



## Behind the Wheels Podcast Transcription

### Season 3 Episode 1

### Galvanic Corrosion: Hub Bore Challenges and Solutions

#### 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.

#### DOUG MASON

I'm Doug Mason.

#### DAVE WALTERS

And I'm Dave Walters.

#### MIKE YAGLEY

So over the years, we've seen a lot of different technologies to deal with, what I'm going to call, the galvanic corrosion in the hub bore area.

#### MIKE YAGLEY

And that's just a technical way of saying, of the wheels stick into the hub. This episode is going to be dedicated to talking about what that is, what's happening, and the different ways to solve that problem; whether it's in the shop or if it's been a solution or an improvement, reduction of the problem, has been designed into the wheel.

#### MIKE YAGLEY

First of all, let's talk a little bit about what that is, what is making the wheel stick to the hub? Doug, you want to touch on that?

#### DOUG MASON

Well, I think that, as you noted, I mean the name you gave it, galvanic corrosion, the hub bore makes it very clear. We're just talking about all of the corrosion that occurs due to the close proximity of the hub bore from the wheel and the hub bore from the hub.



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##### DOUG MASON

The tolerances for our wheels are extremely tight to allow a very good fitting wheel, we'll call it. I think we've had other episodes, Mike, where we've discussed uniformity and the impact of the stack ups that we have in the wheel and hub area. This is extremely tight. We're talking on the order of ten thousandths of an inch, can be all that separates the hub bore from the wheel and the hub itself. And so, you can imagine when you're getting all different kinds of elements in there, you're going to create corrosion situations. And the more surface area you have for the wheel and hub to contact the greater that corrosion and that attachment is going to be, and that's observed many times when someone tries to take a wheel off after being on for two years or more.

##### DOUG MASON

And Dave, you probably could give some insight as to what you've seen from people trying to remove a wheel that has been in the field we'll say for a long time.

##### DAVE WALTERS

Yeah. Doug, over the years, I have seen a lot of creativity of trying to get the wheels off because they stick onto the hub bore.

##### DAVE WALTERS

So the easiest solution of that is we always tell somebody in the field that you need to put some type of material that will not allow that galvanic corrosion to happen. There are products in the field, different types of greases and different types of material that can help you do that. But once they're stuck, and these guys get very creative, and they have figured out that some companies have made a tool that they actually put the tool on the end, and they actually pull the wheel off and I've seen those tools used. And they're actually designed for that.

##### DAVE WALTERS

One issue that I've seen with the one tool is they use metal pullers that go into the handhold. If that's really seized, they could actually damage the handhold of the wheel to the point where you could put a stress riser and start a crack there.

##### DAVE WALTERS

I've seen guys take tow motors and put chain through those handholds and try to pull them off the tow motors. I've seen people back off the nuts and go and do figure eights in the parking lot. And the trouble is once you break it loose, that wheel's going to wobbling back and forth as you bring it back in.

##### DAVE WALTERS

So I've seen a lot of people do a lot of things. They've created little blocks, when they pull the truck in the shop and they back the nuts off, they come off these blocks and the impact of coming off a four-inch block will knock it loose with all the weight of the truck. Again, you could damage studs and nuts on the wheels by doing all this.

##### DAVE WALTERS

So what I always tell people, the easiest thing to do is put some type of dielectric grease in there that will help you get the wheels on and off. And that's kind of my field experience that I've seen.

##### MIKE YAGLEY

Once the wheel is galvanically bonded to the hub and that galvanic corrosion... Let me just take a moment here. The galvanic corrosion... What we're talking about there is you have two dissimilar metals; you have steel up against aluminum. And so, when you have those two metals, two different metals up against each other for a long time, that creates what's called galvanic corrosion, and that bonds the two together, you're going to have, there's an electrolyte, I believe, it's a difference in electron energy; and so, you get the bonding between the two. And so, what ends up happening is, it is very, very difficult. Once those are bonded together, it's very difficult to get it off. And that's my impression Dave, and correct me if I'm wrong, once those two are bonded, there's really not a great answer to that. It's really, really hard to get them off.

## Behind the Wheels Podcast Transcription

### Season 3 Episode 1

### Galvanic Corrosion: Hub Bore Challenges and Solutions

#### MIKE YAGLEY

The tools you talked about. If you're going to use something, you want to make sure you don't get metal on metal. You put some sort of protection, I would say, to make sure that you're not damaging the wheel or at least try to minimize the damage to the wheel. Just anything you can do to keep that metal to metal as you're pulling those off, try and minimize that. Do you agree with that Dave?

#### DAVE WALTERS

Yeah. I mean really, like I said, a little bit of preventive maintenance can really help you get the wheels on and off. And the creativity that I've seen in the field is great. I've seen actually people taking sledgehammers and beating on the tire. I've seen them putting wood block wedges and then getting sledgehammers, slamming on those to break them loose.

#### DAVE WALTERS

So, I mean, once it happens, if I was say, "Hey, these are stuck. What would you do to do that?" Like I said, the wheel puller tool would probably be my first step if you were really stuck, but you really don't get them stuck if you put the lubrication on. So that's really the key to this; is putting some type of lube on that, between the hub bore and the little tanks.

#### DOUG MASON

Yeah, I think what you were saying there Mike, it's funny, you were talking about dissimilar metals and the amount of surface contact. And I think that is one of the things that can be done. And I think we've seen that over the years in the innovations that have taken place in a simple hub bore area, reducing the amount of contact that you can have between the wheel and those hub bore tanks, as you were talking Dave, is going to be beneficial. And I think, Dave, you have a pretty good story about how the first innovation took place and maybe we should walk through that and then move on to the next innovation.

#### DAVE WALTERS

I was down the Houston transit, and transit companies at one time ran a 360° hub. So, the wheel on that had full contact. So, the people in the truck market think they got problems with four or five little tanks. That was a big problem. And I'm doing a training program. One of the mechanics looked at me really like, "Why don't you guys put like a groove in there and reduce the contact area, and all these do is line up the wheels?" And everything he said was absolutely true. So, I went back to my boss at the time, said, "Hey, all we have to do is put a little groove in there and we could reduce that contact area and the wheels should become easier, go on and off." And he's like, "Well, how'd you ever figure this out?"

#### DAVE WALTERS

And I said, "A guy told me in mechanic." And it's funny, because I guess if we did it every day, like those guys, the thought process is so much different than us. It's great to sit here and talk about it. But those guys who actually have to do it every day, they figure out that, "Hey, why couldn't you do this? Or could you do this to make it easier?" So it's amazing when you go out and you listen to these guys, tell you like, "Why can't you do that?" And you go, "Why can't we?" So that's how it all kind of started.

#### MIKE YAGLEY

And we had that groove and there was, basically I'm going to say maybe a three eighth of an inch wide groove, depending on the wheel, the hub, the mountain flange thickness, which is the hub part of wheel. We put that groove in there. And that was our technology for Alcoa® Wheels for many, many years. We did that. And I think some other folks in the industry have similar solutions trying to reduce the amount of metal-to-metal contact, those dissimilar metals, trying to get it to the least they could make it to try and reduce this problem. Doug, you want to talk about what the latest technology is that we've got?

**Behind the Wheels Podcast Transcription**  
**Season 3 Episode 1**  
**Galvanic Corrosion: Hub Bore Challenges and Solutions**

**DOUG MASON**

Yeah. I mean the first one you were noting was the hub bore groove and that was in the middle of the section, there was just a groove. And so, there was basically about a five-millimeter land, each side of that groove that would contact the hub bore or the bore tanks, depending on what interface we were talking about. And as the engineers were looking at it in more detail, it just kind of struck them that really the minimum we need interface there is really just the five millimeters. We don't need that full 10 millimeters.

**DOUG MASON**

And maybe that's one thing to talk about for a second is on these hub centric wheels that hub bore is really just there to center the wheel. You don't need a big, long interface. The wheel is simply be centered. And the tolerances, as I noted, are so tight that it's always going to be centered if you have a certain length of land. And we've really kind of seen that to be about five millimeters.

**DOUG MASON**

And so one of the engineers said, "Hey, I think we can reduce the contact area even further, still maintain the about five millimeters of land contact that we've found over the years to be what's needed and help out the guys who are pulling this off every day, even more." And so, they came up, what they call the vHub™ Bore Technology and it again takes out more material while still maintaining the necessary contact and improves the ease of removal.

**DOUG MASON**

And so it's just another step moving forward with that base understanding, Dave, that you obtained from the mechanic on the floor. And I have to agree with you most of the best ideas come off the floor. And so, this is one where it started many years ago and it's continuing to innovate, I should say, as we go forward. So I don't know if you have more to add to that, but that's how I would describe the vHub™ Bore that we have in place today.

**MIKE YAGLEY**

You want to talk about how that vHub™ Bore work works on high load applications?

**DAVE WALTERS**

The vHub™, when it first came out and being in field service, the way I can say it, it was like, wow, this was so different than anything that anybody's ever dealt with. People get worried like, hey, just really explain in the same thing that Doug did is, hey, the wheel needs very little line up, basically the stretching of the stud by the cap nuts and what torque you put on that hold these wheels on. But what we found in the heavy loads was their hub is a little different and basically some of these lighter weight wheels shouldn't go on 18, 20,000-pound axle. And they basically don't line up to the point where they can. So, it's kind of a great, "Hey, you can't put these 7,400-pound wheels on an axle which require at least a 9000 pound or a 10,000-pound wheel."

**DAVE WALTERS**

So the V groove has really done well. Every time that we went out in the field to address the issues with certain customers, once we walked them through it and showed them what everything was, we had no issues. But it protects us too from putting the wrong wheels on the heavy application. So, it has been a success there too.

**MIKE YAGLEY**

That's really turned out to be a great design. We're very happy with it. And I hope our customers are seeing the benefits; the wheels are not corroding to the hub as much, it's easier to get off, if you do have a problem, if it does adhere to the hub, hopefully it's not as bad as it used to be. Have you had any feedback from the customers, Dave? Have you heard that they're seeing an improvement in performance?

**Behind the Wheels Podcast Transcription**  
**Season 3 Episode 1**  
**Galvanic Corrosion: Hub Bore Challenges and Solutions**

**DAVE WALTERS**

What's great about most of our customers is they took the heart about putting some type of lubricant on the pads and the tanks. So, when they started to do that, even with the old hub bore groove that made their life simple. So, when this came around, it still stayed that put the lubricant on the tanks or on the wheel. And it's really funny because it was the people that didn't have lube in their problem are the ones that are seeing something different. And when they talk to you, you tell them, "Well, you should have been putting lube on the whole time.

**DAVE WALTERS**

And so it's really funny. The people that have kind of done all the right things all along, they really don't say nothing because nothing's really changed. It's the people that really didn't do anything to start with are seeing better performance, but still put that grease because galvanic corrosion is alive and well, especially with the materials they're sticking on the roads now, before the storms, and during the storms is much more corrosive than the old road salt. So, corrosion is alive and well. And so, it's even making that preaching about the lubrication even stronger.

**DOUG MASON**

So it's almost like two levels of protection you're saying there, Dave. You got to have the first, which is the lube. And then the addition of the vHub™ Bore groove of some type in there. But the vHub™ Bore at this point, I think it's about 64% less contact than other aluminum wheels that are on the market. So, it just adds an extra layer of benefit to what you're saying. So, it's good to know. You got to put the lube on first. You make sure you have that in place. And then there's an extra level of benefit by going to the vHub™ Bore.

**DAVE WALTERS**

Absolutely. I've been a component of every training program that I've ever done, which is, and I hate to say this, I'll show my age, but literally thousands upon thousands. And I would always tell the guy, "Look, I would rather, you put the lube on the wheel because whenever you put it on, if you put it on the tanks, you could push technically some lube in between the mounting faces, which we don't want whatsoever, put it on the wheel. And that way, as you put it on, any of the excess will come out and it'll be good." And people was like, "Well, that sounds off picky."

**DAVE WALTERS**

Over the years, when customers have done that, they're like, "Wow, we've had some wheel off issues because we did it the old way. And now we're doing it this way. And it's good." So, like I said, it's a touchy subject because of the deicing materials that are used today are so much more corrosive than what we've ever seen in the industry.

**MIKE YAGLEY**

I'm glad you brought up the importance of the order of putting that grease on, the dialectic grease, because that is something I'm just going to reiterate that, you put it on the wheel so that when you put the wheel on, it pushes the grease out and you don't get it on that interface between the wheel and the hub. You really need to have, I'm going to say a high friction, a relatively high friction interface between the wheel and the hub and getting grease on that is not a good thing, that leads to potentially wheel offs, just terrible things. So, I'm glad you brought that Dave. That was a great point.

**MIKE YAGLEY**

Well, I think that does it, everybody. We wanted to talk a little bit about galvanic corrosion, that's certainly something that we see out in the field.

**Behind the Wheels Podcast Transcription**  
**Season 3 Episode 1**  
**Galvanic Corrosion: Hub Bore Challenges and Solutions**

**MIKE YAGLEY**

Anybody who's been in the field, any mechanic out there I'm sure has dealt plenty with galvanic corrosion, not just between wheels and hubs, but throughout the vehicle. And so, we wanted to talk about that. Talk about what we're doing from Alcoa® Wheels, but also, I think our competitors are doing similar things, trying to reduce the amount of interface between the wheel and the hub to reduce the risk of that. But that's a fallback position. The best thing to do is put that grease on, put the grease onto the hub of the wheel so that when you push it on, the grease comes out, but you get that grease between the tabs and the wheel.

**MIKE YAGLEY**

I think that does it. I want to say, thanks guys. And we'll see you next time.

**MIKE YAGLEY**

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