

AXON

TCOMM

Technical Communications Newsletter

Note From Our Chief Executive Officer

SUCCESS STARTS WITH SAFETY: EVACUATION PLAN

With so many conflicting predictions and recommendations from the media, it can be difficult to know what the right choice is when it comes to hurricane evacuation.



Some may jump the gun and evacuate too early, while others may be skeptical of media reports (like this comic) and delay evacuation until it is too late. The key is finding balance between these two ends of the spectrum.

Safety always comes first at AXON:

Employee, customer, subcontractor, and visitor safety are priority above all else, especially in these situations. Therefore, I'd like to take this opportunity to reiterate that all personnel should be familiar with our corporate emergency procedures.

First and foremost, be aware of the AXON **call-in number** for information during emergency conditions: **713-581-2515**. If you can't reach your supervisor, please avoid potentially dangerous situations by calling

this number before taking action. Also, be familiar with the individuals assigned as your facility's **Emergency Response Coordinators** (pg 6). They are responsible for ensuring personnel safety and limiting property damage during these situations. The team will also monitor media outlets and, after liaison with AXON Management, initiate emergency actions/notices.

I urge each employee to be versed in the five phases of our **Hurricane and Tropical Storm Emergency Evacuation Plan** (pg 6). Success truly starts with safety, and each of our actions affect it whether we realize it or not. So let's do our best in being aligned and prepared to keep each other safe in the case of unfortunate events.

➤ Keith Klopfenstein, CEO

FEATURES INSIDE THIS ISSUE:

- New Design Highlights: From Concept to Reality **pg 2**
- Working Together: Engineering and Assembly **pg 4**
- Transforming Problems into Solutions, Efficiently **pg 5**
- AXON Hurricane and Tropical Storm Emergency Evacuation Plan **pg 6**
- Elastomers: Thoughtful Improvements on Industry Standards **pg 7**
- Continuous Improvements: Type 50 BOP Machining Time **pg 7**

IN EVERY ISSUE:

- Note From Our CEO **pg 1**
- Engineering/Tech. Updates **pg 2**
- A Day in the Life of... **pg 3**
- Did You Know? **pg 7**
- Celebrating Our People **pg 8**

Engineering/Technology Updates

CURRENT TECHNOLOGICAL WINS

DEAN UECKERT

Chief Engineer

Our current focus is ensuring all specifications are met on an order for **eight land accumulators** to get it into production at the JRR facility as soon as possible. Another noteworthy project in progress is for a multiplex system we manufactured in 2002 for a scientific drillship. We are **upgrading the PLC components** (including some software configuration changes) on their BOP control system. I'd like to commend the JRR Engineering Team on their continued diligence to move these projects forward, while also providing support to sales, service, and our Authorized Repair Facilities.

RAVI VELAMARTHY

Senior Engineering Manager

The NHR Engineering Team has made many strides recently with regard to new product development. Some highlights include completed load testing for a new **shear booster safety feature** (below) and fatigue testing for a new **anti-rotation design** to be used in an 18-10M BOP stack. Last week, our **7-15M Low Force Shear Rams** (LFSR) successfully sheared 3-1/2" E-75 and P-110 drill pipe at 2,200 vs. 3,100 psi during preliminary shear testing (below). Thank you to everyone involved for the outstanding collaboration and hard work to make these tests a success.

ERIC CROCHET

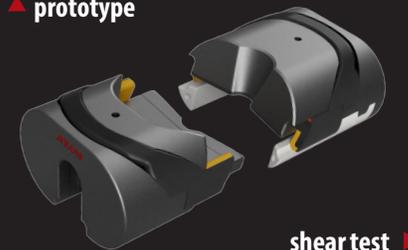
Operations Manager

Engineering has been proactive in ensuring someone from the team travels to our Houma facility when technical support may be needed. This is especially important because we do not have an engineering team on-site at our repair facility. Ravi's assistance in our **July API audit** was very welcoming and appreciated. Moreover, the **combination OEM/CEM 18-10M BOP stack** that I mentioned in the last issue has successfully shipped. The customer was pleased we maintained on-time delivery for their time-sensitive project. The stack will operate in South America this fall.

NEW DESIGN HIGHLIGHTS FROM CONCEPT TO REALITY



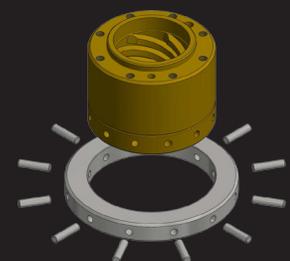
▲ prototype



shear test ▶



▲ load test



▲ prototype



BELOW: The Shear Booster Safety Feature ensures completion of shear and seal in the case of permanent seizure of the overhauling screw and/or nut assembly in the shear bonnets.

ABOVE: AXON's new 7-15M LFSR will fill an industry need for LFSR that can shear/seal wireline and control lines on land rigs.

AXON **T**COMM **Technical Communications Newsletter**

The purpose of this recurring section is to showcase details about technological roles at AXON, including in departments outside of Engineering. In this issue, we learn about Oilfield Services for BOP Control Systems with Freddie Perkins, Sr. Field Service Technician.

A DAY IN THE LIFE OF... SERVICE TECHNICIANS



Freddie has been a field service technician for almost four decades. Prior to being in the oil and gas industry, he was a CNC technician for about fifteen years. In his free time, Freddie enjoys his life-long hobby of woodworking. He creates items such as outdoor furniture and planters using salvaged wood that would have otherwise been discarded.

What does your role entail?

As a Field Service Technician, I am primarily responsible for making sure our surface BOP Controls work properly at the customer site. That includes installation, repair, assembly, testing, and maintenance of the equipment.

What's it like on the customer site?

Time is often the biggest factor. We are usually on-site because the rig is down and something needs to be fixed. Because of this, we focus all our energy on making sure the customer gets back to work as soon as possible. Even things like eating and sleeping are secondary sometimes (to us and the customer) as we work together to minimize the downtime on their rig.

How do you achieve that?

The most important thing about field service is **proactively doing things**

right...the first time. Rework can equate to costly expenses, for us as well as the customer. Our goal is to do things as quickly as possible while maintaining precision and safety. It is essential to be comfortable and familiar enough with the equipment to do that effectively within the required time frame. This is where experience comes into play. There are many skills and "tricks" that can only be acquired through years of hands-on experience.

You've been doing this for quite some time. Have you noticed any big changes in oilfield services?

In response to our industry's downturn, it seemed that many domestic companies attempted to reduce costs by performing their maintenance work in-house rather than outsourcing the work. However, regulations are often more stringent overseas, such as in

the North Sea. In those areas, they still typically use OEM companies like us to ensure all i's are dotted and all t's are crossed with their BOP controls to minimize risk and ensure accountability.

What is an example of one of the longest times you were on-site?

I was in China for three months for an equipment package we delivered to our customer several years ago. AXON sent multiple team members over there – from engineering to field service – to assist in the customer's start-up and commissioning process. Unanticipated issues can arise at the start-up of any rig, so it was vital that AXON was present to ensure our equipment still met specifications when hooked up to other equipment.

What are you currently working on?

Andrew Lair and I have been helping NHR with the accumulator bank used for stripping/shearing during BOP tests. It needed some maintenance work, so we are over here disassembling and replacing parts as required to get it functioning properly. If we aren't out at the customer site, we do what we can at the AXON facilities to ensure our in-house equipment is up to par.

You specialized in CNC machines prior to BOP control systems. How do you like the change?

It's incredibly satisfying because we work on equipment that is the first line of defense in well control situations. Due to this fact, our work must be done right the first time. There really is no "second chance" when safety is at stake, and I take great pride in knowing that my work helps keep people safe.

➤ Freddie Perkins, Sr. Field Service Tech.

AXON

T COMM

Technical Communications Newsletter

WORKING TOGETHER: ENGINEERING AND ASSEMBLY

When completed products leave our facilities, the last pair of eyes on them is typically the Assembly Team. Of course, there are many other individuals involved along the way (machining, inspection, etc.), but this vital role is the ***final check*** before AXON equipment travels to our customers. On the other end of the spectrum, our Engineering Team begins the process with product conceptualization.

As discussed in last issue's article, **The Importance of Interdepartmental Synergy**, involvement of cross-functional teams is highly advantageous to streamline production. This piece focuses on the relationship between **Assembly and Engineering**, as they are the bookends to the process.

Different but Complementary Skills
It would seem natural that each team can be left to work on its own areas of expertise successfully. However, a stronger bond between the groups is mutually beneficial. The teams are made up of people with different but complementary skills. Working in tandem and openly providing/receiving feedback can consistency and effectively solve – **or proactively avoid** – issues. Challenges of any size can be tackled faster by drawing on the teams' collective skills, experience, and knowledge.

Engineers must work with numerous constraints like API requirements and customer specifications when calculating product designs. In contrast,

Assembly is literally hands-on, direct contact with the products. This is a valuable resource for Engineering, as they can raise valuable "what if" questions based on their experience, allowing us to think outside of the box and improve designs (e.g., reduce assembly time and minimize risk of damage during installation).

When working together, **we form a bridge that makes the process faster, more precise, and more pleasant.** Rather than assigning blame, working collaboratively towards a common

goal fosters an openly communicative, supportive, and positive environment. Working separately will still probably get us to our goal, but it would likely take longer and may require some U-turns along the way.

Teamwork between Engineering and Assembly from the beginning through the end eliminates easily avoidable, repeat mistakes. This is a vital relationship to forge, and the insights each group can provide one another greatly benefit AXON – **and our customers** – immediately and in the long haul.

"In my experience, everyone in the shop has been opened-minded rather than saying 'we are going to do it this way and that's it.' I think the key is stepping away from my computer and getting out there whenever possible. Yes, we are all busy, but making that effort has personally streamlined many things for me and can help us catch mistakes on both sides."

► **Paul Barrett, Lead Mechanical Designer**

"At my last company, Engineering tried to speed up production by changing our one-piece flow to an assembly line method. Although it seemed more efficient in the virtual world, we quickly found this method would not work in the real world. I appreciate how AXON Engineering gets our feedback on how to improve processes, like making sure we have updated BOMs."

► **Delvin Shelby, Mechanical Assembly Technician II**

"It's apparent our team members were carefully selected for their specialized skills – our facility runs like a well-oiled machine. In addition to looking at the relationship between Engineering and Assembly, I think more cross-training between AXON facilities would also help us further evolve within our industry. There's a lot we can learn from each other."

► **Matt Holifield, Test Technician II**



TRANSFORMING PROBLEMS INTO SOLUTIONS, EFFICIENTLY

David Cain, Sr. VP of Engineering

Uncertainty makes humans feel uncomfortable. Fear of the unknown naturally led early humans to rely on aleatory decisions for basic survival, and later, for explaining phenomena in the world around us. Simply put, **aleatory thinking** represents quick decisions based on chance or superstition instead of fact.

Humans and science have advanced greatly since primitive years. Today, **non-aleatory thinking** is preferred, as it strays away from snap judgments and relies on systematic, knowledge-based problem solving. This organization of objective thought leads to efficient solution paths, which can evolve further into **paradigm changes** (i.e., revolutionary technology). However, even with conscious efforts to maintain objectivity, high levels of uncertainty can still trigger aleatory thinking.

Combating Aleatory Thinking

The engineering field addresses uncertainty daily as it functions to design and develop technical solutions for a wide variety of facets. In addition to product development, AXON engineers are an integral resource for quotations, operational cost reductions, maintenance, etc.

High uncertainty is inevitable due to numerous individuals and moving parts involved. **Consequently, it can cause people to mistakenly believe their opinion-based, aleatory decisions are derived from fact.**

So, how do we combat aleatory problem solving? Eliminating uncertainty within the actual process – **especially within our team** – allows us to collectively and systematically move together towards solutions. This can be achieved by **creating, clearly**

ORGANIZED PROBLEM-SOLVING PROCESS		
STEPS	DETAILS	LESSONS LEARNED
1 Identification	Root Problem Causalities (list): Involve other departments to get multiple perspectives.	Assessing various viewpoints, including root causes, results in insights that help us identify the problem.
2 Segmentation	Problem Breakdown (list): Separate the problem into subcategories to identify all possible issues.	Further breaking down the problem gets us closer to the true root cause and lends structure to our problem-solving process.
3 Prioritization	Possible Solutions (list): Identify potential solutions and prioritize based on impact.	Prioritizing makes our process more efficient, as it focuses on testing solutions that are the most meaningful.
4 Evaluation	Conduct Focused Analyses: Test the possibilities in order of prioritization and keep sight of the root problem.	Adhering to the prioritized list helps us focus our efforts on the right analyses, reducing wasted time and getting us to the correct answer quicker.
5 Recommendation	Formulate Clear Storyline: Translate the results into a clear and concise recommendation.	Presenting a clear storyline supports implementation because it helps others quickly understand the problem and why / how it needs to be solved.

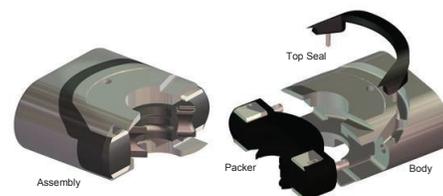
communicating, and adhering to an organized problem-solving plan.

Putting it into Action

Engineering recently used this approach to facilitate a solution plan involving AXON's **Type 50 Variable Bore Rams*** (VBR). Specifically, rubber extrusion occurred on our VBR packer during the high temperature testing required by API 16A (4th Edition). The steps are described above, including valuable lessons learned.

Overall, this organized method provided all members of our multi-disciplinary team with an efficient system to weigh potential solution paths without confusion. Unnecessary uncertainty was removed from the process, allowing us to focus on a comprehensive solution together.

* The VBR includes a ram body, rubber packing, and metallic inserts to resist extrusion.



VARIABLE RAMS FEATURES:

- Packers are designed to seal wellbore pressure on a wide range of tubing and drilling pipes, drill collar or casing sizes.
- When closing pressure is applied, the rubber in the packer flexes and flows around the pipe to form a secure seal.

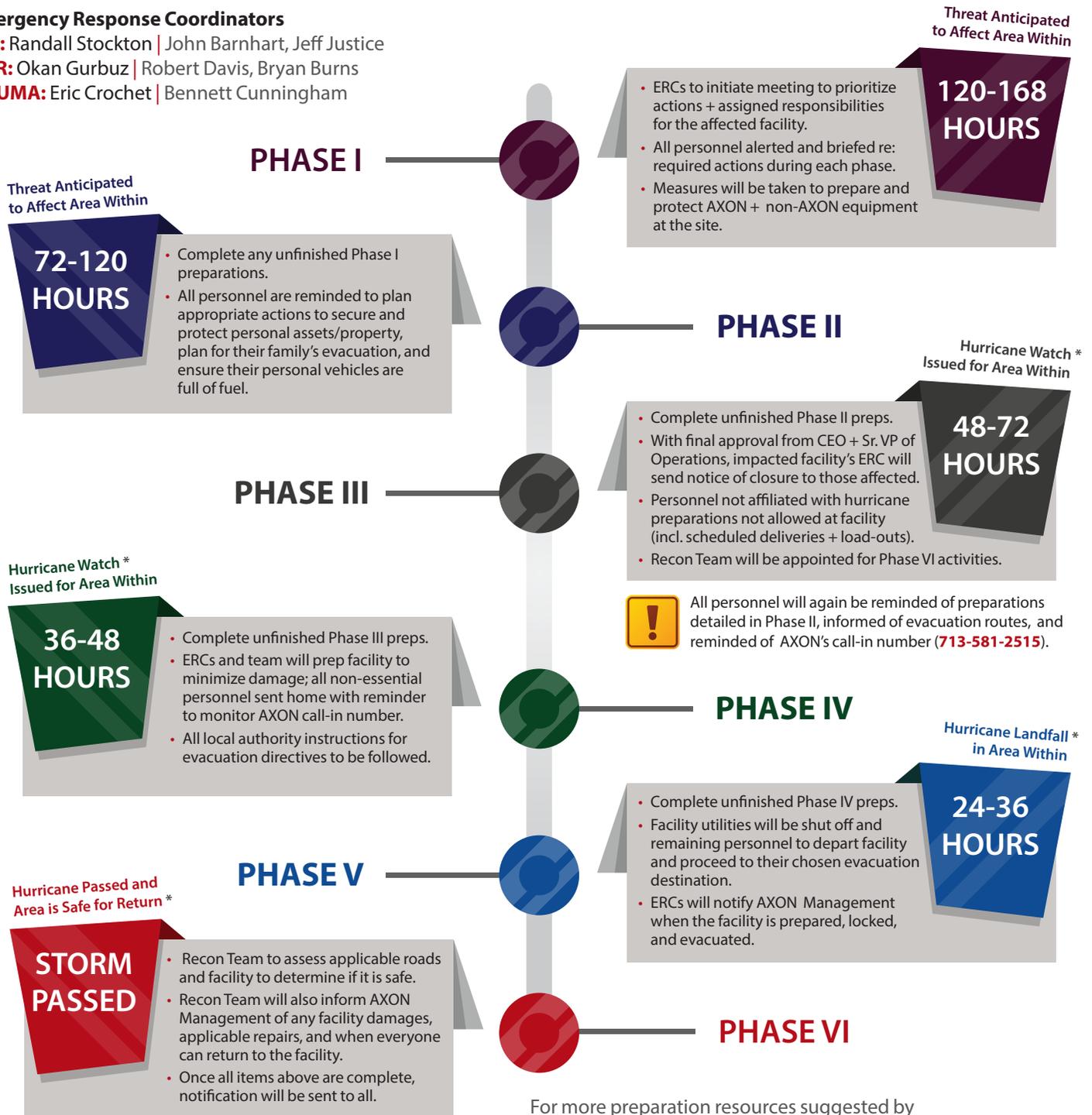
AXON HURRICANE AND TROPICAL STORM EMERGENCY EVACUATION PLAN

Emergency Response Coordinators

JRR: Randall Stockton | John Barnhart, Jeff Justice

NHR: Okan Gurbuz | Robert Davis, Bryan Burns

HOUMA: Eric Crochet | Bennett Cunningham



* Issued by National Weather Service and/or local authorities

For more preparation resources suggested by local authorities, visit: tiny.cc/axonhurricane

ELASTOMER DEVELOPMENT

Thoughtful Improvements on Industry Standards

I just completed my second internship at AXON and will be going into my Junior year with much more knowledge on elastomer development. Working with the Engineering Team to transform the existing mold processes has been a very challenging and satisfying experience. My focus was developing a new approach to maximize sealing characteristics while minimizing rubber waste and extrusion.

BACKGROUND INFORMATION

To be a leading OEM, it is vital that AXON can produce quality elastomers at a competitive price. Part of the challenge is designing molds that will quickly and efficiently produce quality elastomers. For example, it is common practice in our industry for top seals to be designed by first creating a seal that is larger than the groove. Multiple tests are then conducted to progressively adjust the mold dimensions needed to achieve a functional seal.

This “guess and check” method can lead to lengthy periods of R&D testing, as well as added costs. Additionally, seal volumes typically end up being about 110-115% of the groove volume. The excess volume does not allow adequate room for the seal to move, often resulting in extrusion.

SYSTEMATIC APPROACH

For the last month and a half, I spent the majority of my time developing and testing a new calculation system to improve the mold design process

described above. Critical data points and constraints are factored into the calculator configuration to automate the process. Adjustments can easily be made to meet specific product requirements. **The design for our 7-15M LFSR Top Seal was completed within hours using this method.**

Innovations like our new seal calculators come into fruition by taking a **different approach on a known process** (pg 5). It is imperative to begin by understanding the foundation behind the issues we are trying to solve. First, David Cain shared his vast knowledge on polymers and the science behind high pressure sealing. Then, rather than limiting our assessment to product-specific issues, we evaluated areas that could be improved in industry-wide applications.

The “bigger picture” approach helped us develop a reliable calculation system to design new seals significantly faster and more effectively. The precise calculations generated allow for the possibility of completing a seal design with just one prototype. It also increases focus on critical sealing surfaces, resulting in improved field performance. I am proud to have been a part of this process and look forward to seeing AXON’s elastomer progression into the future.

➤ **Mitchel Ramirez, Engineering Intern**
Texas A&M; Mechanical Engineering

CONTINUOUS IMPROVEMENTS

Machining time was recently reduced significantly for AXON’s Type 50 single and double BOP bodies. In addition to **decreasing their machining time by >60%**, this process improvement freed up a bottleneck resource (Horizontal Boring Machine) for other use.

➤ **Tu Le, Manufacturing Manager**



*After testing machine limitations and design parameters, we found the **Vertical Turning Lathe** could also bore the required flange holes within spec.*

DID YOU KNOW?

- **Did you know...** Per API, all AXON employees must be familiar with the company quality policy and goals/objectives? (ref. quality posters or any Quality personnel for more information)
- **Did you know...** you can check availability and reserve needed conference rooms by adding the room name to your meeting invite? (ref. Outlook contact list)
- **Did you know...** you have access to free online training courses through iSolved? (ref. 6/6/19 HR email on eLearning)

Need more info? Have something you want to feature? Let me know!

➤ **Rachel Chalfant, Sr. Sales Assistant**

AXON

T COMM

Technical Communications Newsletter

Cooperation is the thorough conviction that nobody can get there unless everybody gets there. -VIRGINIA BURDEN

Each employee plays an active role not only for their personal success, but also for the success our company and our customers. Please join us in recognizing new members, promotions, and anniversaries in our AXON team.

JUNE

THANK YOU!

- Jim Henneke, 39 yrs
- Delvin Shelby, 14 yrs
- Bennett Cunningham, 8 yrs
- Mary Swanniutt, 7 yrs
- Dean Crow, 7 yrs
- Luis Guzman, 1 yr
- Christopher Blair, 1 yr
- Cy Vicknair, 1 yr
- Juan Mijares, 1 yr
- Uthman Komolafe, 1 yr
- Andrew Percle, 1 yr

CONGRATS!

- Rey Paulino, Senior Quality Specialist



JULY

THANK YOU!

- Randall Stockton, 40 yrs
- Randy Trahan, 11 yrs
- Troy Ledet, 8 yrs
- James Lovell, 8 yrs
- Tina Rys, 8 yrs
- Woodie Sanford, 8 yrs
- Eric Vicknair, 8 yrs
- Lisa Henn, 7 yrs
- Craig Taylor, 5 yrs
- Rey Paulino, 5 yrs
- Jan Iversen, 1 yr

CONGRATS!

- Paul Barrett, Lead Mechanical Designer

WELCOME!

- Quan Ton



REMINDER:

AUGUST | JRR

Nominations for our August AXON Achiever at JRR need to be turned in by **August 25th**.

Thanks for your support!

➤ Kari Leafe, HR Director

AXON ACHIEVER HIGHLIGHTS

JUNE | Kristy and Ravi were recognized by fellow employees for their exceptional customer service on multiple on-going BOP stack projects for major clients, as well as for their performance above and beyond normal duties. *Great job!*

JULY | Chancey was recognized by fellow employees for his exceptional customer service and motivation, as well as his initiative to lower costs and improve processes. Chancey's recent work on a major job was vital and helped achieve a 51% product margin for a \$1.7 million project. *Awesome!*

Got questions,
comments, or
contribution ideas?

tcomm@axon-es.com