

# FADU Training Update

Spring 2011

Volume 1, Issue 1

## Points of Interest:

- v.2011 Software Update Available Soon!
- Exchange Program for Early-Model Draw Latch Closures
- Service Advisory Letter (SAL) on Maximum Recommended Bolt Loading
- Two 'Training Tips' Inside!

## Across The Desk...



- John M. Jenco  
Charlotte, NC. USA

After spending a good part of 2008 responding to requests to design an improved training

fixture capable of teaching key factors associated with proper assembly of pressure-boundary bolted connections for process piping systems, we were finally able to deliver FADU S/N 001 in late summer of that year. With the long-anticipated release in 2010 of the ASME PCC-I guideline pertaining to bolted joint assembly, and in particular, Appendix 'A' therein, pertaining to training guide-

lines for bolted joint assemblers, interest and orders for our FADU have jumped as positive 'word-of-mouth' about our technology began to spread.

Because it is software-driven and computer-compatible, rather than chained to a hardware display, we have been able to implement a number of customer-suggested software enhancements as well as

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## Standardizing Bolted Joint Assembly Training

After nearly 40 years of experience across multiple industries and applications, JJENCO is unarguably a global leader in the art and science of bolted joint assembly for pressure-boundary systems. Of late, there has been a renewed interest in standardized training for this area. Recently, the American Society of Mechanical Engineers (ASME) released their new PCC-I guideline, with Appendix 'A' devoted entirely to minimum training guidelines for bolted joint assemblers. JJENCO supports the idea of

standardized training and certification, and is pleased that our FADU represents the *only gasketed joint training fixture* capable of recording the results of practical testing to support certification records for each student.

To further support bolted joint training, JJENCO - in cooperation with the Fluid Sealing Technology Institute (FSTI) - has developed the first in a series of 4 training modules for assemblers of pressure-boundary bolted connections. This introductory module focuses on famili-

arization with related tools and correct tool usage, flange joint configurations and applications, gasket materials and applications, assembly procedure adherence, and basic bolted joint assembly concepts. Subsequent modules target skill sets required by Bolted Joint Assembly Technicians, Senior Technicians, as well as Instructors.

Each module contains a fully annotated PowerPoint view-graph set covering the course material, suggested classroom discussion questions, hands-

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## Exchange Program for Early-Model FADU Draw Latch Closures

The first several JJENCO FADU's built were constructed using small, 3-1/2" long 304 stainless steel draw latches as the primary closure and locking mechanism for the FADU base unit, which also doubles as the FADU storage and shipping container. Two of these draw latches are installed on each FADU base unit. Although offering a small and convenient size, with a low-profile when latched or unlatched, for a limited time JJENCO is offering FADU Owners whose units are equipped with these 1st generation draw latches the opportunity to upgrade their older draw latches to our new 5-1/4" model at no charge. While these older-style draw latches are still quite service-

able, JJENCO believes in providing the very best for our customers. These new draw latches, which have been standard on all new FADU shipped since late 2010, continue to be constructed out of 304 stainless steel but are load-rated to 800 lbs. In addition to generally more robust construction, these larger draw latches are also easier to adjust and manipulate when opening or closing. They also accommodate a slightly larger 5/16" diameter padlock shackle. FADU Owners who wish to exchange their old 3-1/2" draw latches for the new 5-1/4" latches free-of-charge can do so by removing their old latches (both the draw side and the stationary side of each



**NEW 5-1/4" Load-Rated Replacement Draw Latches**

latch) and returning both complete latches to JJENCO before April 30, 2011. Mark your shipment 'ATTN: Draw Latch Exchange Program', and include a return address label with your complete shipping address. FADU Owners taking advantage of this special offer will receive their new draw latches within 2-3 weeks., as well as instructions for installation. For additional information, contact John Jenco at +1.704.944.5568.



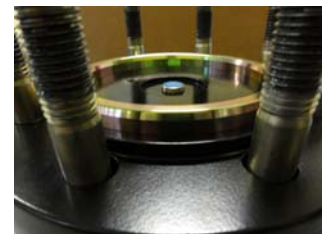
### FADU Featured in 'Mechanical Engineering' Magazine

In the December 2010 issue of *Mechanical Engineering* magazine, published by the American Society of Mechanical Engineers (ASME), the JJENCO Flange Assembly Demonstration Unit (FADU) was the featured technology of the Tech Focus (p.22) section.

## First Custom Flange Module Delivered!

In 2010, FDS Group (Paris) subsidiary company Flexitallic LP, Houston, TX, USA, ordered their first JJENCO Flange Assembly Demonstration Units (FADU) to augment their in-house gasket technology training program for clients. Subsequently, another FDS Group company, Novus Sealing Limited, West Yorkshire, England, ordered another FADU to support research and training activities for FDS Group's European clients. Two key requirements were to customize the Novus FADU from the standard ASME 4-in Class 150 flange specification to a Class 300 flange setup, and to deliver an additional ring-joint

(RTJ) flange module using an octagonal metal ring gasket. Conversion to the ASME Class 300 specification necessitated a change in flange dimensions as well as bolt diameter for the strain-gauged fasteners used in the FADU. To accommodate both a conventional raised-face flange set and RTJ flange set, extended length strain-gauged bolts were required in conjunction with an innovative split spacer design. Selecting the correct combination of spacer heights enables a single set of extended length bolts to accommodate both flange sets and gasket thicknesses. The user interface software was also adjusted to take into con-



**FADU 4-in Class 300 RTJ Flange Module w/ Octagonal O-Ring Metal Gasket**

sideration the increased root area of each bolt in order to display the correct bolt stress values. Due to the changes in flange size and number, several changes were also made to the FADU base in order to accommodate packaging of all the components within the base when in the storage/ transport configuration.

## FADU Voltage Reminder!!

On more than one occasion, we have received an email from a confused FADU Owner outside the USA wondering why their FADU is not functioning as expected. In one case, after extensive troubleshooting over several weeks by fax, email, and telephone, it was finally determined that “maybe someone did plug it in without using a step-down transformer after all...”. While unfortunate, this highlights an all-important issue. Because the FADU can be deceptively simple to operate, some people don’t think that they need to

familiarize themselves with its proper operation, or better yet, **READ THE MANUAL**. Attempting to operate the FADU using greater than 120 VAC current can result in damage to delicate internal electronic components that can only be properly identified and repaired by returning your FADU to JJENCO for factory service. In addition to our bench charges for troubleshooting and repair, as well as high replacement component costs, shipping to/from the USA to complete the necessary repairs can also be quite ex-



Use 110 VAC 50/60 cycle current only!

pensive. Take time to ensure that everyone who will operate the FADU fully understands its proper setup, operation, and packaging. This single tip can save you thousand\$ of dollars!

## Service Advisory Letter (SAL) Issued on Maximum Recommended Bolt Loading

In August 2010, JJENCO issued our first Service Advisory Letter (SAL) to all FADU Owners entitled ‘Strain-Gauged Bolt (SGB) Failure Due to Intentional Over-Tightening’ as a result of a FADU bolt failure.

During a classroom demonstration, the instructor was attempting to illustrate how a fulcrum-effect between to raised-face flanges could lead to initiating radially-inward buckling (RIB) of a spiral-wound gasket (SWG) when the first fastener tightened in a flange assembly is tightened excessively, resulting in a significant increase in the intended preload for that fastener when the second (opposing) fastener in the normal ‘cross-pattern’ loading sequence is tightened. Passing on the fact that elevated bolt preload has been demonstrated to not be the primary factor

contributing to RIB occurrences in SWG’s, the instructor failed to anticipate that the fulcrum effect might not only increase bolt preload in the first-tightened bolt, but more importantly, on the internal strain-gauge elements *within* the bolt.

Although the instructor was correct in his understanding that the yield strength of the SGB used in the FADU is approximately 160 ksi (1,103,161 kPa), it is worth noting that the maximum SGB calibration value is 23,000 pounds (102 kN), providing a maximum preload of approximately 113 ksi (779,107 kPa). This latter value is well in excess of the 105 ksi (743,950 kPa) material yield strength for ASME A193 B7 bolting material that these fasteners are meant to emulate in this training application. Accordingly, there should be no

reason to ever exceed our recommended 85% of the calibration value. This is indicated by a displayed value of 96 ksi (661,897 kPa) for any individual bolt.

Unfortunately, the above experiment resulted in disrupting the internal strain-gauge within the bolt, and required sending the affected SGB back to JJENCO for repair and recalibration; not an inexpensive process. In the end, the FADU owner elected to purchase a spare SGB in order to continue training with minimal interruption while the 2-week repair and recalibration process took place.

The moral of the story: Although robust in design and simple to operate, your FADU can be broken with patience and perseverance! Treat your FADU like the expensive instrument it is.

*“Your FADU can  
be broken with  
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like the expensive  
instrument it is.”*

## Recent FADU Enhancements

### INTERNAL SGB CABLE CONTROLLER

To improve access to the internal MIL-SPEC connector when plugging/unplugging FADU modules from the FADU stand, we have implemented a simple PVC cable controller that routes the strain-gauged bolt cables away from the connector. The controller is simply pressed into position after removing the FADU module from the stand.

### ALUMINUM EDGE TRIM KIT

To provide increased protection against general wear-and-tear of the FADU base during transit, JJENCO began installing aluminum angle around all exposed edges of the case. We think this also improves the base unit appearance.

### SPRING-LOADED HANDLES

To improve the handling and transporting characteristics of the FADU base in transit, JJENCO has upgraded the lifting handles to new spring-loaded handles that keep them tight against the case when not in use. They are also load-rated to 400 lbs. In addition, the new handle lift points are also covered with a rubber pad that provides a better grip and is easier on the hands.



Trim kit, handles, stencil & latches

### SHIPPING ORIENTATION STENCILS

To provide increased protection when shipping your FADU from one location to another, JJENCO has begun adding shipping orientation stencils on each end panel. The stencils indicate the orientation that is expected when transporting or shipping the unit. In addition, we have added a “Do Not Stack” warning to each end panel to help assure that other freight is not stacked upon the FADU in transit, potentially causing damage to the base unit hinges.

### INTERNAL STORAGE COMPARTMENT

To improve the probability that the FADU Operations Manual will stay with the unit, we have created a small storage box on the lower end panel of the FADU base. The box provides sufficient space to keep the Manual, as well as a few spare gaskets or other small items.



Storage compartment

### DRAW LATCH UPGRADE

To increase security during transport and improve functionality, JJENCO has upgraded to a new 5-1/4” stainless steel draw latch that is load-rated to 800 lbs. In addition to generally more robust construction, these larger draw latches are easier to adjust and manipulate when opening or closing. They also accommodate a slightly larger 5/16” diameter padlock shackle.

### BOLT PRELOAD/GASKET STRESS SOFTWARE DISPLAY

We have added a radio button selection on the software display to enable the user to instantly convert displayed values from bolt preload to gasket stress

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## Standardizing Bolted Joint Assembly Training

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on practical demonstrations designed for our FADU, and practical examination tests using our FADU designed to enable students to demonstrate their understanding and skills before an Instructor.

The FSTI will maintain an online Test Question Data Bank to which accredited Instructors can register students and grant student access for the purpose of completing the knowledge portion of their testing. Passing students will receive the appropriate level certification from FSTI, who will maintain that accreditation on behalf of the student and prospective employers. Instructors interested in participating should contact John Jenco (jjenco@jjenco.com / +1.704.944.5568) for more information.

### Training Tip #1

When using the GCM (gasket compression module) to compare one factor to another (e.g., performance of two different types of torque wrenches), always relubricate the strain-gauged bolts and hardened steel washers each time before tightening in order to assure that the K-factor representing frictional and other losses remains identical for each demonstration.

# v.2011 Software Coming Soon!

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2011 marks the first major revision to our FADU User Interface Software application developed in 2008. During this time, we have continued to make needed minor enhancements and adjustments along the way. Our last noteworthy modification in 2010 was to incorporate a user-selectable radio button to enable the display of either bolt preload or gasket stress values.

For 2011, we have been compiling a wish list from users, as well as some of our own ideas, and are excited about the prospects for this new release.

First, we have already begun incorporating a revision to the software installation sequence for all FADU shipping in 2011. This improvement greatly simplifies the software installation process. We'll also continue to include a step-by-step software

installation guide of screenshots for the entire process with each FADU for those that require added assurance.

Second, we plan to provide a couple new menu items; one to enable the user to select to display values and scales in either English or Metric units. Our international users should greatly appreciate this item. We are also trying to incorporate an automated "Self-test" function that will report on a number of conditions that should aid in remotely troubleshooting any functional issues that arise with the FADU.

Third, we are planning to incorporate a new 'Snapshot' feature that will enable the user to record an on-screen snapshot of bolt preload values and display them directly below the 'live' values for each bolt, along with an elapsed time

function to keep track of the time since the snapshot was executed. This should enhance the ability to illustrate gasket creep without resorting to the 'log data' function.

Fourth, we're hoping to include a table that can be used to record load cell values from the Torque-Preload Module for easy comparison of the effect that different factors (lubricant, nut markings, use of washers, etc) can have on applied load.

Finally, we're adding other surprises designed to further improve the user interface.

Look for the v.2011 software to be available in 2nd Qtr of the year. Registered FADU owners will receive an email notifying them of the release date, with instructions on ordering their upgrade if desired.

## Training Tip #2

Did you know that when using the FADU as your training fixture you no longer need to use calipers to measure pre-compression gasket thickness in order to guess at the maximum gasket compression? As anyone who has tried to measure the gasket thickness of a spiral-wound gasket (SWG) knows, the uncompressed gasket thickness can easily vary 0.010-in, depending upon the point of measurement around the gasket. Using the FADU, simply 'zero' the display to record the distance between the flanges before installing the gasket. Then, after the gasket is installed between the flanges, the value displayed in the 'Gasket Compression' window is the uncompressed gasket height. Subtracting the SWG metal ring thickness from this value gives the maximum expected gasket compression. Simple, huh? Don't forget to re-zero the display before you begin tightening the flanges.

## Recent FADU Enhancements

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### FIXED FADU STORAGE SADDLES

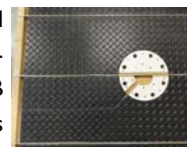
To minimize movement of the internal storage saddles used to hold the FADU stand while in transit, we have modified the saddles to be joined together at a fixed distance using a threaded rod.



Fixed saddles

### CONCEALED POWER CORD/USB ROUTING

To reduce the potential for a trip hazard during use and improve the overall FADU appearance, we have routed a channel underneath the rubber diamond-plate mat to accommodate both the 110VAC power cord and computer USB cable from the FADU stand to a point off the edge of the base. Pressing the cords through a corresponding slit in the mat hides the cords in the channel when in use.



Concealed cord routing

### SOLID-BOTTOM NUT RETAINER FOR TORQUE-PRELOAD MODULE (TPM)

To improve the ease of use when installing a new threaded fastener in the TPM we have changed the old style nut-retainer attached to the bottom of the TPM flange and replaced it with a nut-retainer that has a solid bottom, thereby providing a reaction point for the threaded fastener to bottom out against.



Solid-bottom nut retainer



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Since 2001, JJENCO has successfully provided contract technical research, new technology development, personnel training, and business and technical consulting principally to multi-national corporations, US Fortune 500 Companies, and large private institutions primarily on topics related to commercial nuclear power generation. With headquarters located in Charlotte, North Carolina USA, JJENCO's mission is to provide 'world class' expertise through the utilization of both in-house resources and a network of subject-matter experts around the world to assist clients in understanding and resolving their most important issues in the most practical and cost-effective fashion.

To learn more about how JJENCO can help resolve your issues, contact John Jenco (jjenco@jjenco.com) to discuss your particular requirement.

### Delivering Value in a Demanding World

## Across The Desk...

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our own. Because the novel training module design is, well, modular, we have been able to once again respond to customer requests to develop and deliver additional training modules for training on other than raised-face and flat-face flange configurations, such as those for ring-type joint (RTJ) gaskets used extensively by the Petroleum industry.

As we build more and more FADU's, we continue to add minor enhancements to our original design in order to make it even more functional and easy to use. Many of these design features are available to existing users as 'after market' upgrades on our website. As an example, we have significantly automated the installation process for the multiple software modules that early users rightly found somewhat confusing at times.

We have also begun offering 1-day onsite 'Train the Trainer' orientation classes to help training instructors from multiple industries to rapidly gain confidence in how to most effectively use their FADU to train students. These classes familiarize instructors with the FADU design, setup, operation, repackaging, and maintenance of the unit, and focus on how to use the various FADU modules to most clearly illustrate the key points related to successful bolted joint assembly in pressure boundary systems. The course also provides suggestions on opportunities for student interaction using the equipment.

2010 saw FADU sales jump in demand, with units delivered to power generation and petroleum refining operations, as well as numerous sales to the gasket vendor community. In addition to sales in the US and Canada, 2010 also saw the

beginning of international sales in Europe and the Far East.

Looking forward, 2011 has already seen multiple orders placed for new FADU's for both domestic and international delivery. The FADU is well on its way to rapidly becoming *the standard training fixture* for bolted joint assembly training.

JJENCO will continue to refine and enhance our FADU and associated products, while we also continue to implement new customer support services such as this 'FADU Training Update' newsletter. The *Update* will be published semi-annually to keep FADU owners and interested parties informed on the latest product and bolted joint training information. To sign-up for email delivery, register on our website at [www.jjenco.com/fadu.html](http://www.jjenco.com/fadu.html).