if Buyer notifies Seller in writing of any breach of warranty within 30 days after the goods were delivered or the services performed. In addition, any services or goods furnished by Seller's suppliers or subcontractors are warranted only by such supplier or subcontractor. EXCEPT AS SET FORTH ABOVE, THE GOODS OR SERVICES PROVIDED HEREUNDER ARE PROVIDED ON AN "AS IS" BASIS. SELLER HEREBY DISCLAIMS ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, PERFORMANCE, OR FITNESS FOR A PARTICULAR PURPOSE. ANY ADVICE OR ASSISTANCE PROVIDED BY SELLER IS PROVIDED ON AN "AS IS" BASIS, AND SELLER DISCLAIMS ALL REPRESENTATIONS OR WARRANTIES REGARDING SUCH ADVICE OR ASSISTANCE.
7. Limitations of Liability. IN NO EVENT SHALL SELLER OR ITS AFFILIATES BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA OR BUSINESS INFORMATION AND THE LIKE), WHETHER IN AN ACTION BASED IN CONTRACT, TORT OR OTHERWISE, ARISING OUT OF OR IN CONNECTION WITH THIS AGREEMENT OR ANY PRODUCTS OR SERVICES PROVIDED IN CONNECTION HERewith. IN NO EVENT SHALL SELLER'S OR ITS AFFILIATES TOTAL LIABILITY TO BUYER EXCEED THE AMOUNTS PAID BY BUYER HEREUNDER. ANY ACTION FOR ANY LOSS OR DAMAGE WITH RESPECT TO THE GOODS OR SERVICES COVERED HEREUNDER MUST BE COMMENCED BY BUYER WITHIN ONE YEAR AFTER THE FIRST INCIDENT GIVING RISE TO SUCH ACTION. THE FOREGOING LIMITATIONS OF LIABILITY ARE INTENDED TO BE INDEPENDENT OF ANY EXCLUSIVE REMEDIES AVAILABLE UNDER THIS AGREEMENT, INCLUDING ANY FAILURE OF SUCH REMEDIES TO ACHIEVE THEIR ESSENTIAL PURPOSE.

8. Indemnification. Buyer shall defend, indemnify and hold Seller and its affiliates harmless from any and all loss or damage sustained by Seller and from and against all claims asserted against Seller with respect to the goods or services covered hereunder arising in whole or in part out of (a) failure of Buyer, its agents, employees, or customers to follow specifications, instructions, warnings or recommendations furnished by Seller or others; (b) failure of Buyer, its agents, employees or customers to comply with all applicable legal requirements; (c) misuse of the goods by Buyer, its agents, employees or customers; (d) misrepresentation by Buyer, its agents, employees or customers; (e) the sole or contributing negligence of Buyer, its agents, employees or customers; or, (f) alleged infringement of any patent, trademark, trade secret, copyright, or other intellectual property or proprietary right of Buyer or a third party as a result of Seller's performance in accordance with Buyer's designs, plans or specifications. Buyer hereby waives and releases Seller and its affiliates from all rights of contribution or indemnity to which it may otherwise be entitled.

9. Security Interest. To secure payment of all sums due Seller hereunder, Seller retains a security interest in the goods delivered hereunder and this agreement shall be deemed a "Security Agreement" under the Uniform Commercial Code. Buyer authorizes Seller as its attorney-in-fact to execute and file on Buyer's behalf all documents, including financing statements, Seller deems appropriate to perfect such security interest. Title to the goods covered hereby shall remain in Seller until full payment is received by Seller. Buyer represents that it is solvent and an ongoing concern. If Seller at any time believes (a) Buyer's credit is impaired, (b) Buyer is insolvent, or (c) that Buyer is otherwise no longer a viable on-going concern, Buyer shall be deemed to be in material breach hereof and Seller may, without liability to Buyer, withhold its performance hereunder, change the payment terms, and/or repossess goods or services previously delivered.

10. Miscellaneous. This document constitutes the entire agreement between Buyer and Seller relating to the goods and services covered hereunder. No modifications shall be binding upon the Seller unless in a writing signed by Seller's duly authorized representative. In making and performing this agreement, the parties hereto are acting and shall act as independent contractors. No waiver by Seller of default by Buyer shall be deemed a waiver of any subsequent default. This agreement is made and shall be governed by and construed in accordance with the law of the State of Illinois without regard to its provisions governing conflicts of law. The parties agree that the provisions of the United Nations Convention on Contracts for the International Sale of Goods shall not apply to this agreement.

Lean Engineering, Inc.