Behind the Wheels Podcast Transcription
Season 2 Bonus Episode 3
The Heavy Duty Parts Report with Jamie Irvine

ANNOUNCER
You're listening to Behind the Wheels with Doug Mason, Dave Walters, and Mike Yagley. This is a show where we talk about heavy truck and medium duty axle ends. Doug, Dave, and Mike bring close to 100 years of experience and expertise in the transportation business.

Join us once a month to learn new things about axle ends. Sponsored by Alcoa® Wheels, the global leader in aluminum wheel innovation.

MIKE YAGLEY
Welcome to another episode of Behind The Wheels. I'm Mike Yagley. And today we have a very special episode lined up for you. We're going to be talking with Jamie Irvine from Heavy-Duty Parts Report, and we had a great discussion with him on wheel torque solutions. And so Jamie, thank you for inviting us to your podcast and thank you for that opportunity to talk to you about what we've done.

JAMIE IRVINE
It was great to have the three of you on the Heavy-Duty Parts Report. And one thing that I really found is that this episode that we're going to share with your audience today, it's like a little masterclass, and I know I've been in Heavy-Duty Parts for 22 plus years, and I learned a lot from the episode. I really enjoyed it. So it was a real pleasure to have you guys and I'm glad to be here today.

MIKE YAGLEY
Well, thank you again, Jamie, I'm really looking forward to this. I hope everybody enjoys it as much as we did.

JAMIE IRVINE
Welcome to the Heavy-Duty Parts Report. I'm your host, Jamie Irvine. We're here with the hosts of Alcoa Wheels Behind The Wheel podcast. And we're going to hear about a success story that goes back 10 years. A group of industry experts came together to solve a customer's wheel torque issues. Now our guests today made their debut on the Heavy-Duty Parts Report on June 1st, 2020 episode 48. Links are in the show notes if you'd like to go back and listen to that episode. Now I'd like to introduce all of our guests today. So Doug, welcome to the podcast. Welcome back to the Heavy-Duty Parts Report.

DOUG MASON
Thank you very much Jamie. Very happy to be back. Thank you.

JAMIE IRVINE
It's a COVID world and you're in the basement today.

DOUG MASON
That's right? Yep.

JAMIE IRVINE
Sounds good. Dave, nice to have you on the show.

DAVE WALTERS
Thank you, Jamie. It's great to be back.

JAMIE IRVINE
Mike. Nice to have you back.

MIKE YAGLEY
Thanks Jamie.

JAMIE IRVINE
So we are here today to talk about a really a success story, but in order to understand the whole story, we've kind of got to go back in time. 10 years ago, you had a fleet reach out to you. What kind of fleet was it and what was the problem that they were having?

DAVE WALTERS
It was a major waste company in the US and they were having wheel offs and nobody in the industry likes to discuss wheel offs. It's one of those topics where we know they're out there, but nobody wants to talk about it. This company was having issues and they basically came to a group of four of us and said, "Hey, would you be on the team?" So they wanted a wheel guy, a stud guy, a not and hub guy, and then a torque tool gentlemen. And we all gathered in their facility in Detroit because it was centrally located with the companies that was involved in this. And we'd go up there and we would have our planning session and say, would this give you better clamp load? Would this help in the wheel retention? So we were kind of, I would describe us as mad scientists with actual trucks that we could try or ideas and concepts at, and as we went through this process, we could say, wow this is working. This is not working.

DAVE WALTERS
So one of the great things that came out of this to start with was we didn't realize, but grip length means a lot. And grip length means if you would run aluminum wheels compared to steel, you're getting a longer stud. So anything from the head of the stud until the nut body. So, I mean, cash drums were thicker than a steel jacket drum, aluminum hubs was thicker than that. So the concept went to let's get more grip length because this is going to help with some wheel retention. So I know Mike can help us kind of explain that a little bit more to our listeners.

JAMIE IRVINE
Right? So the situation is this fleets having wheel offs is dangerous. They bring you experts together to say help us solve the problem. And as you started to tackle it, you started through trial and error to try to identify what's the problem and how to solve it. So, Mike, let's go a little further on torque grip. Why is it so important? Explain to us what was learned from working with this fleet to try to solve their problem?

MIKE YAGLEY
Well, I guess fundamentally the very first thing our listeners, your listeners have to understand is that the stud is essentially a spring. It acts like a spring. When you take a spring, you pull out a part and that introduces force that holds the whole thing together. When you torque a nut, you're pulling that stud and you're actually stretching the stud slightly. Now that stud is acting like a spring. What Dave is talking about there with grip length is really the difference between having a little tiny spring and trying to pull it and having a good spring with a lot of metal there that you can pull on and you get a little bit more spring back. We've all pulled those little, like those Springs that are in pens. You pull one of those apart, that little tiny thing, and that stretches it over stretches very easily. You start having problems pretty quickly.

JAMIE IRVINE
Try to do that with the spring from a break pot.

MIKE YAGLEY
Like they've said, the more you're putting between the head of the bolt and that nut, the more space there is there, the more you're making use of that spring, that stud that is actually we're treating like a spring. And when we do the math, it all shows up in the physics. You know, if you go back, we use a calculation called Hooke's law, and this is developed back in the 17 hundreds or something to understand how Springs work. And you go through the math and that'll tell you that really the grip of that spring is directly proportional to the amount of length you've got to it. So if you want to increase the grip, if you want to increase the clamping forces, you increase the length and an easy way to do that is like Dave said, add materials that are going to make that stud a little, act a little bit longer.

JAMIE IRVINE
This is probably obvious, but I want to ask just to make sure I have this correct in my mind. So when we talk about the stud acting like a spring, we're not talking about being able to visually with our eye see the stud stretching. This is something at a much like a microscopic level, but it is measurable from an engineering perspective.

MIKE YAGLEY
That's exactly correct Jamie, really you're not going to see that stud actually stretch.

JAMIE IRVINE
If you do you got a bigger problem.

MIKE YAGLEY
If you see that stud stretching, then yeah, you are in a big, big world of hurt. And that's a whole different world of that. Maybe that's another visit, but there's a lot going on there if you start seeing that stretching, but it is stretching slightly and what's called the elastic zone. And when a stud stretches and the elastic zone, if you let it go, it'll go back to its original shape. Once you go outside of the elastic stone and when you stretch it further, it goes into what's called the plastic zone. Then it can't go back to its original shape. And so that's what's happening when you correctly torque a nut on a stud, you're stretching it and the elastic zone. And when you pull that back, that stud should go back to it's normal, it's original shape. Just like a regular... Like a spring would.

JAMIE IRVINE
Right, right. That makes a lot of sense. So back in my machining days, I remember having to calculate how to machine some threads onto a rod. And that was lots of fun. I actually messed it up the first time and just about blew it apart because I went too deep, but I broke the tooling off. It was almost a disaster, but I was like 19 and just learning how to be a machinist. So I guess they forgave me. Doug, when it comes to the threads on a stud, there's a real difference between a rolled and a cut thread. Could you explain to us the difference and why that was relevant in this story?

DOUG MASON
Yeah. The difference is again, in the manufacturing process. You were describing how that you were trying to cut threads. And when you were beginning your machinists endeavor, you moved on to something else.

JAMIE IRVINE
That's why I'm a podcast sales now not a machinist. I didn't have high levels of skill there.

DOUG MASON
So what happens when you're machining them then is you're actually obviously cutting and removing material, right? So you have a bar, a stock bar and you turn it to a certain thread pitch and everything that you need, then you're removing the steel. When you do what's called a roll thread, you don't remove any material in that case. And what ends up happening is you mechanically are putting the threading in through a dye set up, a hardened tool steel is creating that as you roll through, and the benefit to that is... Number one, you're creating a compressive stress in the root of the thread. And that's going to be the weakest portion and where our wheels are going to start to fall apart first, or the studs are supposed to going to fall apart first.

DOUG MASON
And so you create an invention with the thread. You have this compressive force, that's now put in there, you're not removing any material, you're actually pushing it in on itself. And so you're not removing any of the grain we would call it. That would be in a normal machining situation where you're removing and cutting right through the grain. So you get little terrors when you do the machining portion, as opposed to a very smooth finish when you do the rolled portion. So the overall strength of the part, when you're talking from a tensile perspective, and then more importantly, from a fatigue perspective, you have to improve the fatigue life by having roll threads.

DOUG MASON
So that's really the main difference. It's a process that you use, but it creates a big difference in the overall strength and the fatigue life of the study itself. So utilizing those in this situation, when you get to a point where you start, as Mike was calling, going from the, perhaps elastic to the plastic zone, you're going to be able to create more defamation, more rapidly and a machine thread as opposed to a roll thread. And so in this case, I believe Dave, we talked more about it, but the people that he was working with, they said, "Hey guys, let's use roll threaded parts." That's going to be better overall. And I think that was one of the learnings they had, that they start putting all these things together. They actual stretch length. You want to call it the grip length, the stud that's being used. And we'll talk about a few other things as well that went into improving this process dramatically.

JAMIE IRVINE
Right? So Dave, when you were going through this process with that fleet, it sounds to me like there was a lot of variables at play. And so you must have had to just eliminate these kind of one at a time in order to kind of get to the root cause. Is that kind of the approach that you took?

DAVE WALTERS
Absolutely. I mean, every time we would think of something and you got to realize a refuge fleet is unlike any other fleet of trucks where an average refuge trucks, so seven, 14 flats a year, or a normal over the road truck is slim than that. So just a simple thing like a roll threaded stud kept that life going through their life cycle of their truck compared to a cut thread. So they were trying to figure out the cost endeavors of all this. And it's like, "Wow, might cost more upfront, but it's going to save us a ton of money because these studs can last 50 times compared to 10." And so a lot of knowledge was being learned and people would say like, "Wow, that's really great." Well, we didn't notice going in it, but after we were experimenting and working with these trucks, that's one of the lessons we've learned.

JAMIE IRVINE
This has been a fascinating conversation guys. I'm really excited to finish it. And to also hear how the story ended. So Mike, what are indexing sleeves and how do they impact safety?

MIKE YAGLEY
Well, I guess another one of the things that they've, did talk about was indexing sleeves. Like you mentioned now, indexing sleeves are basically, if you look at a wheel on a stud, right? We design the wheel. So it has a lot of clearance. So there's not any problem. The bolt hole, it has a lot of clearance on it and there's no problem putting the wheel tires onto the hub. One of the problems with that is that once that wheel starts moving around in there, once the torque gets up even a little bit, you can get a lot of movement. That clearance that we give our customers to make mounting easy, allows for movement of the wheel under that nut, if the torque gives at all. And so what indexing sleeves do is it's basically very simple. It's just a little typically plastic.

MIKE YAGLEY
They just slip it on and it fills that gap between the wheel and the stud. The stud is 22 millimeters in diameter. The wheel is 26, 27 millimeters in diameter. The wheel, the bolt hole is 26, 27. So you've got this little bit of clearance. And that fills that up. The reason that's important is that when wheel gets loose, when a knot gets loose, one of the things that happens is there's movement underneath there. And just like we're counting on the friction between the nut and the wheel to hold the whole thing together. Once there's movement in any of those surfaces, you start losing that friction and it just starts going off the rails on you. It's, you'll start losing more and more friction, much more quickly.

JAMIE IRVINE
Right? As those holes get elongated too, right. Which then creates more of a gap, which then it's almost like a positive feedback loop. Is that correct?

MIKE YAGLEY
Exactly. Once you get any motion in that joint, it's going to start getting away from you. Then you start introducing motion and the adjoining joints and everything can come loose pretty quickly. Well, it takes time, but it's better to not have the motion. And so what the indexing sleeve does is it just fills up that gap, reduces the amount of motion to almost zero. And it really does help keep that joint nice and tight. It takes that vibration out. And if you do have a little loosening, it increases your amount of time where you can go in and find it and tighten it back up again, the more motion there is, the faster that's going to come loose, the less motion there is, the more time you have to find any problems that are out there.

JAMIE IRVINE
Yeah. That makes sense. And the English language is a funny language, right? We have all these misnomers, like a positive feedback loop sounds like it should always be positive, but it can actually create negative effects at a much more rapid rate. So, Doug, I'll ask you a question like here in Canada, we have a where if a wheel is taken off and then put back on for any reason, the repair place that does it, they have to put a little tag, they kind of hang it from usually your gear shifter. And it says that this wheel has been removed and put back on, and here's the torque specifications. And you have to come back in, in a hundred kilometers or 60 miles and re torque, have those nuts retorqued. Can you explain the science behind why that's so important because it, the conventional wisdom would be, get the biggest impact on you've got rammed that sucker on there and then it's tight.

DOUG MASON
Yeah. Everything we've been talking about when it comes together in this instance, Jamie, obviously when you're torquing down than not itself, you're creating a force instruction that stud, as Mike has mentioned to us. Obviously, if you stretch it too far, like taking the slinky of days of old and pulling it too far, then, Oh no, it won't go back. I can't use my slinky anymore. That's the same thing that happens here. So if you over torque and thus stretch this stud too far, it will not go back into shape. And so it's very important that you meet the requirements of the torque that is specified by the OEM for that particular setup. Every different vehicle, and you go from a class one to a class eight are going to have different torques that are required to hold that wheel in place. And so when you use a pneumatic nut runner, you don't know what your final torque is.

DOUG MASON
You don't know where you're ending up. And as Dave would say, a lot of people like to use the good and tight method. You just get it good and tight. You hit it, you hit it once you hit it twice, three times, maybe that'll be better. And all of a sudden, instead of putting the 450 to 500 foot pounds that you need to put in there, you getting 700, 800, 1000 even, and you've stretched that stud and now it will fatigue and then it will break off. So that's why it's so critical. And you were also mentioning the fact that that needs to be done, or we would say it needs to be checked, not necessarily retorqued, but it should be torque checked. After a certain amount of mileage, driving it around the shop, going around some corners, everyone has kind of a little different amount of time or distance you need to go.

DOUG MASON
But the point is you need to do that because it allows that joint to settle. Anytime you have interfaces together, you have the opportunity to have material in there. You should always clean it, clean it very well, but maybe you didn't clean it quite enough. The studs and themselves should be cleaned off to make sure that there's no debris in there so that you as well don't have any loosening. And that drive that you just talked about, that you do. If the joint is not good, it'll start to loosen that quick. And so by checking it that within five sometimes say up to a hundred miles, depends who you're talking to. You'll catch that. And you'll be able to ensure that when that vehicle leaves, your torque is... And you're going to be good and set for a while.

JAMIE IRVINE
So I feel like I've been in a master class and I just want to make sure that I can pass the test. So if you are over torquing, can you actually put so much force on that, that you move the stud into the elastic so that it won't return?

DOUG MASON
Yes.

JAMIE IRVINE
I passed the test.

DOUG MASON
You definitely can. And people do that all and they just don't realize it. You walk into a shop and they're using a too large of an airline with a gun and they just go at it and yeah, you can bust it right off.

MIKE YAGLEY
You get into that situation like Doug was saying where you pull the slinky and it doesn't stretch back to its original shape. You have to remember that what you're using to hold that wheel onto that hub is that desire of the stud to get back to its original shape. Now, when you pull it, that stud wants to spring back to its original shape. And that's what holds the whole thing together. That's called the clamping force. And if you stretch it so much that it no longer wants to go back, it's just as happy at this new length that you've introduced. You've lost all that clamp force and that's stud is not doing its job anymore.

JAMIE IRVINE
Okay. So Dave, we started the story back in 2011. It is 2021, 10 years later. What is the fruit of the collaboration here beyond just the lessons learned what steps were taken? I believe that this even went as far as to be introduced to TMC. So tell us how the story ended.

DAVE WALTERS
We went to TMC and actually did live demonstrations, why this was so important to the experts in the panel. And it's funny because we had viewing sessions every hour and then people would come by major fleets and watch us. And it really changed the industry because like, maybe they didn't like the whole part of it, but they liked parts of it. So they said, wow, okay. We didn't understand why roll threads against cut threads were so different or wow, indexing sleeves. I had one major fleet say these are cheap little insurance policies. If something does go wrong, that the wheel's not going to fall off completely. These are pretty nice things. So they started to pick and choose and they developed actually a torque tool that can print out a tag of where each stud torque and they put it right on the work order.

DAVE WALTERS
Well, a lot of these shops are saying, this is great because if I'm ever in a legal case, I can say, "Hey, here's the torques it's printed. It's on the work order." So every fleet took a little bit out of wheeled torque solutions. But in my thing is, is we were voted the top four new inventions that year in 2011, we got to the finals. And as I would say, as Dale Earnhardt said, we were the first loser were the runner ups. But the people that beat us is not even in business now. So I guess the longevity. We won, you know what I mean? But when you see refuge trucks with aluminum wheels running around, that was not really what they wanted to do. But through this study, you see most of the refuge trucks running aluminum wheels using the grip length, using a lot of this. And it was a great safety victory for the industry because we learned so much as people being a part of this and to share this to the industry, that's what it's supposed to be about. So I really felt great that I was a part of it that I was asked to be the wheel guy in this part. And it really turned out better than I ever thought.

JAMIE IRVINE
I never would have imagined that 10 years later you'd be talking on podcasts about it. Did you? Not back then. That wasn't even on the radar.

DOUG MASON
That was not on the radar.

JAMIE IRVINE
Well you've been listening to the Heavy-Duty Parts Report. I'm your host, Jamie Irvine. And we've been speaking with the hosts of Alcoa Wheels Behind The Wheel podcast. To learn more, go to Alcoawheels.com. I'm going to go around, we'll start with Doug. Doug. Thanks so much for being on the show.

DOUG MASON
I appreciate it. It's always a pleasure. Thank you, Jamie.

JAMIE IRVINE
Mike, really appreciate it. Enjoyed the conversation.

MIKE YAGLEY
Great talking with you, Jamie. Really enjoyed the show.

JAMIE IRVINE
And Dave, thank you so much for sharing this story. I appreciate it.

DAVE WALTERS
Thank you, Jamie. Great pleasure.

MIKE YAGLEY
I hope you all enjoyed that episode as much as we enjoy doing it. Jamie, how can people get in touch with you for Heavy-Duty Parts Report?

JAMIE IRVINE
So everything that we do over the heavy-duty parts report lives at heavydutypartsreport.com that's Heavy-Dutypartsreport.com. That's where we have all of our podcast episodes. We have all of our other content, things like live videos and exclusive webinars. So if anybody wants to check out the show, head over there and we'll be happy to have you.

MIKE YAGLEY
Very good. Well, again, I hope you all enjoyed the show. We'll see you next time.

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