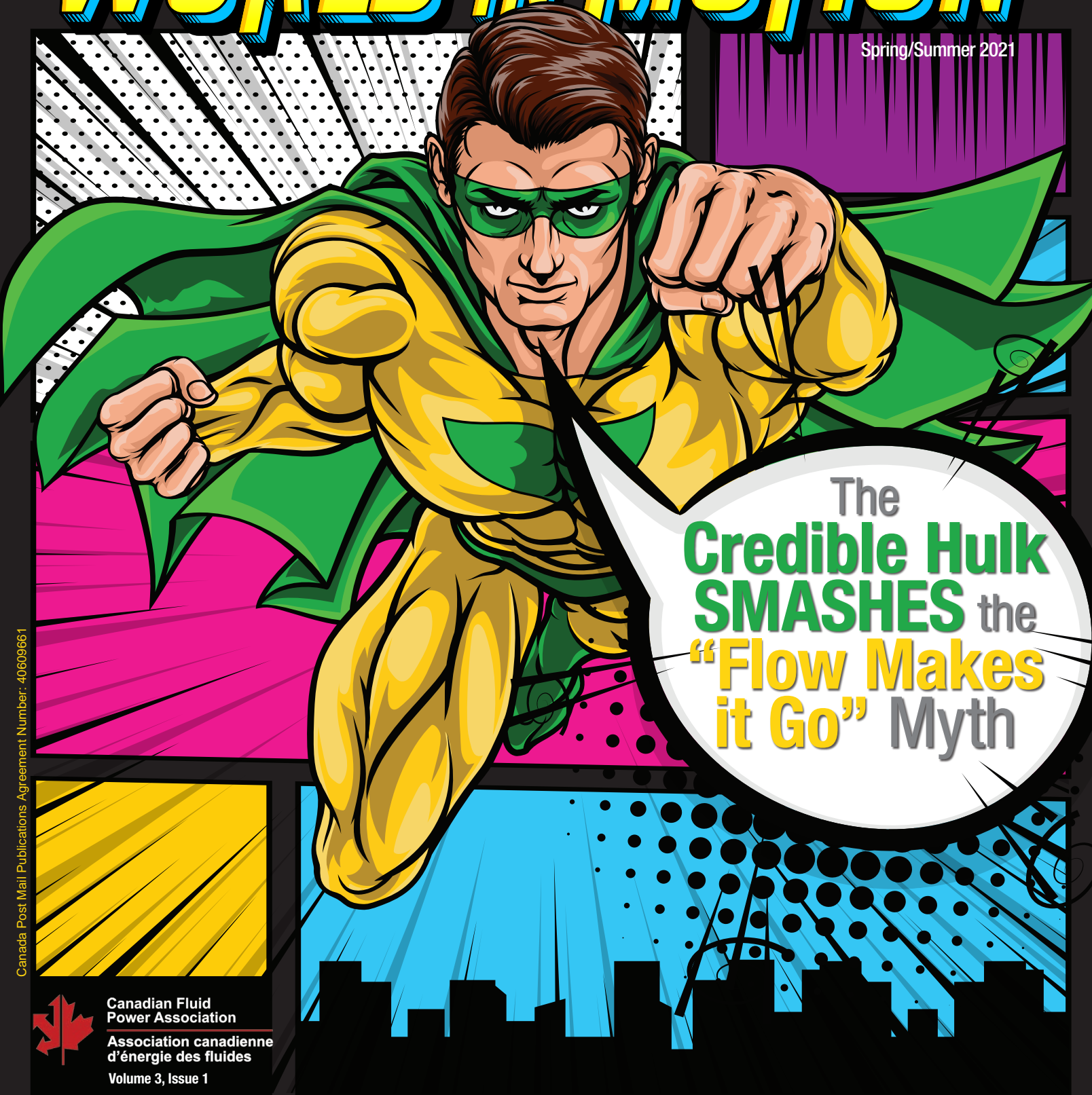


YOUR WORLD IN MOTION

The official publication
of the Canadian Fluid
Power Association

Spring/Summer 2021



The
Credible Hulk
SMASHES the
“**Flow Makes**
it Go” Myth

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Canadian Fluid
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Association canadienne
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Volume 3, Issue 1

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Caryes Allan
President
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Hope for a New Normal

Here we are over a year later with a glimpse of light at the end of the pandemic tunnel. As vaccines ramp up, it gives people hope that things will go back to normal, or the “new normal” we’ve all gotten used to. It’s hard to imagine I’ll be able to again walk into a grocery store with no mask and then walk out again without sanitizing my hands. But I’m optimistic.

The Canadian Fluid Power Association’s (CFPA) board of directors shares my optimism, with a near-unanimous announcement they would attend our upcoming annual general meeting (AGM), should governmental and employer restrictions allow it. I’ve blocked my own calendar for this upcoming September 22 to 25 in stunning Picton, Ontario. This year, we combine our golf tournament with the AGM to offer the most geographic bang for the buck, since CFPA members may not enjoy the freedom of multiple travel opportunities.

As is customary for the association, we offer more than memorable hotel stays in scenic locations—our dais of speakers is sure to leave an impression. Robert Hawke will engage attendees with his presentation, *Laugh it Off: Harnessing Humour at Work!* Carl Dyke will satisfy your left brain with *The Future of Learning and Skills Development*. We also borrow Mathew Wilson from Canadian Manufacturers & Exporters to offer their Political & Economic Update. See page 16 for more details on the event.

I want to take this time to personally thank each and every member of the CFPA for your continued support. It’s been a rough 13 months, and you’ve overwhelmingly stuck with us despite the challenges. Our membership remains high, which shows industry optimism above and beyond the board and me.

I hope your own optimism is strong, but even with the pandemic’s passing and the strength of the CFPA, we will still need your help. I challenge you to get involved with as much time and effort still left undrained from the lockdowns, homeschooling, and lack of travel. The pandemic will end, but the CFPA will always need directors, planners, educators, committee members, and contributors. E-mail info@cfpa.ca to see how you can help grow the Canadian Fluid Power Association.

We directors and the committees of the CFPA want nothing but to reward you for your dedication to our cause. We continue to develop and expand our offerings to engage and reward our dedicated membership. Although the pandemic sidelined the famous Fluid Power Challenges, we’re exploring avenues of education through online portals. International Fluid Power Society certifications or perhaps digital versions of our Fluid Power Challenge are currently in discussion. Our popular Market Insight reports are, to many, the reason to join the association, so we continue to expand and grow our economic data offerings.

To some, our in-person events provided the most value to CFPA members, and trust me, I miss them as much as you do. It saddens me you all cannot attend the upcoming AGM, but I promise we will make 2022 a year to remember with the CFPA. Stick around for the next 12 months because what comes next will be marvelous. 🍁

I want to take this time to personally thank each and every member of the CFPA for your continued support. It’s been a rough 13 months, and you’ve overwhelmingly stuck with us despite the challenges. Our membership remains high, which shows industry optimism...

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*Ted O'Donnell
Vice-President
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Change & Courage

As I said in my last message, change is the only thing that is constant, and differences are all that we have in common. It's time for us to have the courage to embrace both for the benefit of our industry.

It's time for courage. In the face of this pandemic, it's time for courage as individuals to maintain vigilance against this virus but to also begin to move back to normal—and, as businesses, to accept the new normal and begin to move forward. As an association, we must have courage, too; courage to explore our industries and technologies and to begin to, once again, develop and grow for the benefit of both our members and their businesses.

Change has happened, and it will continue to happen, and those who have the courage to embrace it and use it to their benefit are the ones who will drive us forward. I want for our association to embrace the changes in our industry and have the courage to use those changes to drive our industry forward with new technologies and businesses.

We need to consider adjacent technologies and businesses and how their differences can help our industries and technologies grow. We should consider who else is operating in our sphere of industry and how we might find ways to work together or even how we might change to develop new solutions for our customers that will help them adopt newly evolved fluid power technologies into their new machines and equipment.

What do we, as an association of like-minded individuals and companies working with fluid power, have to do to develop and grow our industry? What do we need to learn or become involved with, or who should we be talking to that will help us drive our industry forward?

Once again, I am requesting participation from our membership and others to help us guide our actions and support the future direction of how our association supports our industry. Things have changed, and they will continue to change. And we, as the representatives and interested parties of the fluid power industry in Canada, have a duty to consider where we are going and what we need to do to help our members develop and grow.

Where do you see technology taking us? What changes have you embraced that are making you stronger? What can you share with fellow members that you see as a positive development for our industry and something we should check into? Who on your team can contribute knowledge for the benefit of our industry? Who have you worked with recently that can help us make a difference?

If this idea is interesting to you, please reach out to us to help us chart the coming years for our industry and how we, as an association, can help our membership and our industry navigate, learn, grow, and change. Bring your ideas, your willingness to change, and your courage to our team.

We are getting closer to a time when this pandemic will be behind us. Now is the time for action. Now is the time to reinvigorate our motivations and look forward with determination, courage, and strength. Now is the time to begin to take action. 🍁

Things have changed, and they will continue to change. And we, as the representatives and interested parties of the fluid power industry in Canada, have a duty to consider where we are going and what we need to do to help our members develop and grow.

on the cover

The Cr



edible Hulk SMASHES the “Flow Makes it Go” Myth

By Josh Cosford, Director of Communications,
Canadian Fluid Power Association

What's more cliché? Onomatopoeia such as **“THWAP!”** used on the pages of comic books to express sounds in text, or the idea that flow makes it go? The unfortunate truth puts me in a position to contradict my industry colleagues, many of whom I've rubbed elbows with over these past dozen years. Nevertheless, I'm here with my close friend, The Credible Hulk, to smash the “Flow Makes it Go” myth once and for all.

Let's start by discussing how the confusion arose. It stems from volume. And why not? A fluid takes the shape of its container, by definition, and containers have volume. The combined volumes of tiny cylinders in a piston pump make up its theoretical displacement. Should we wish to move liquid (and movement of liquid alone), it generally moves fluid equal in volume to that displacement for every rotation of our pump. A 10-cubic-centimetre displacement pump will theoretically move 10 cubic centimetres of liquid in that single rotation.

If we rotate the pump's shaft by hand, we will continue to move liquid from its suction port to its outlet port. Okay, so it doesn't take a superhero to figure out we have flow, right? Be careful how you respond—The Credible Hulk is glaring. Indeed, we do have flow, but not for the reason you think. We'll get back to that later, but let's first define “Flow Makes it Go” as commonly used.

We learn to calculate the volume required to achieve a given hydraulic cylinder velocity using the following formula:
 $720 \times (\text{velocity in ft/sec}) \times \text{piston area (in}^2) \div 231 = \text{GPM required}$

Let's say we want to achieve one foot per second in our four-inch bore cylinder. Your super math powers helped you arrive at just over 39 gallons per minute needed to achieve a single foot of velocity every second. It's math, and math is never wrong, right? Are there any circumstances in which pressure is a factor with cylinder velocity?

“But Josh, you must not confuse pressure with flow!”

$$v_{ss} = K_{vpl} \sqrt{\frac{P_s \cdot A_{pe} - F_l}{A_{pe}^3 \cdot (1 + \frac{\rho_v^2}{\rho_c^2})}}$$

- Where:
- v_{ss} is the maximum steady state velocity
 - K_{vpl} is the valve flow constant of the powered land or edge computed from the valve specifications.
 - P_s is the supply pressure
 - A_{pe} is the area of the powered or pushing side of the piston.
 - F_l is the load force. Subtract if opposing motion, add if aiding motion.
 - ρ_v is the ratio of the flow constant of the power land to the exhausting land. Normally valves are symmetrical so $\rho_v = 1$
 - ρ_c is the ratio of the piston's pushing area to the side that is exhausting.

VCCM equation



Now, we continue addressing the fallacy. The misconception that pressure is resistance to flow often follows “flow makes it go.” We’re told pressure occurs only when flow meets with downstream resistance. Until the resistance comes into play, hydraulic oil flows with perfect conservation of energy, traversing plumbing as if pulled through a vacuum? There are formulae to work through this principle, too, like this one for calculating pressure drop through an orifice:

$$[GPM \div (23.5 \times A)]^2 = \Delta P \text{ (Pressure drop)}$$

How about we use 20 GPM and a 3/16-inch orifice? The Credible Hulk had the answer before I finished typing “orifice” and



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informed me that our resistance to flow resulted in around 950 PSI of pressure drop. Gee willikers, Batman, it seems we’re backed into a corner. In my own argument *against* flow makes it go, I’ve clearly shown that flow dictates cylinder speed and a resistance results in pressure. Luckily, The Credible Hulk brought along more than two tickets to the gun show. He also brought his friend, Sir Isaac Newton.

Zeke knows a thing or two about forces, and he has his own opinion of how things move. In fact, he invented the kryptonite to the “Flow Makes it Go” fallacy: Newton’s first law of motion. I asked The Credible Hulk to explain it. In short, he paraphrased, “Ain’t nothin’ movin’ ‘til me push on it.”

Indeed, big fella. According to the laws of nature, no object with mass may change direction without being acted upon by a physical force. One of the more famous equations ever written tells us when force is applied to a mass, we may easily calculate acceleration:

$$a = F \div m$$

Zeke insisted I used Newtons (go figure), so my example is in metric. Say we want to move 1,000 kilograms, how quickly can we accelerate it with 5,000 Newtons? Even I was able to



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run the mental calculations on this one to arrive at five metres per second squared. Try this mental experiment: change the force number to zero Newtons and recalculate the equation.

Without fail, any time you wish to move physical matter, and even if that matter is oil, it absolutely requires force. Even turning our 10cc piston pump by hand to create flow, the force to move the fluid comes from our hand. Flow doesn't make it go. Force makes it go. Force *allows flow to occur*. Let that last one marinate.



I had The Credible Hulk help me with an example, which you can see to the left. We took his 1,000-pound warm-up kettlebells and attached them to the end of three open-ended cylinders. One cylinder was filled with a steel rod to push on the piston. Another cylinder was filled with ball bearings and another piston to push the bearings. The last cylinder was filled with hydraulic oil and another piston to push on that fluid.

In the first example, The Credible Hulk pushes on the steel rod with

at least 1,001 pounds of force and, assuming we're using ultra-low friction seals, the kettlebell starts to move. Was the volume of the steel rod the source of the movement? No, it was the Hulk's finger creating the force.

The second example shows a tube filled with ball bearings, and if the big guy pushes on the piston, force transmits straight through those bearings and to the cylinder's piston. In turn, that cylinder pushes the 1,000-pound kettlebell. From where did

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the force to move the load come? Once again, from The Credible Hulk.

Finally, our third example shows hydraulic oil inside the tube, contained by the two pistons. The Hulk pushes the right-hand piston and the entire contraption moves with the same characteristic acceleration and velocity he achieved with the steel rod and ball bearings. I challenge you to describe how this differs from the first two examples.

Does flow occur in the last example? Yes, it does. But flow occurred because force was applied. Assuming our cylinder has a tiny one-square-inch piston area, the hydraulic pressure is approximately 1,000 PSI. According to "pressure is resistance to flow," the kettlebell created the pressure, not the Hulk.

"But Josh, if the kettlebell resistance weren't there, there would be no pressure!"

You can bet your comic collection pressure would still exist, even at minuscule levels. As previously stated, no movement

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can occur without some force, and, in our example, that force manifests as hydraulic pressure. If we remove the kettlebell, The Credible Hulk may still need to push with a pound or more of force to overcome friction, and you can double-down your bet with your 8-Tracks that pressure will always be higher at his finger.

The reason the kettlebell appears to “create the pressure” because of its resistance is due to Zeke’s third law, so eloquently stated by The Credible Hulk as, “Me push puny bell. Puny bell push back.” Indeed, if it weren’t for Newton’s laws, fluid power jingles

would have you believe the kettlebells created their own energy. The kettlebell didn’t create the pressure; the pressure came from an equal and opposite reaction. Energy can only move from an area of higher potential to one of lower. The pressure doesn’t start at the resistance. Upstream pressure just increases until it’s enough to overcome downstream load pressure.

If you’re feeling spunky and are comfortable with calculus, let me introduce you to the VCCM equation in the graphic on page 9. This equation still arrives at steady-state velocity, but you can see how vital force plays a role from the variables.

If you’re bored, run through some calculations to see how pressure and flow changes affect velocity. And don’t get me wrong, flow is essential, and the original cylinder velocity calculations are a great learning tool—or if you need an estimate.

However, fluid power shouldn’t be compartmentalized into jingles or considered in the scope of individual equations. Hydraulic systems are a method to intelligently *transmit energy*, which manifests as a *combination* of pressure and flow, not as two discrete, unrelated variables. I’ll leave you with what I call Cosford’s Law: “Pressure makes it go; flow is the rate at which you can create pressure.” **POW!** 🍷

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A decorative graphic at the top of the page features a series of lightbulbs. On the left, three arrows (one red, two grey) point downwards. The word "feature" is written in a bold, italicized font above the first lightbulb. The lightbulbs are arranged in a row, with the one on the far right being illuminated in yellow and having radiating lines around it, while the others are grey and unlit.

feature

In the Know:

In the Know: A Report from the CFPA's Board of Directors

Due to the ongoing COVID-19 pandemic, our most recent board of director's meeting took place, once again, through Microsoft Teams.

This time with 12 directors in attendance, we discussed the usual past minutes, reviewed the financials, and covered the routine topics.

Although we don't discuss financials in this column, it's worth noting the pandemic has not crippled the association. Our famous annual general meeting (AGM) and golf tournament's cancellations were a blow to our top line, but the contribution from a strong membership left us nearly neutral for 2020.

The board voted to combine our golf tournament with the AGM to save cost and provide maximum value to attendees. With the pandemic on full boil and no certainty in the coming months, we wagered the consolidated event would most easily satisfy some of our member company's travel restrictions.

The board reasoned that few members would fly to attend the event; the logical approach was to host the combined event in a location guaranteed to result in the most attendees. We felt a spot easily accessed from both the Golden Horseshoe and Quebec made for the best likelihood of a strong attendance. We decided after the board meeting that beautiful Picton, Ontario would provide an equidistant location, while

offering a scenic landscape with much to offer. See page 16 for more details on the event.

If you've been lucky enough to help with your company's web development, you understand how the process is intensive, to say the least. We're making slow and steady progress on the new CFPA website, which has an improved appearance and includes the membership database. The new database will offer you drill-down options for both companies and products, much like a digital version of our popular fluid power buyers' guide.

We're always crafting new methods to increase membership value, which has been difficult during the pandemic. With heightened comfort stemming from web meetings, we feel it's a perfect opportunity to increase our virtual meetings and presentations. The motion to increase our webinar frequency passed.

We hosted two webinars recently. On April 21, Jason Crawford gave a presentation on the move to automate the food and beverage industry. He provided attendees with an overview of the sector, the industry's challenges, and how automation benefits the industry. Jason was followed by Diana Harrop from Centennial College, who discussed the student wage subsidy from the Career Ready Fund. The webinar concluded with Bonny Koabel from AKR Consulting Canada, who covered the myriad of employment funding programs available to businesses across Canada.

...we discussed the possibility of an online platform to mimic the actual live challenge in fit, form, and function... such a platform offered in conjunction with our Local and National Challenges will provide the opportunity for engagement for schools and students with limited resources.

Our monthly schedule continued in May, when Heather Lalonde from the Economic Developers Council of Ontario discussed how we could rebuild the economy, post-pandemic. We pooled our own resources to offer another of our popular CFPA Market Insight presentations, which always draw a large audience. If you missed these past two webinars, look for details for June's event in your mailbox.

Continuing to discuss our new online economy, we pondered the demand for online hydraulic training, similar to our previous in-person International Fluid Power Society (IFPS) training and certification events. The CFPA feels our offering of IFPS-sanctioned training provides our membership with the value they expect, so keep your ear to the rail as we finalize dates and offerings.

We end this edition of the board of director's report in the same vein of online education. Just as much as for our AGM or golf tournament, the CFPA is legendary for the Fluid Power Challenge created many years ago. We were unable to proceed with even a virtual challenge in 2021, so we discussed the possibility of an online platform to mimic the actual live challenge in fit, form, and function.

Although we've finalized nothing with a new, virtual and online challenge, we feel such a platform offered in conjunction with our Local and National Challenges will provide the opportunity for engagement for schools and students with limited resources. Keep an eye on the board of director's report for updates on this and other essential board topics. 🍁



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The CFPA's AGM revolves around the exceptional collection of keynotes from leaders in the fluid power and economic industries. Each pillar of the CFPA is represented by an industry professional with insightful words on leadership, economics, industrial regulations, marketing, and education, to name a few.

The pandemic has taken a toll on all of us. Our opening keynote, *Laugh It Off: Harnessing Humour at Work!*, will help all of us develop strategies to overcome the mental stress brought on by the pandemic with tools we can all use in our personal and professional lives.

Members have been having trouble finding skilled personnel for years, and



INSET
Sailboats in Picton Harbour, Ontario. Photo by Terry Culbert.

the lack of post-secondary training has become more problematic over the years. We will be looking at the future of learning and skills development and ways to open up virtual training programs that culminate in International Fluid Power Society certification.

Networking is a key benefit of association membership, and this is the perfect opportunity to form new relationships with senior leaders in the fluid power industry. With the right mix of business topics and networking, you'll leave the AGM better informed, connected, and engaged in a host of new ideas.

As usual, the event is not all work and no play. Our opening night will feature a four-course meal with a sommelier and some lovely wine pairings. Our meetings will conclude on Thursday, with a trivia event followed by a casual meal in Amelia's Garden.

MAIN IMAGE
A view along the waterfront in Picton. Photo by Daniel Vaughan. Photos provided by the Corporation of the County of Prince Edward.

Spouses are welcome, and they will be invited to all networking events, plus a special winery tour and lunch on Thursday.

The event will culminate in our 2021 CFPA Annual Golf Tournament at the Picton Golf Club. Golfers will meet on the patio overlooking the water for a networking lunch, and then tee-off begins at 1:30 p.m.

After a long year-and-a-half stuck behind our computers, we really hope we'll be able to welcome members back with a chance to listen to some fantastic keynotes and enjoy each other's company once again! 🍁



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