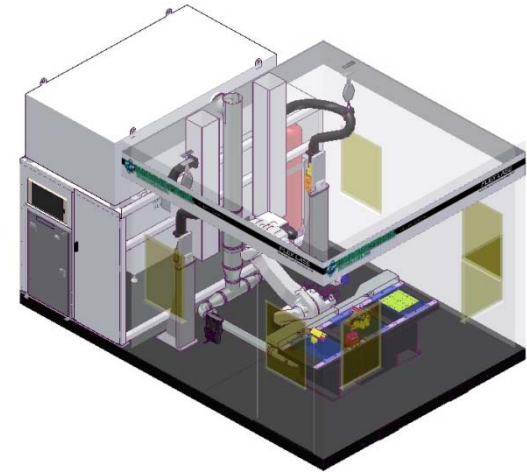


FLEX LASE - system references and overview



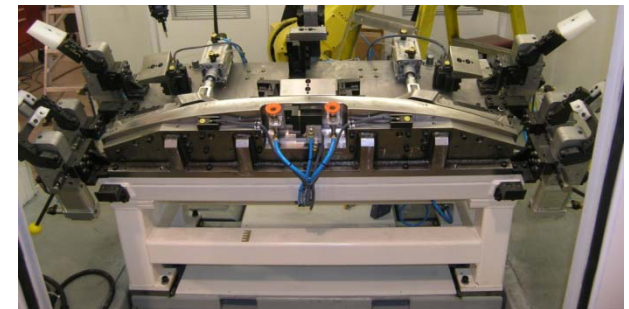
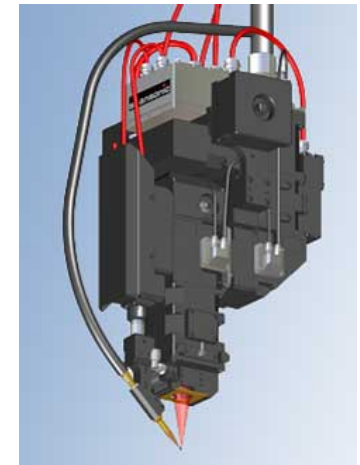
FLEX LASE: a universal, multi-axis laser processing cell



This FLEX LASE system is equipped with a 6 axis robot that carries one of multiple laser focus heads specific for welding, cutting, brazing, cladding or marking – depending on the process required. Laser welding processes and focus heads available include static and dynamic scanning design. Focus heads are stored in holster stands and are automatically picked up by the robot in a programmable quick-change mode. A beam switch in the on-board fiber laser directs a beam to the focus heads used during processing. Laser cutting, remote welding and marking can be accomplished in the same production cycle without set up or alignment.

Automotive

Laser Brazing



This FLEX LASE system is dedicated to laser brazing of automotive body-in-white components. The system is designed for manual material handling as components are loaded into dedicated fixturing thru dual sliding access doors. Within the work cell, a 6 axis robot carries a laser brazing focus head, a model AL03 from Scansonic with tactile feedback for precision guidance of the process, a 4kW fiber laser and custom fixturing.

Nuclear component welding



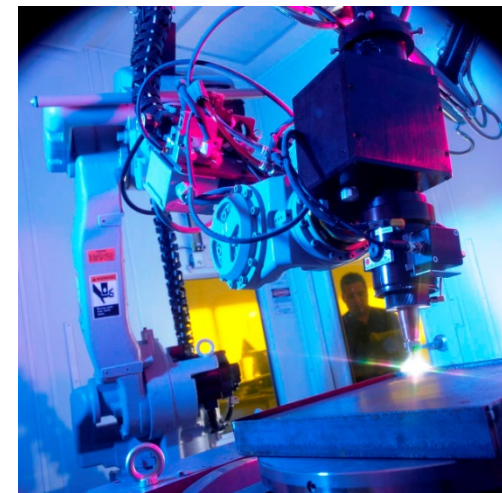
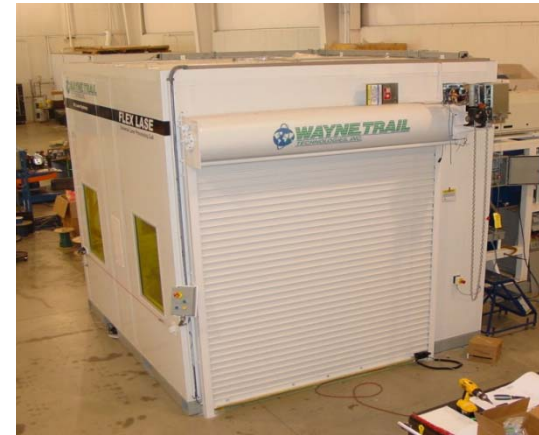
Laser Welding



This FLEX LASE system is equipped with a 2kW fiber laser. The integrated 7 axis system includes a 6 axis robot that carries a remote focus head and a 7th (aux) axis rotary fixture with integrated quick-change tooling for multiple parts designs. A family of fixturing and tooling assemblies were provided to handle the various sizes of nuclear waste containers and other components to be manufactured. The system features an automated sliding door for easy operator access and an automatic beam power checking system.

Aerospace

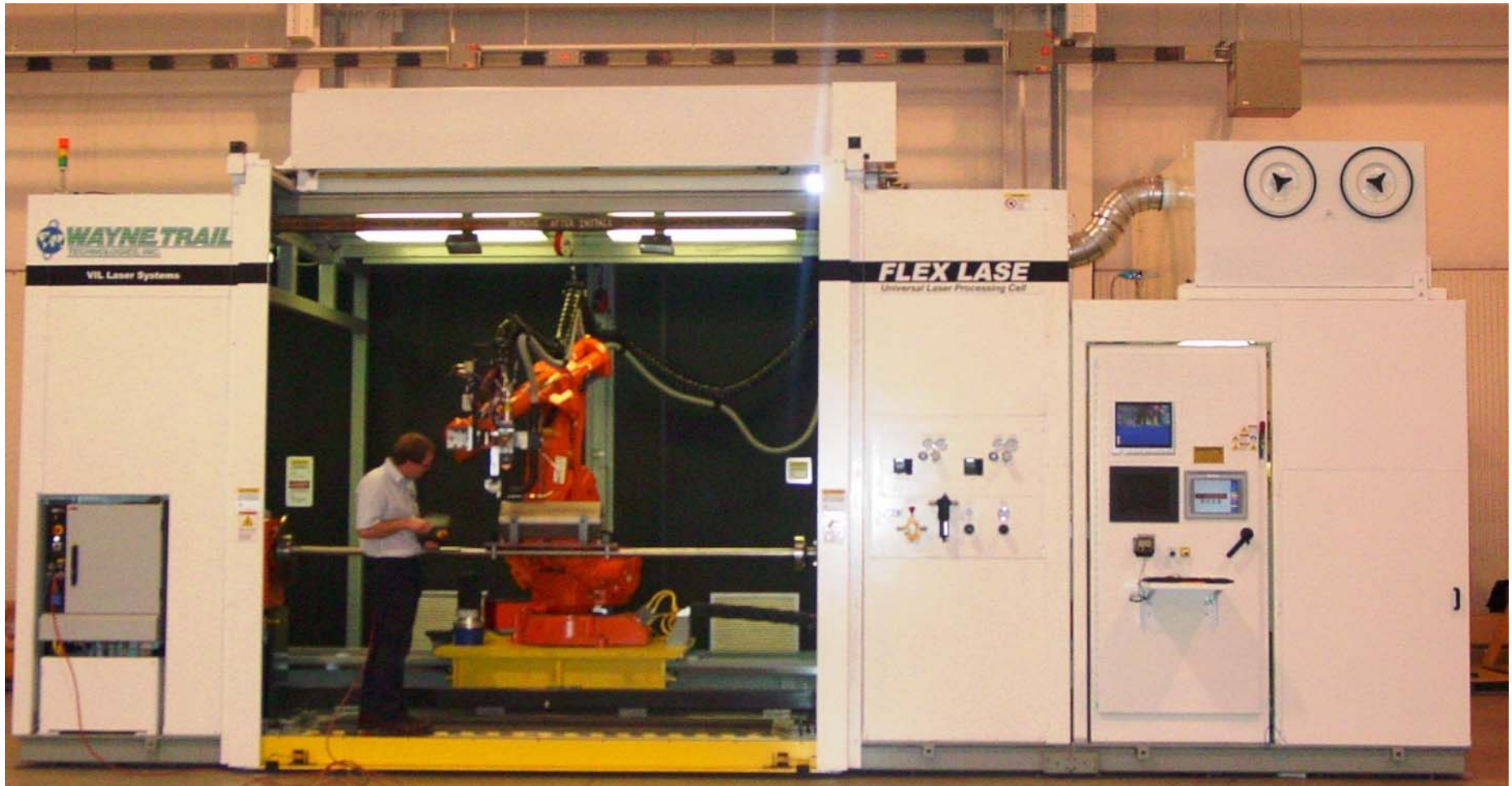
Laser Cladding and Cutting



This laser cladding and cutting cell is built within the footprint of a standard FLEX LASE design. This particular unit is equipped with a customer specified CO2 laser. Accordingly, the beam path is mirror based and is contained within an articulated arm connected to the robot. A servo controlled rotary positioner is provided to properly orient the parts during processing. A raised floor with grate-type top is supplied to help collect excess cladding power or debris from the cutting operation. Clean out drawers are provided.

Nuclear reactor component welding

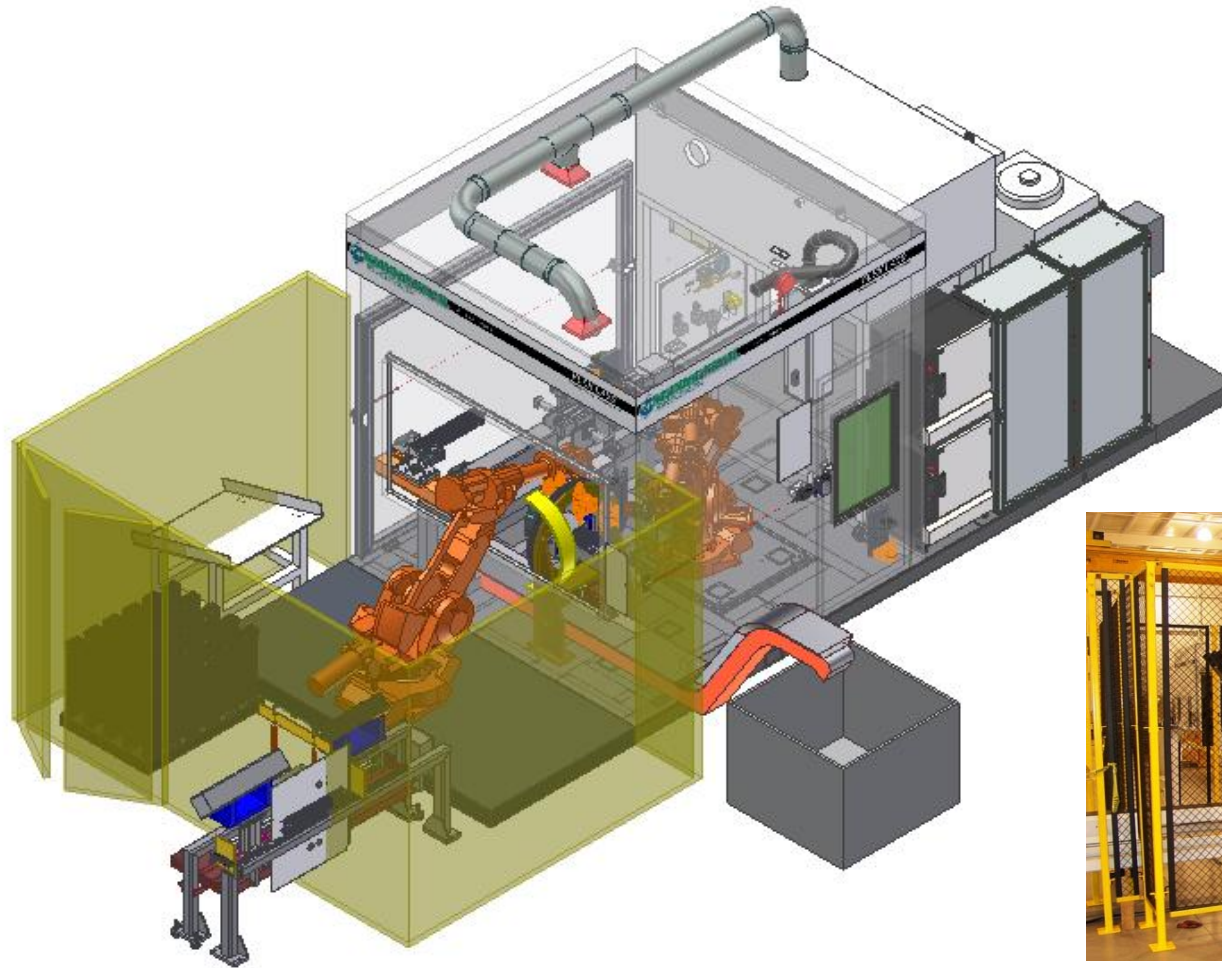
Laser Welding



Custom designed FLEX LASE system serving the nuclear industry features robust construction and easy access for overhead crane material handling. The system is designed to laser weld stainless steel reactor components and is interfaced with an 8 kW fiber laser. The integrated 8 axis system includes a 6 axis robot that carries a remote focus head, a robust 8 ft. trackway (axis 7) for linear robot travel and a head/ tail stock for parts fixturing (axis 8). With an emphasis on process quality and control, the system features seam tracking, weld process monitoring, an integrated parts tracking system and an automatic beam power checking system.

Hydroformed component trimming – ag tractors

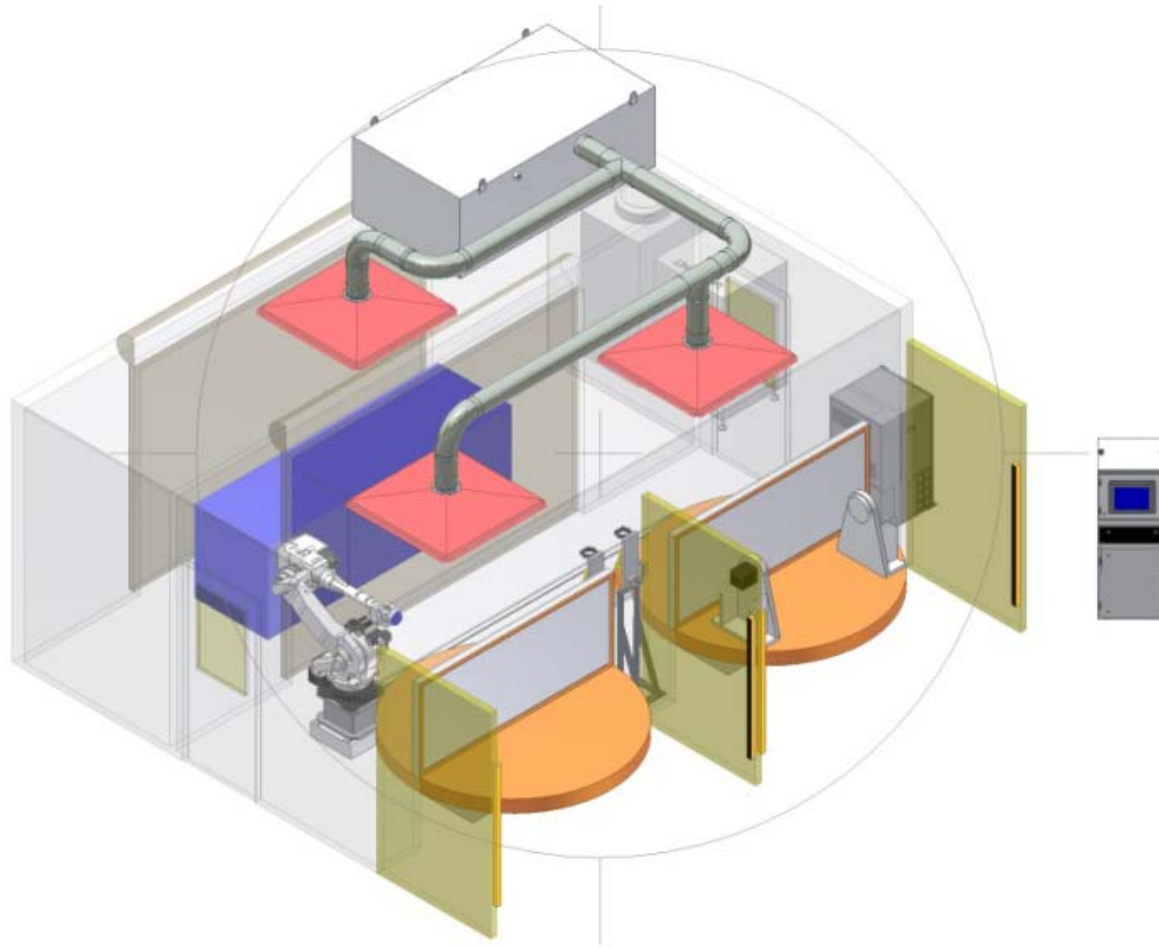
Laser Cutting



This FLEX LASE system is dedicated to laser cutting. Robotic material handling brings 'in-process' hydroformed stainless steel parts to and from the work area. Within the work cell, a special rotary fixture device, in coordinated motion with the robot, is used to rotate the part during processing. A scrap conveyor and scrap collection bin are also provided and are fully integrated into the material handling scheme of the work cell, while maintaining CDRH class 1 integrity.

Food prep service manufacturing

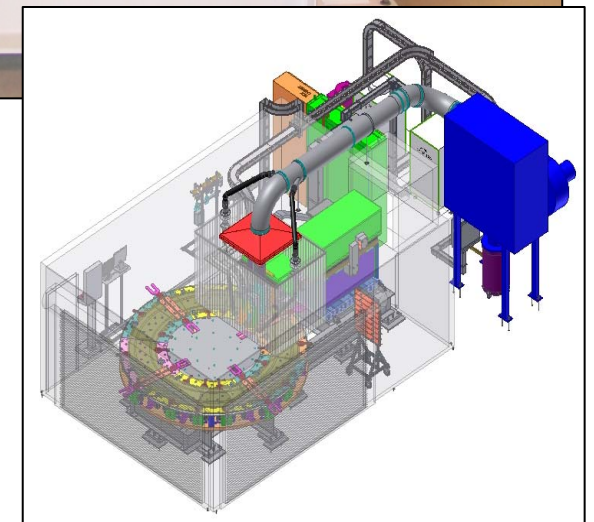
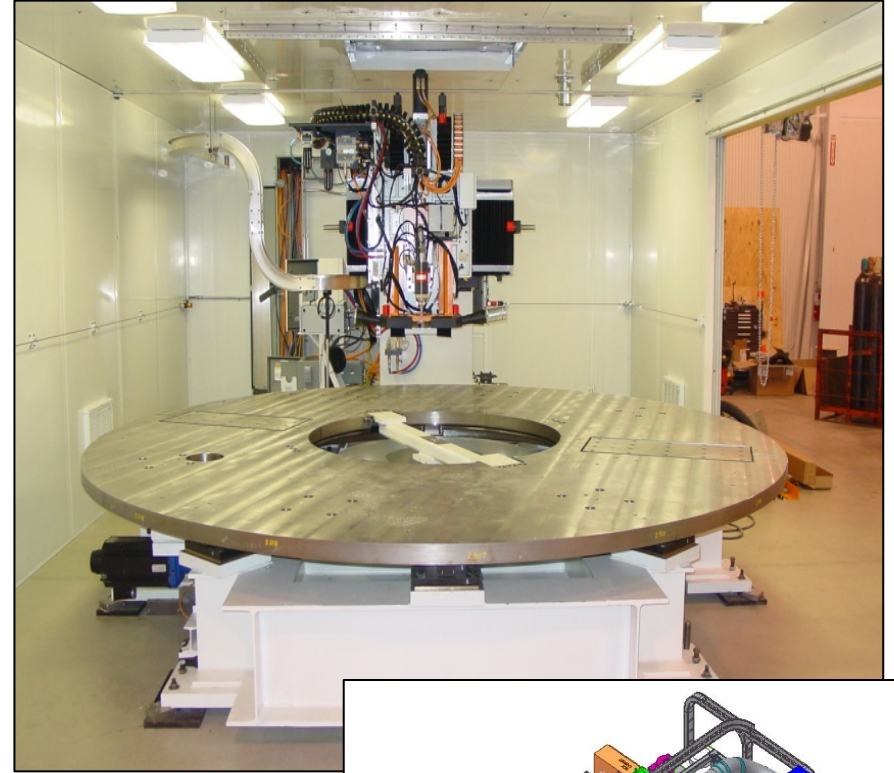
Laser Welding and Cutting



This dual turntable FLEX LASE welding system also has an 'auxiliary process area' at the rear of the machine, for use when the front mounted turntables and fixtures are being changed-out. A powered roll up door separates the front and rear work areas. The six-axis robot is mounted on a 7th axis track to enhance reach. A second laser process head holster, and a beam switch in the laser are provided for future growth and the addition of other process heads, such as laser cutting, in the future. The system utilizes a 4kw fiber laser.

Aerospace

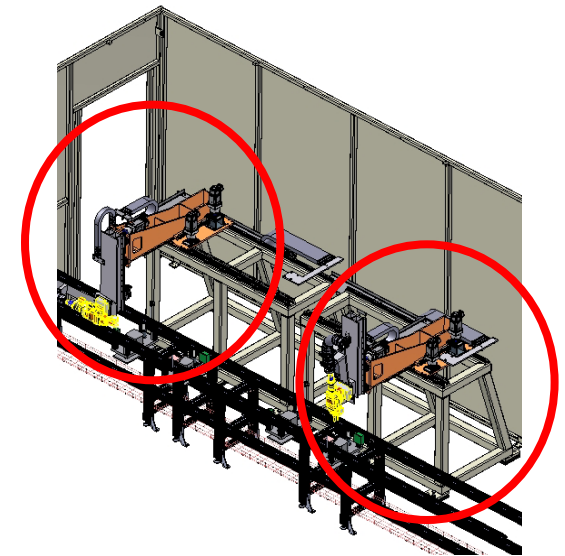
Laser Cutting and Welding



This is a highly customized FLEX LASE, laser cutting and welding cell with integral fixturing supplied to an aircraft manufacturer. Due to the high precision requirement of the application, the motion of the laser processing heads was obtained via CNC controlled multi-axis gantry and servo positioned (and backlash controlled) rotary turntable – instead of the more customary six-axis robot. Parts being processed are extremely large and the multi-step process requires a long cycle time. Part loading and unloading is accomplished via two large powered overhead doors. The system is integrated with a 3kW fiber laser, in an enclosure suitable for future expansion up to 6kW.

Automotive Li-ion battery production

Laser Welding

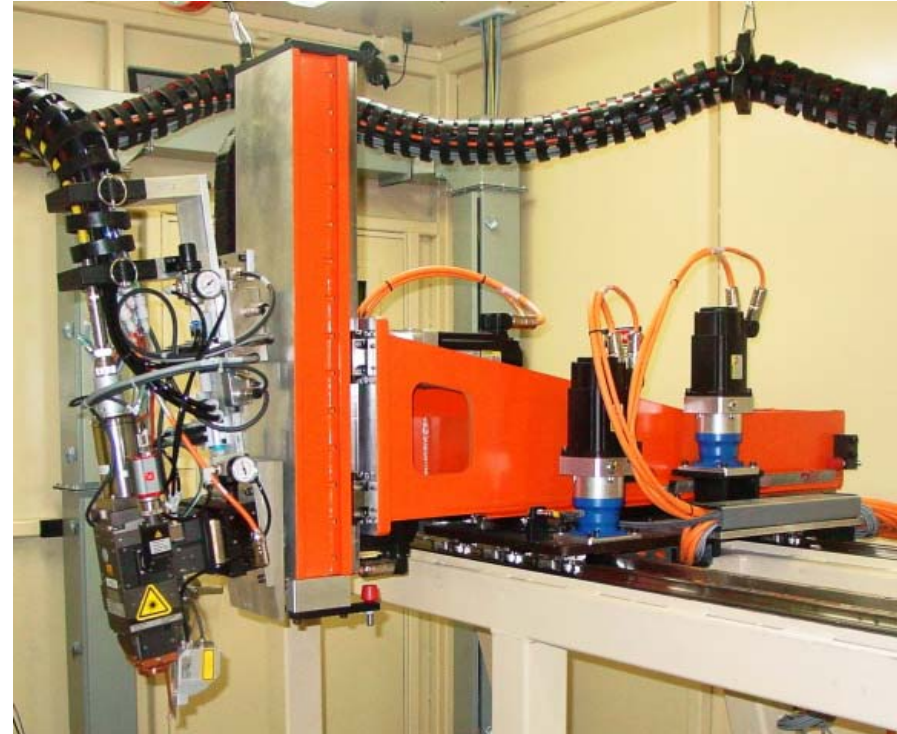


This 'dual gantry' dual-head system (within a single CDRH class 1 enclosure) is a high accuracy, high speed solution for a very precise laser welding operation on a lithium-ion battery component.

The twin CNC gantries offer robust design, with long life helical rack and pinion drive components. Other features supplied include automatic seam tracking, process monitoring and CCD camera/cross-hair generator for set-up assist. The system utilizes a 4kW fiber laser with beam switch for alternating processing between the two laser weld heads.

Automotive Li-ion battery production

Laser Spot Welding



This single station, single gantry system is a high precision, high speed solution for a very precise laser welding operation on a lithium-ion battery component. Flex Lase CNC gantry solutions offer robust design, with long life helical rack and pinion drive components. Ball screws and belts are eliminated, resulting in longer life, easier maintenance and higher accuracies. Accuracy and repeatability are higher than typical robot performance, and may be desirable for certain precision applications. Laser process options include a high resolution vision system for 'finding' and assuring alignment before laser welding, of the very small, hand-placed components being processed. This system is integrated with a 150W Nd:YAG laser for spot welding.

Aerospace

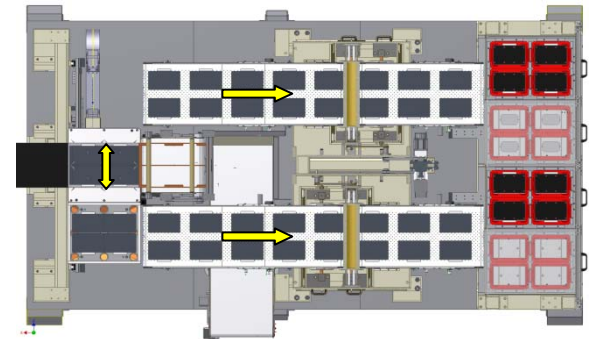
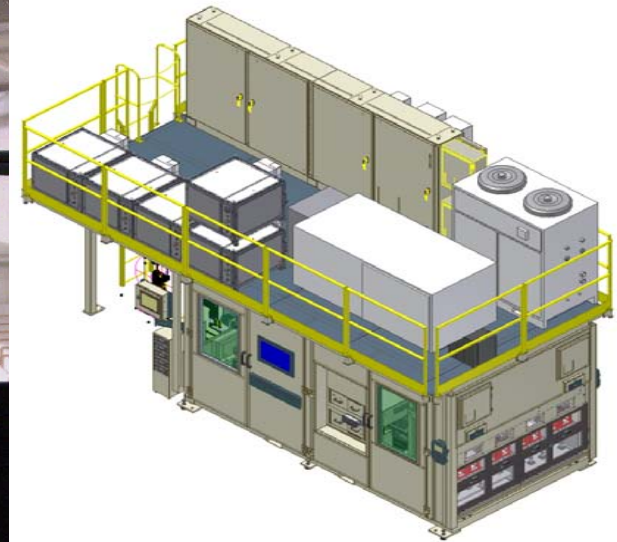
Laser Cladding, Welding and Cutting



Shown is a FLEX LASE system that is interfaced with equipment for laser cladding (wire feed), laser cutting and scanner based laser welding. This flexible cell features a scanning laser processing head, the RLSK model from HIGHYAG, which can process a 3 dimensional envelope of 200 x 300 x 200 mm³ and has a working distance of approx. 600 mm. The focus head has an integrated z axis that allows variation of z focus position +/- 100 mm without change in focus diameter. This Flex Lase system was supplied with a 6KW fiber laser. A servo controlled rotary positioner is provided to properly orient the parts during processing.

Laser processing system for Li-ion Battery Industry

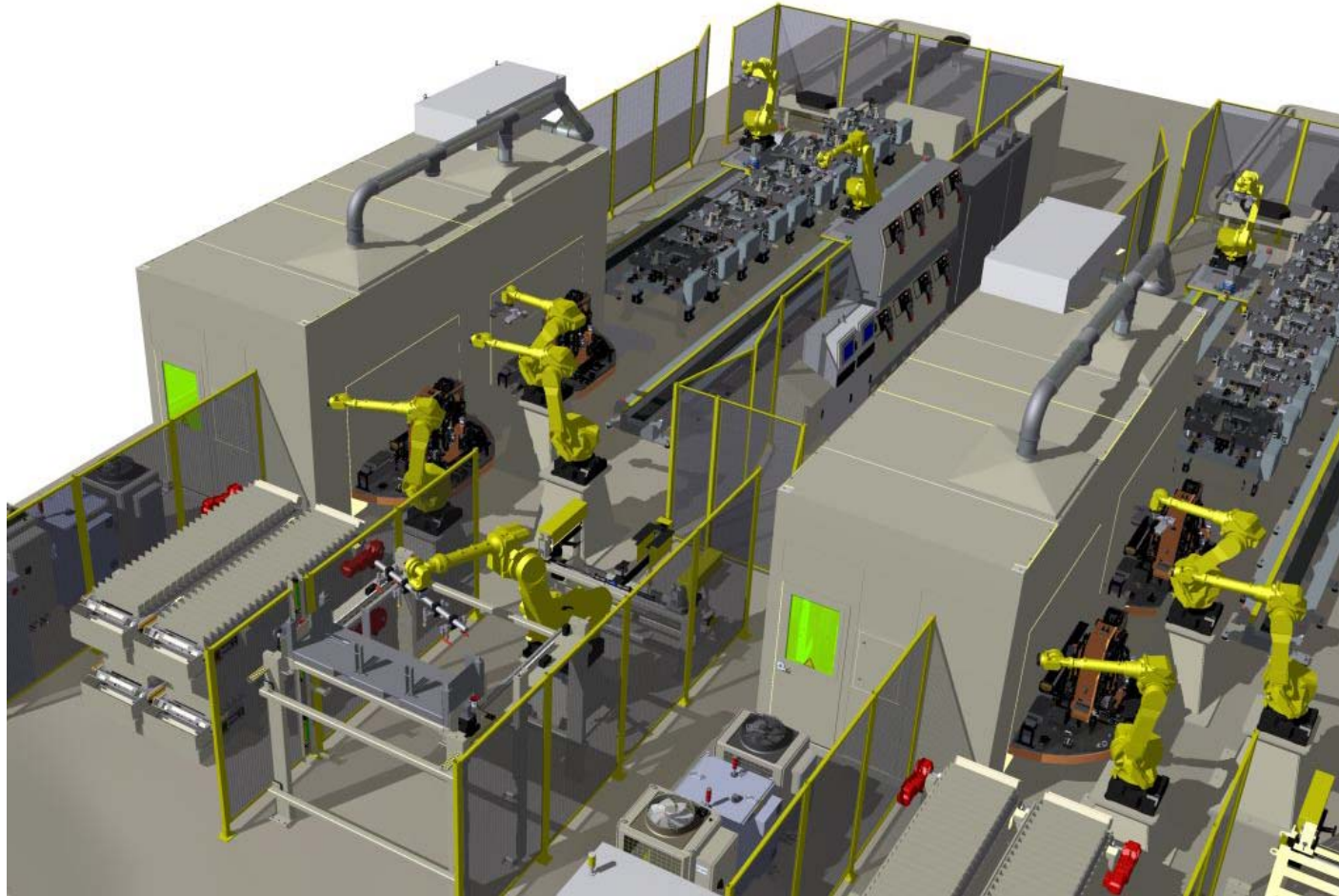
Laser Cutting



The FLEX CUT I is a high speed, high precision system designed for remote laser cutting of thin foils and coated foils, materials that are common to Lithium-ion battery electrode materials. This high production FLEX CUT system features two lanes of simultaneous production. The fully integrated, Class I safe system features an unwind system with straightener, five 2kW fiber lasers - with each laser integrated to its own 3-axis scanning mirror focus head. The system included custom fixturing, material handling including pick and place units, vacuum conveyors and high speed shelf mount 6-axis robots, a parts cleaning system, fume removal systems and parts unload drawers for unloading and loading of parts magazines.

Integrated fabrication and assembly line

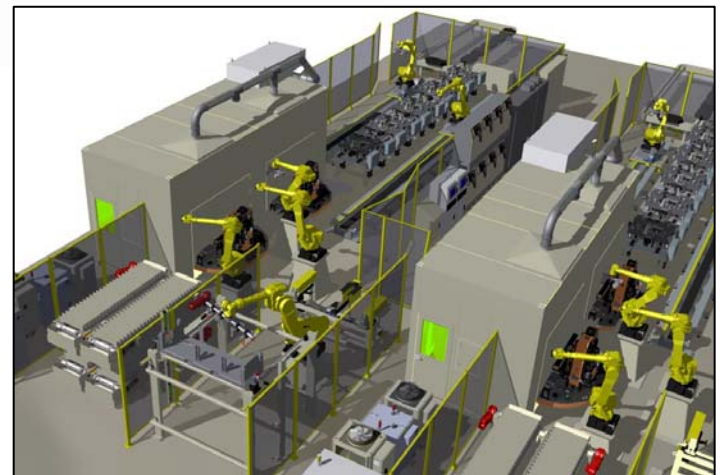
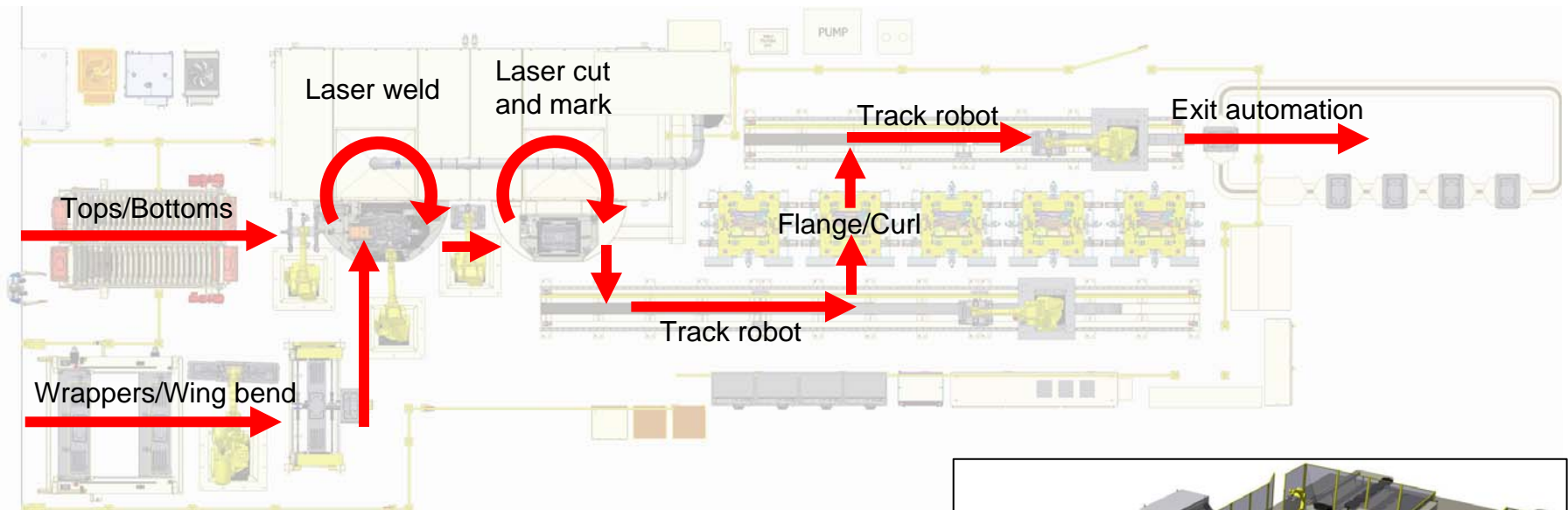
Laser Welding and Cutting



This integrated, turnkey system (scheduled for completion Q4 2012) includes two large dual turntable FLEX LASE systems for laser welding and laser cutting of appliance components, with various robotic & pick and place automation, related assembly processes such as wing bending, flange/curl forming, etc., flexible tooling, a stand-alone 'check station', and a 4 press automated stamping line equipped with Wayne Trail servo transfer, destack, stack, lubricator, measure/square station, auto-die change, and die storage/retrieval.

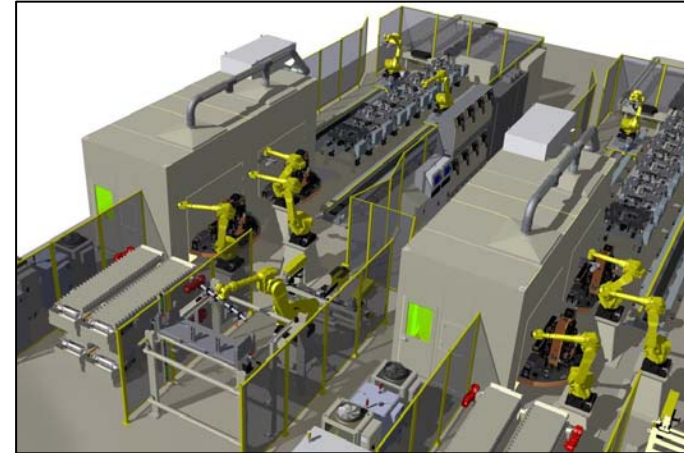
Integrated laser fabrication and assembly line

Process Flow Diagram



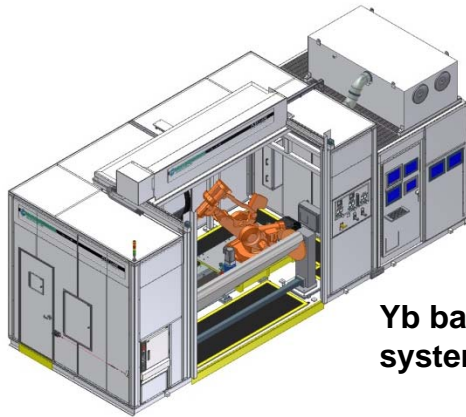
Integrated laser fab and assy line

- Close-coupled, efficient use of floor space
- Programmable automation reduces manpower
- Robust design for maximum uptime
- Full change-over in 15 minutes to 1 hour – model & style dependent
- Integrated pre-and post- processing systems (upstream/downstream)
- Operator safety and ergonomic considerations
 - ✓ **Laser stations:** CDRH class 1 compliant
 - ✓ **Safe access and viewing:** rated windows, CCTV and monitors
 - ✓ **Intuitive HMI controls:** Set-ups, ops, batch input, faults & prompts
 - ✓ **Process monitoring (weld):** real-time monitoring for QA/QC schemes

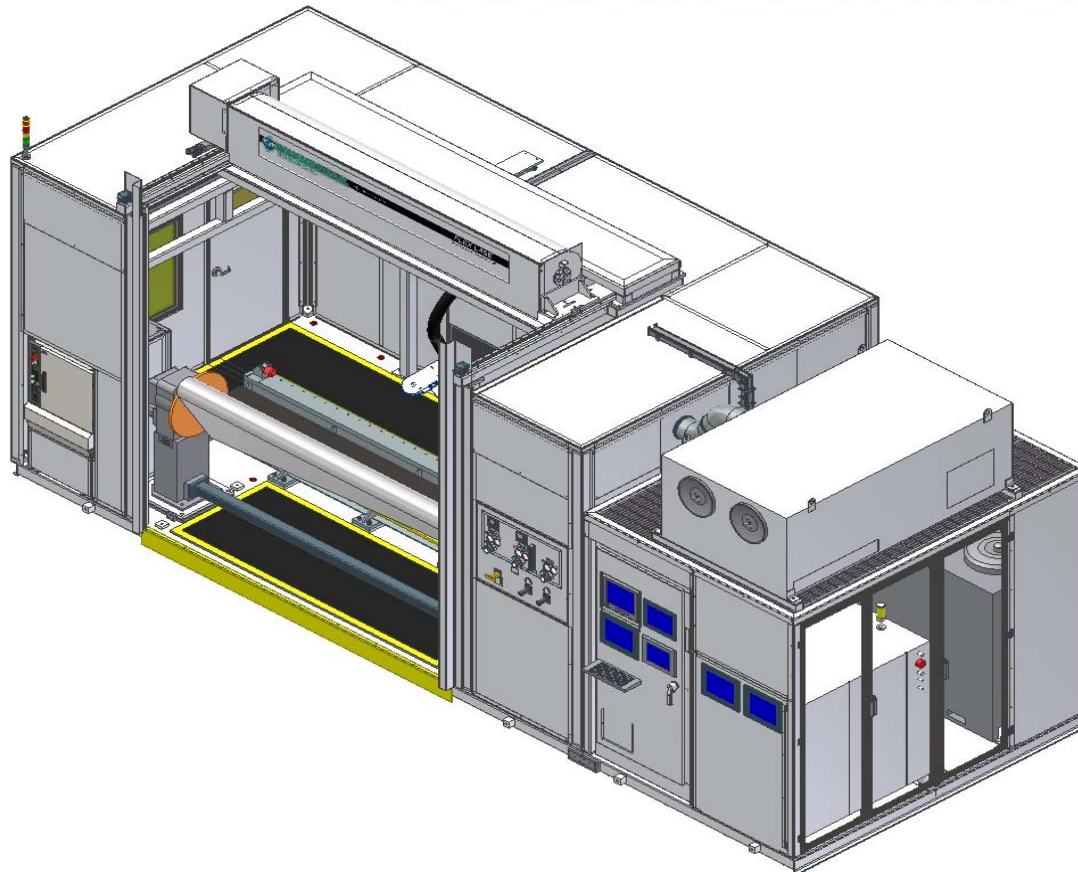
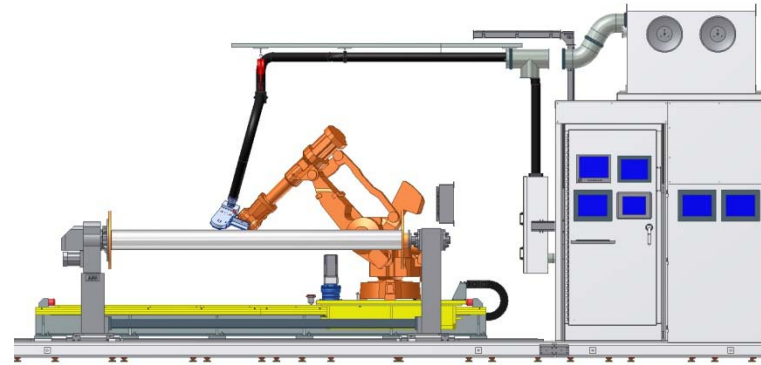


Apps Gallery

Yb or Nd:YAG based FLEX LASE system with *PLS-1* process head



Yb based system



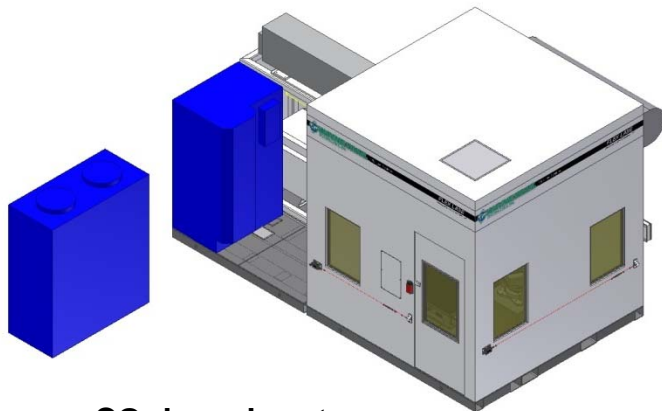
LASER PAINT STRIPPING:

The PLS-1 scanner based laser paint removal head from Edison Welding Institute (EWI), can be easily integrated into the FLEX LASE concept, to address de-painting of nearly any size or shape of 'off-aircraft' components, or components from any number of other industries.

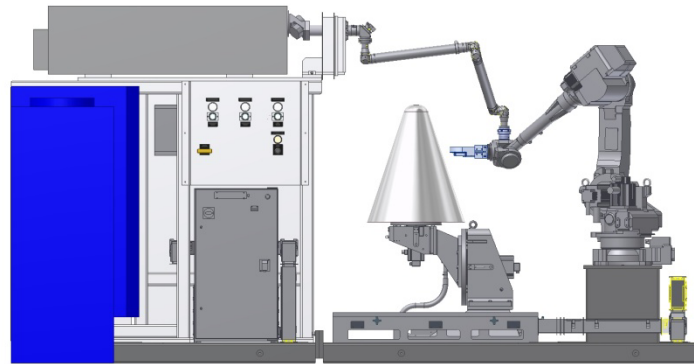
Standardization of the FLEX LASE work cell reduces delivery time, allows for excellent component commonality across multiple application platforms, and is provided with documentation suitable to train operators in the use and maintenance of the system in a minimal amount of time.

Applications Gallery

CO₂ based FLEX LASE system with *PLS-1* process head



CO₂ based system



LASER PAINT STRIPPING

Whether equipped with Yb; Nd:YAG, CO₂ power sources, the 'works in a box' approach of FLEX LASE provides a work-cell platform that can be rapidly deployed, highly standardized for a 'commercial off-the-shelf' approach . . . or be fully customized when needed.

