FUTURE SHOCK

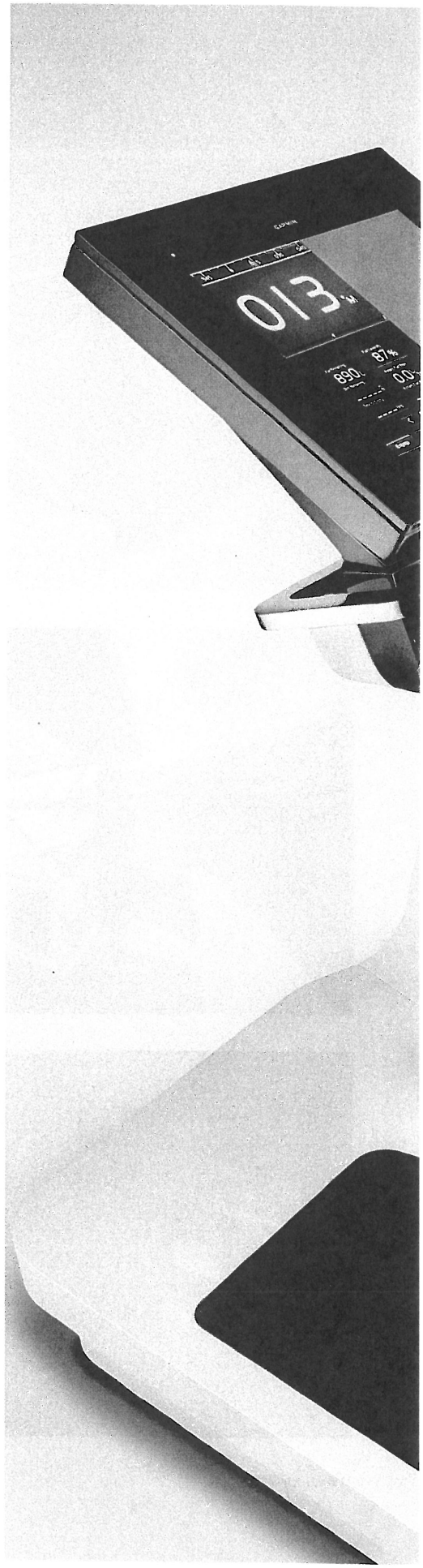
IS ELECTROMOBILITY POISED TO TAKE US BEYOND THE INTERNAL-COMBUSTION MARINE ENGINE? VOLVO PENTA THINKS SO, AND SOONER THAN YOU THINK.

Last summer, by way of announcing its recent purchase of outboard manufacturer Seven Marine, Volvo Penta held an extraordinary marine press conference. By this I mean the thing didn't take place in a boat-show booth, with a cadre of marine journalists looking on. Or in a high-rise conference room hired for a special roll-out, complete with a rubber-chicken dinner.

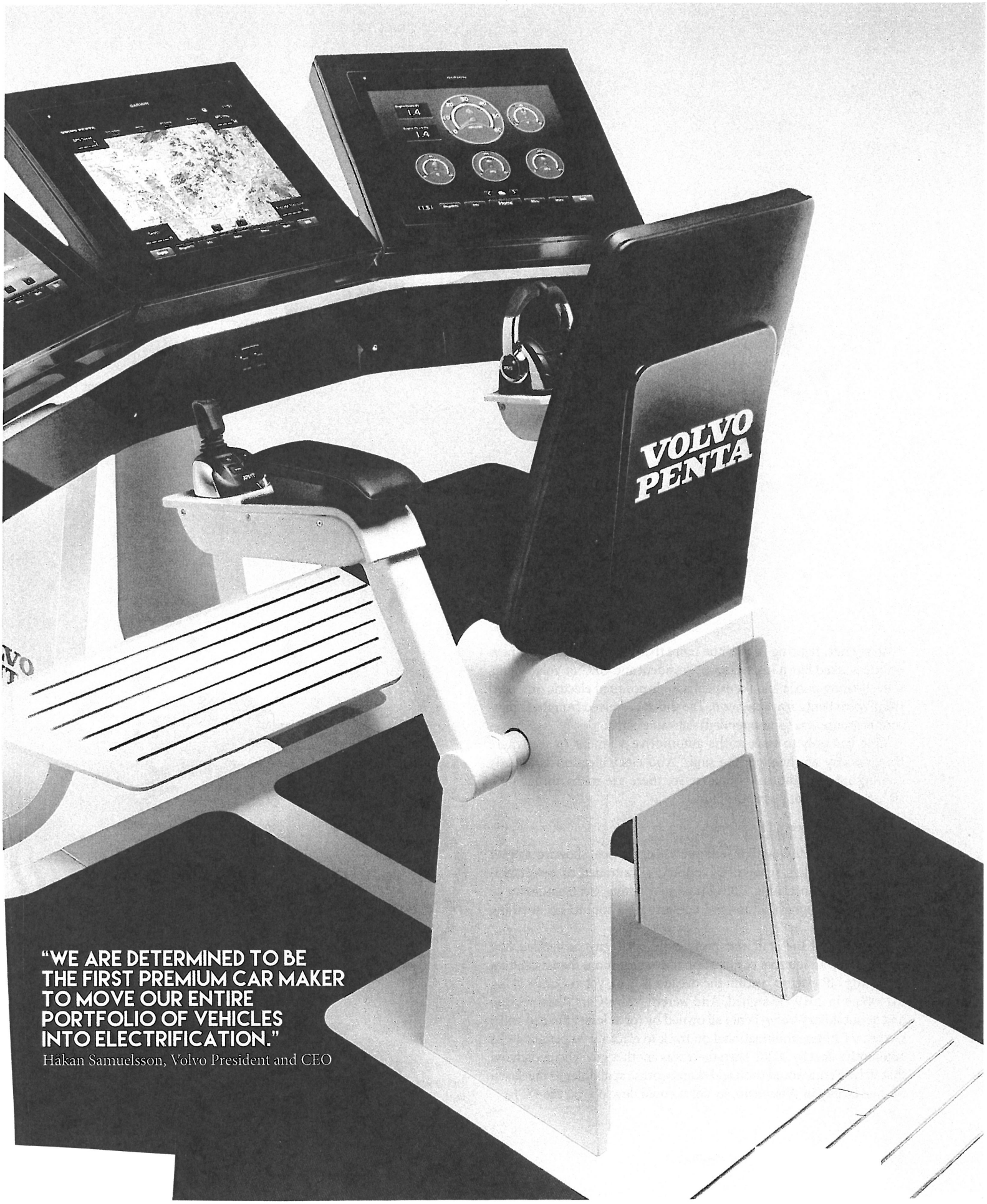
Instead, it occurred telephonically. On the line were the Volvo Penta brass in both Gothenburg, Sweden, and Chesapeake, Virginia; the Seven Marine honchos in Germantown, Wisconsin; and us—the journalists—dialing in from all over the world to listen in and ask questions.

It was an out-of-the-box deal, as far as I was concerned, and unlike any other press conference I'd ever attended. But then, historically, Volvo Penta has always been an envelope-pushing outfit. It put the first stern drive on the market back in the late 50s, introduced the Duoprop's contra-rotating propellers to the recreational marine scene in the early 80s and, just a decade ago, was first up with pod propulsion.

Understandably, the theme of the Global Audio Conference Call, as Volvo billed it, was big-time internal-combustion horsepower—Seven, after all, builds some of the most powerful, gasoline-fired outboards on the planet. So, toward the end of the affair, I'm really not sure what made me toss out what was perhaps a fairly oddball question, given the circumstances. Maybe something somebody had said earlier was spurring me on, something about Volvo Penta broadening its technology platform so it could offer modular solutions, "regardless of energy source."

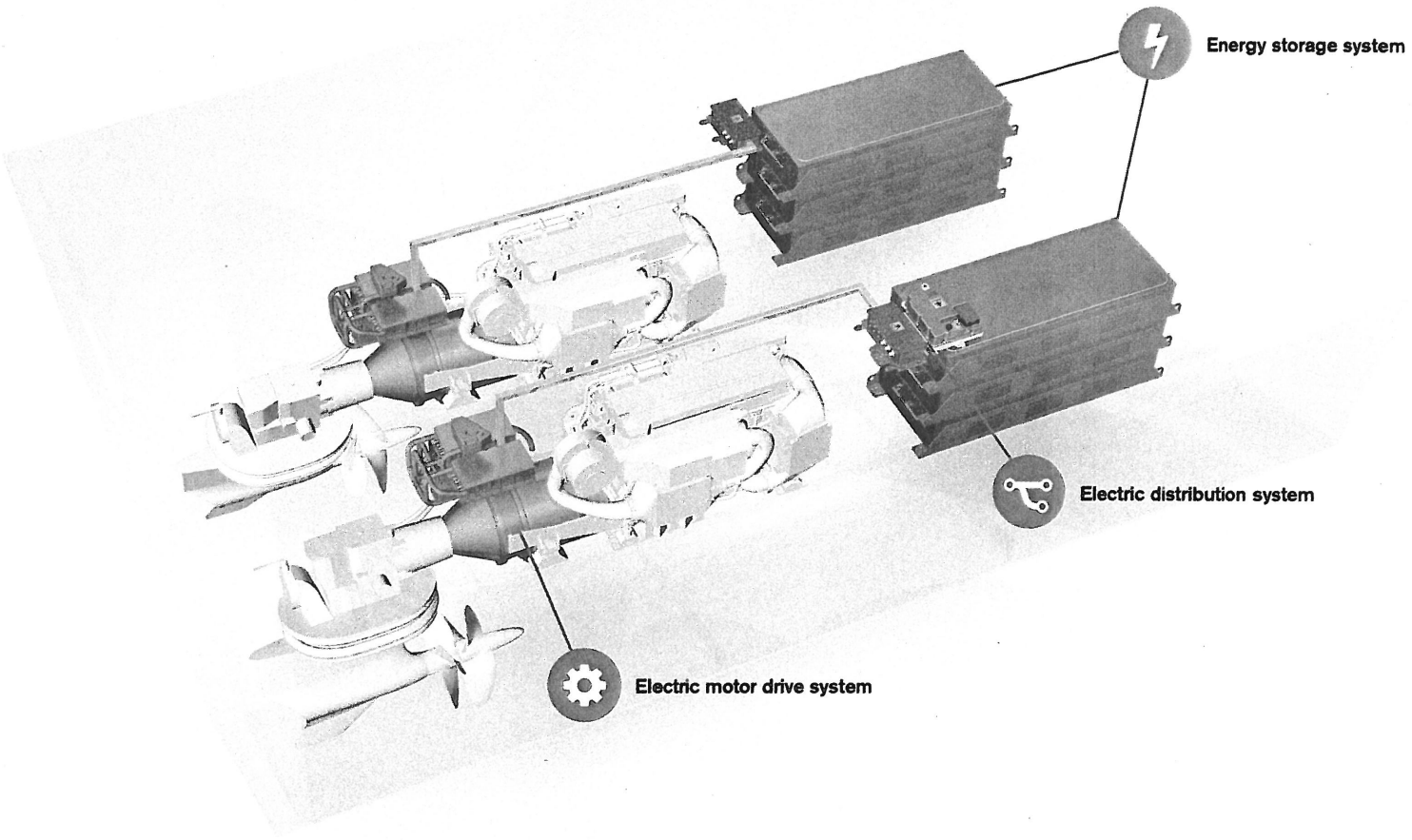


Volvo's helm of the future would "ergonomically optimize" all e-mobile systems.



"WE ARE DETERMINED TO BE THE FIRST PREMIUM CAR MAKER TO MOVE OUR ENTIRE PORTFOLIO OF VEHICLES INTO ELECTRIFICATION."

Håkan Samuelsson, Volvo President and CEO



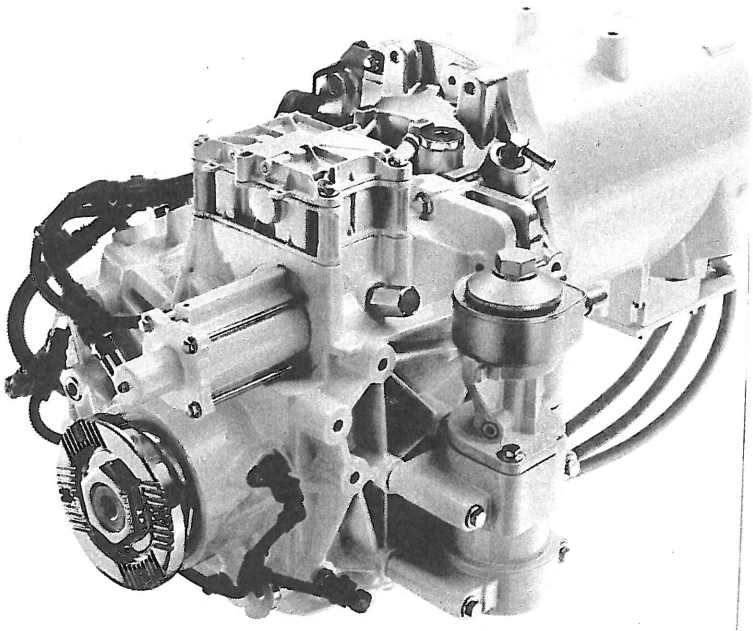
At any rate, figuring I'd get little more than a Swedish guffaw, I nevertheless asked Bjorn Ingemanson, President and CEO of Volvo Penta, if the boating public should expect a high-powered electric outboard from Volvo Penta any time soon. The shock I received from Ingemanson's response was (pun intended) flat-out electric.

"One has only to look at the automotive segment to see where things today are headed," he said. "And electrification is already coming into the marine industry. So, there are many things possible that were not possible before."

The Windmills of Sweden

The months that followed proved interesting. At boat shows and other marinized shindigs around the country, I continued to hear tantalizing tidbits concerning Volvo's up-and-coming electromobility or "e-mobility" program, although I couldn't get a soul to say anything on the record.

And some of the stuff was pretty wild. One guy contended that Volvo Penta, an internal combustion maven for more than a century, was going "all electric" within the decade. Wasn't Volvo Cars making the switch in 2019, he argued. And weren't Volvo Cars, Volvo Group and its subsidiary Volvo Penta all owned by (or at least affiliated with) Geeley, a Chinese multinational on track to electrify 90 percent of its automotive fleet by 2020? Then there was another guy who contended that Volvo Penta would soon add skunkworks capabilities to the Seven Marine facility in Wisconsin, so Volvo could develop (on the QT) a



Top, a schematic rendering of the IPS-hybrid system shows how compact the electric motor/generator (shown above minus shroud) will be.

stable of brand-new, super-quiet, super-efficient electric outboards. Just wait, he advised.

Understandably, curiosity got the best of me. I contacted Volvo Penta, requested an interview with Senior Vice President and Chief Technical Officer Johan Inden concerning all things electric, and eventually found myself flying off to Sweden, a country that produces much of its electrical power via renewable resources. The latter fact was strongly emphasized by the number of huge, modern windmills I saw from above as my plane approached Gothenburg, the home of Volvo Penta's corporate headquarters. There were literally thousands of them.

Buses and Yachts

Inden and I sat down together one afternoon in one of the outbuildings at Volvo Penta's picturesque test facility on the edge of the Gothenburg Archipelago, an immense collection of rocky, forested, mostly automobile-free islands where bicycles, boats, electric cars and ferries are the standard means of transportation. We'd both just arrived from a small, select and quite conventional press conference in Gothenburg proper. There, Volvo Penta president Ingemanson, Inden and a couple of other Volvo principals had made two significant announcements.

The first was a hoot. It zeroed in on Volvo's first self-docking yacht, a 68-foot Azimut (see "A Boat That Thinks on page 192") that had just transported us to the test facility. The second had wider-ranging implications perhaps. It heralded Volvo's first major foray into the field of marine e-mobility. An IPS-powered electric-hybrid vessel (with twin Volvo Penta diesels in the 8- to 13-liter range) was scheduled to launch in 2021.

Right from the get-go, it was obvious that Inden sees hybrid propulsion as the true game changer—the first major step by a major engine company into a future where both commercial and recreational vessels will be environmentally cleaner, more efficient, quieter, smoother, easier to use and more attuned to specific applications than they are today. However, when I asked him how many years he thinks it will be before marine hybrids and all-electric drivelines gain a significant share of the marine market, he was a tad vague.

"One of my colleagues on the truck side got almost this same question the other day during a seminar," Inden observed. "He was asked when half of his revenue base or half of his products will go all-electric. And I think he had a very good answer—he said he had no idea. But also, just imagine—yesterday, we might have questioned if electromobility would really happen. Today, it is about how fast it will happen and how we will scale up for an electric future. Indeed, we are seeing relevant electromobility technologies in service right now as we speak."

Such technologies have one thing in common, according to Inden: predictable usage patterns. It's no coincidence, he pointed out, that buses were the first form of electromobility that Volvo put on the market. Buses, after all, operate within highly predictable parameters, running the same routes daily and making the same stops where equipment can facilitate charging. On the marine front, passenger ferries, water taxis and tour boats are similar—running times are predictably bus-like and so are charging logistics. So, numerous electric vessels of the type are already on the water today.

"However, a yacht—which must be more versatile—is not as easy as all this," Inden continued. "For example, you may not decide where you're going with your yacht and how far until you are actually on board. Or you may arrive at your destination and find a problem with your accommodation, so you change your plans. Full electromobility under such uncertain circumstances is more challenging. So, this is why we will see over the upcoming decades the spread of this technology with conventional propulsion continuing, but also with hybridized drivelines that provide full-diesel for planing speeds offshore, full-electric for mooring or when approaching a dock, or maybe both, where you use the electric motor to boost the diesel power to get over the planing threshold, among other things."

Top, Volvo has over 6,000 electric buses in service worldwide. Bottom, it's also involved in high-profile electric ferry projects in Europe.

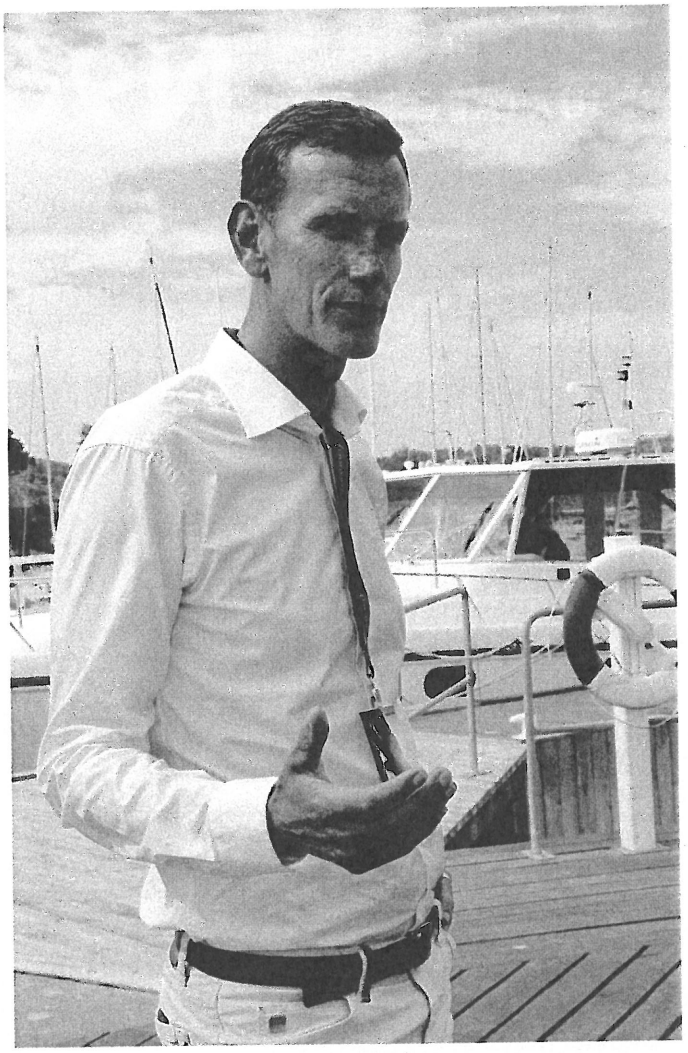
How It Works

Volvo's been doing R&D work on land-based e-mobility for several years and, in fact, already has an e-mobility development and test lab in Gothenburg. Moreover, less than 10 years ago, Volvo Group stopped building and selling buses powered by diesel engines exclusively and made the switch to electric. Today the company has over 6,000 hybrid and full-electric buses on city streets worldwide.

These details, seemingly unrelated to the development of a hybrid-electric yacht, are nevertheless quite germane for one major reason—Volvo is using its highly successful and fully vetted hybrid-electric bus technology to develop the IPS-powered hybrid it will launch in 2021. While one hybrid version will be marinized and the other not, the drive trains (except for transmissions), Lithium-ion battery packs and many other components will be more or less the same.

The IPS-hybrid system itself is of the parallel type, meaning diesel and electric power can be employed simultaneously as well as separately. To achieve this, a clutch and an electric motor/generator (with an inverter controlling both the motor's torque and speed through a 600-volt DC bus system) are compactly spliced into the drive train between the diesel engine and the IPS pod. Lithium-ion battery packs supply juice to the motor (and for hotel loads) and can be charged either by the prime mover or via a remote AC or DC charger. An electrical distribution system routes electrical exchanges amongst the battery packs, the motor and other peripheral components.

How does the system actually work? When you disengage the clutch,



Volvo Penta's Senior VP and Chief Technical Officer Johan Inden.

the boat runs exclusively in the full-electric mode while achieving top speeds, according to Volvo, in the 10- to 12-knot range. Engaging the clutch puts both diesel and electric power into the propulsion system.

Of course, the virtues of a hybrid powerplant are numerous. First of all, in full-electric mode a hybrid is essentially emission-free, generally quieter than an internal-combustion engine and less prone to vibration. And then, while maneuvering dockside, boat handling torque tends to be more robust and instantaneous with full-electric power. And finally, there's the battery customization thing—the size and number of battery packs can be tailored to the purposes of a given vessel. Where a great deal of electrical power may be required, say, for continual or long excursions through environmentally sensitive areas, add batteries. Where less electrical power is required, simply subtract.

A Prophet in a White Shirt

By the time I'd finished speaking with Inden, I was truly intrigued. For starters, he seemed like an eminently practical, down-to-earth guy, with a predictably conservative approach to product development, marine safety and life in general. But then, a flair for the fabulous kept coming up, often unexpectedly and with gusto.

The first time I picked up on this was when I posed a question about battery technology. Lithium-ion dominates the e-mobility scene these days, and I wanted to know what might be next. Might it be graphene—the space-age material that was all the rage some years ago, fizzled out but is now possibly making a comeback?

"My perspective," Inden enthused, "is that we don't see any radical inventions like the one you mentioned going into industrialization right now. And that means, I think, that the current technology will stay with us for a couple of technological generations, where each generation lasts a few years and essentially doubles the energy density of the batteries. However, this is still quite exciting—if you have one battery pack today and you can run ten nautical miles, five years from now you will be able to run twenty nautical miles in the same boat with the same weight and footprint."

While battery technology is probably e-mobility's biggest hang-up these days, the promise inherent in the rapid pace of energy-density development he'd just described seemed to energize Inden, causing him to fervently revisit a futuristic scenario he'd briefly outlined during the press conference in Gothenburg that morning.

The scenario opened in a harbor city where a ship-loading facility occupies one side of the waterway (with electric cranes, electric terminal tractors, partially robotic electric truck trains and autonomously operated electric barges) and a marina occupies the other.

"Now, as a boat owner, I might go to this marina in an electric bus," Inden suggested, "and maybe, on the bus, I will bring out my tablet and tell my boat—it will be either full-electric or hybrid-electric—that I am coming and that I will be at the bus stop near the marina at such-and-such a time. The boat will then prepare itself automatically—it will go online, check that everything is in order, and soon send me a short diagnostic report that assures me all is well before I take the trouble to get off the bus."

"Then I wouldn't be surprised," Inden continued, "that the boat can actually dispatch itself, via the self-docking option you have already witnessed today. It checks the surrounding area, travels smoothly, quietly and with no emissions over to the place where I may be getting off the bus and then away we go on our cruise. Maybe there's an environmental or legislatively-restricted zone that we will pass through where noise, speed and emissions are prevented, but we will have no problem.

"And when we come back, my electric boat will need charging, so why not have that take place at the same charging station that the bus uses? And then, once I depart, my boat will simply take itself back to its slip where charging and shutdown procedures can be completed automatically."

"But is all this realistic?" I asked, somewhat wide-eyed.

"We need imagination," Inden responded with a wide grin. "We need dreams; we need to think about how we can do things even better for the people who use our products. That is our job here at Volvo Penta."

I considered these assertions for a moment, then proffered a grin of my own. Obviously, I was sitting across the table from a guy who seemed normal in many ways—a fellow who drives a normal car, lives in a normal house and cruises with his normal family on normal weekend boat trips around the Gothenburg Archipelago.

But then, just as obviously, I also seemed to be sitting across the table from a prophet of sorts, in a white-startched shirt. And truth to tell, you had to seriously consider the things he was saying, not only because of his influential spot at the top of the marine biz, but because of where today's evolving technologies are generally headed.

Is Volvo Penta's vision of boating's future, and the part e-mobility will play in it, all that far-fetched? Inden doesn't think so and, quite frankly, neither do I. ❐