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# AGRICULTURE

Innovative AAID Control System is the Answer to Soil Compaction

AgriBrin



IT MIGHT BE a sketch penned on a napkin, a flash of brilliant inspiration while driving home, or perhaps observing a simple process in action that serves as a catalyst for a sudden idea that leads to a game-changing invention. Oftentimes inventions are borne out of these types of first-hand experiences and a deep desire by creative-minded individuals who are driven to making their work environment as efficient as possible. Such is the case for a southern Ontario hog producer and cash cropper named Jake Kraayenbrink, who along with other farmers has had to deal with the scourge of soil compaction the entire time he's worked in agriculture. It would appear he and a team of experts around him are well on the way to solving a major problem for all farmers alike.

A life-long farmer, Kraayenbrink is the oldest of five children of parents who emigrated from Holland. The family settled on a farm in Port Lambton, Ontario along the St. Clair River, which separates Canada and the U.S. state of Michigan. In 1987, Kraayenbrink married his wife Betty from Aylmer, Ontario and in the following year they purchased a 100-acre hog farm near Moorefield, Ontario, about 55km northwest of Guelph. In 2003, he expanded his farm holdings and also became quite involved in doing test work with the University of Guelph and government agricultural ministry workers on the value of manure and soil health.

As noted, a major concern with farmers around the globe centres squarely on soil compaction. Nowadays, as farm tractors and



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field equipment continue to become more sophisticated with constant advancements in technology, it also means utilizing considerably larger and heavier machinery to execute various tasks such as manure spreading in the fields, which only exacerbates the negative ramifications of soil compaction.

Densely compacted soils contain few large pores and have a reduced rate of both water infiltration and drainage from the compacted layer. Kraayenbrink and several friends began tossing around the idea of deflating the tires on farm vehicles and decided to elicit the advice of a researcher named Greg Stewart, who subsequently felt the idea was an intriguing one.

A government-funded program for innovative

ideas led to Stewart and Kraayenbrink teaming up for a project on inflation and deflation.

"I was providing the tanker and Greg was doing the research on compaction benefits with deflated tires and the funding paid for the capital costs," Kraayenbrink begins.

It's believed the initial idea for deflating tires may have occurred on D-Day during World War Two on the beaches of Normandy. Innumerable vehicles used by the allied forces became stuck on the sandy beaches, but after deflating the tires they were able to drive away. Following extensive research based on that same methodology on the Internet, Kraayenbrink and Stewart realized that some European countries had been using the deflation-inflation model for more than 20 years.

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"I think I must have sent about 170 emails trying to decipher how their system worked," Kraayenbrink says.

Through additional government funding, Kraayenbrink, Stewart and Sam Bradshaw, an engineer from Ontario Pork, traveled to Europe in March, 2010, gathering pertinent information in Denmark, Holland, Germany, Belgium and France.

"I was able to stay a bit longer and went to six manufacturers and two universities in five countries Kraayenbrink quickly surmised they had borne and learned a lot. But those manufacturers weren't witness to a robust system for trucking, but it was far more elaborate than necessary for agriprepared to set up in Canada," Kraayenbrink says. Undeterred, Kraayenbrink's group followed cultural purposes. As part of the public project that up with a direct approach to a North American he was working on, it was also his responsibility company that had designed a system for inflating to also demonstrate the system, which meant and deflating tires in the trucking industry. But as visiting numerous towns across the country.

Kraayenbrink points out there is a colossal difference between the fundamental requirements of trucking and farming.

"A truck tire has high pressure and low volume, whereas agricultural vehicles have high volume and low pressure," he explains.

# **Refining the Technology**







Another major concern: it took the system about two minutes to deflate the tires.

"If you're not a farmer you may not appreciate that, but for a farmer whose work is seasonal and where every second counts, two minutes is a long time to sit at the side of the road to wait to go into the field, especially if you want to do three or four loads in an hour," Kraayenbrink notes.

It became readily apparent to Kraayenbrink that a system more closely-suited to agriculture would be necessary so he, engineer Maurice Veldhuis and truck mechanic Steve Bailey created an entirely new system catering to farm vehicles, called the Automatic Air Inflation Deflation (AAID) control, which incredibly is able to deflate tires in just 20 seconds.

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– Jake Kraayenbrink

"We're really excited about it and it's all done without leaving the tractor seat," Kraayenbrink says. "The three of us worked the winter of 2011 at the Kraayenbrink Farms shop to develop the new system."

The impressive AAID control system allows a farmer to adjust their vehicle's tire pressure from the fields to the paved roads and back again. By reducing tire pressure, the tires' footprint widens and lengthens, and as such increases surface area while reducing soil compaction. The AAID control is not only compact and fast, but also exceptionally versatile. It comes equipped with a manual override if any part of the control system fails, so there is never any down time, which is of critical importance to a farmer. The unit can be moved to other implements (large square baler, grain buggy, solid manure spreaders, etc.) very easily with a quick attach table that requires only four bolts. The invention has been extremely well received,

which has aided in moving the initiative forward.

"Doors have opened that guite frankly we didn't expect," Kraayenbrink reflects. "We've been to a number of shows, and you need to have a display. A tire company gave new tires and a tractor company loaned us a new demo tractor so we have new equipment at the shows. That meant a lot to us because in business, if the doors don't open it makes it hard to move forward. We credit a lot of our success to the help others have provided to us."

Since the creation of the AAID control five years ago, Kraayenbrink has attended numerous trade shows and conventions where he'd been known for decades as a pig farmer sell-

ing breeding stock, so it's been somewhat of

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a transition for those old acquaintances to see him taking on this brand new role.

While the initial prototype system was a positive start, Kraayenbrink and his team promptly recognized that in order to head down a successful path they would need to develop enhancements to the technology of the control system to make it extra special. There was also the matter of covering off legalities, such as finding a competent patent lawyer.

"All of these things were new to me," Kraayenbrink admits. "Ontario Pork advised me to look into Bioenterprise so I went there and met with Doug Knox and he was a huge help. That organization specializes in mentoring new businesses. We're very excited for being a part "Ontario Pork advised me to look into Bioenterprise so I went there and met with Doug Knox and he was a huge help. That organization specializes in mentoring new businesses. We're very excited for being a part of all this with

 them. They directed us to people who have been great value to us in helping move forward with AgriBrink."

– Jake Kraayenbrink





of all this with them. They directed us to people operator doesn't have a device to measure tire who have been great value to us in helping move pressure the lifespan of the tires can be greatly forward with AgriBrink." compromised," Kraayenbrink says.

A little more than a year ago, AgriBrink discovered a company called NeuronicWorks, a **AAID Operation** Toronto-based engineering consulting company that specializes in providing custom hardware, The AAID control system is very simple to opersoftware and system design services. There was a ate with a toggle switch that deflates the tires in need to catapult the team's invention to the next 20 seconds, providing 60% more surface area level and this was the partnership to do it. allowing the farm vehicle to enter the field and greatly reduce soil compaction as the tires ride "They helped in making our controller do additional things and it was assembled with the building over the ground rather than sinking into it. Upon blocks from ISO, which allows you to take a piece leaving the field, once speed is increased beyond a pre-set level, (typically about 18km/hr), an of equipment and plug it right into the monitor of the newer tractors," Kraayenbrink says. alarm will go off signalling to the operator that The AAID controller has a built-in global it's time to inflate the tires.

positioning system (GPS) and also a data log-"The only way to get rid of that warning ger, which keeps records of the speed of the sound is by pushing the toggle switch up. It's vehicle and the pressure of its tires. To the best almost impossible to drive the vehicles at the of Kraayenbrink's knowledge this is the first wrong tire pressures without willfully ignoring system that has such capabilities, which should what the controller is telling you. The compresbe music to the ears of tire companies because sor is operated by hydraulics and it has a log for it allows their products to perform to their RPMs and speed and will turn on and off on its optimum level, without compromise. The techown. It's a very easy system for any operator to nology takes the guess work out of whether or run," Kraayenbrink says. not the proper pressure is in the tire or if it's in A small controller with a toggle switch is the proper range. The AAID controller ensures all that sits in the front cab portion of the tractires on tractors are inflated to the optimal level, tor. Another box that is about 10 inches, by 10 whether it's driving on hard pavement, loose inches by four inches deep sits on the tanker gravel roads or on the soft soil in the fields. and it has air going in and air going out that Crucially, the system adds a significant amount regulates tire pressure. Each of the valves and to the lifespan of the tire – often in excess of components come from the trucking industry 25%, which translates into huge cost savings. and meet all safety regulations.

"Some of these units have eight tires. If the

It's no secret that some people are adverse



to change and many farmers are quite leery about the putting their fate into the hands of electronic technology, especially because much of their work is seasonal. They may have a need to be out in the field for just a couple of weeks, so it's essential the unit works flawlessly when called upon. But there was also a time when farmers balked at the thought of using higher-priced radial tires for their tractors. However, when the tractors

couldn't properly navigate their way through the fields with a plow there was a switch to radial tires and all of a sudden the tractors were much more able to pull the plows because of superior traction. Kraayenbrink envisions his system as being equally revolutionary.

"It will take cooperation on machinery manufacturers to be able to put compressors into their tractors, but we hope that our controller would

be the controller of choice because of the speed, simplicity and reliability of it," he says.

Reducing soil compaction while improving soil health and crop production are all tied together as part of the main objective. But there are numerous additional benefits to inflating and deflating tires on farm vehicles.

"The system is made from a farmer's perspective, but we have used excellent engineers

"We can reduce fuel consumption in the springtime by at least 15%. There is also a huge saving on rubber. Making a tire last 25% longer is significant."

## – Jake Kraayenbrink

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who have built it to our required criteria, making it practical and beneficial for the farmer. The teamwork has been great. It's also huge for the environment," Kraayenbrink mentions. "We can reduce fuel consumption in the springtime by at least 15%. There is also a huge saving on rubber. Making a tire last 25% longer is significant."

To illustrate how the system works, imagine having a 10-speed racing bike and a mountain bike in the sandy dunes. The mountain bike rides over top of the sand and takes less energy than the 10-speed because of its wider tires, whereas the narrow tires of the 10-speed sink into the sand. Conversely, on a paved road the tires on the 10-speed bike have less surface area and requires less energy to accumulate speed, while the bulkier mountain bike tires serve to slow a rider down, creating more friction with the surface of the road. The same methodology holds true with farm vehicle tires and the hard or soft compound being driven on.

The bottom line is that the inflation-deflation system allows farmers to get into the fields sooner, and time is money. It's preferable not to have to go into the fields during periods of

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detrimental weather, but if rain is unrelenting for a week or two at a time, there is no choice but to get the job done. Kraayenbrink says that with the system and having a larger footprint there is the ability to get into the fields earlier.

"The idea is not to promote that (entering the fields in bad weather) but the reality is that farmers are often faced with that scenario of having to get into the fields because the weather just isn't giving up – it's raining every day. This widens the period of application for getting the job done. We also seem to have more weather extremes nowadays, so having that equipment is a benefit," he says.

If soil on a farm is densely compacted it will not absorb nutrients in the water the way less compacted land could, and as such it directly affects the ability to grow healthy crops in the field. Based on studies, the No.1 yield robber of crops is in fact soil compaction.

"Compaction and its effects are difficult to measure," Kraayenbrink remarks. "It depends what soil you have, along with the health of it and the moisture."

# Distribution Network Expansion

Now that AgriBrink has patented its controller one of Kraayenbrink's goals as they move into the manufacturing phase is to bring down the cost of the system and also to develop a wide-ranging distribution network.

"We don't have the resources to order 1,000 units to get the price down," he candidly admits.



"My family has been a huge help and without them I wouldn't have been able to do it. We're looking to establish the foundations for AgriBrink to have a product that works really well and we hope to entice an established company that could use this in their product line."

A primary objective is to inform as many farmers and agricultural companies about the product's existence. As demand for the unit increases AgriBrink is looking to team up with a partner company that has the capability of massproducing the units. The message of innovative improvements has to be reiterated many times before any considerable movement can occur, which is one of the reasons why Kraayenbrink has spent a tremendous amount of time on the road, talking about the notable advancements in technology that are now available to farmers.

Funding is available for eligible farmers to receive up to 65% back on AgriBrink's tire inflation-deflation system, including installation through the GLASI Farmland Health Incentive Program. It is only available for a limited time so Kraayenbrink hopes farmers take full advantage of the significant cost savings. The Ontario Soil and Crop Improvement Association will also be able to provide more detailed information.

"It's huge when the government takes our system and makes it available to farmers and says they'll pay 65% of the cost to purchase the "It's huge when the government takes our system and makes it available to farmers and says they'll pay 65% of the cost to purchase the equipment because they recognize the benefit of it."

# – Jake Kraayenbrink

equipment because they recognize the benefit of it. To have the 'science world' as I call it give their approval to what we're doing is a major step and that's about where we're at right now. I believe this is ready to just take off but it has to earn the respect required to build the business," Kraayenbrink says.

Kraayenbrink attended Canada's Outdoor Farm Show for the fifth year this past September and the AAID controller was so exceptionally well received by those in attendance. "I was constantly busy with people coming to talk with us. We had a couple of tire companies that really took an interest and could see the benefit of what this system can do for their tires. When the tire manufacturers realize this is equipment that can benefit their tire, it has huge implications for this system to go ahead."

Kraayenbrink averages six or seven major trade shows per year, showcasing the AAID controller system, but that number may increase over time. Despite that full-time commitment he still manages to be involved in the field work at his farm but a good portion of his time is spent on this new project, where he continues to add more building blocks. As the system further develops, one of his main objections is to have the system be as user-friendly as possible.

"I want to sell a system and never hear about any problems with it and we work hard to make that happen," he says.

Much of the attention created by the AAID control system is still new to Kraayenbrink, who up until five years ago had very seldom been interviewed by a media outlet. Since then AgriBrink has been featured in about 25 publications throughout North America.

It's rather apropos that the 68th UN General Assembly declared 2015 the International Year of Soils, with the goal of raising full awareness among civil society and decision makers about the profound importance of soil for human life. As an extension of that platform, it appears Kraayenbrink is on the cusp of something big; something that has the ability to transcend farming around the world. **CBJ** 

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