The technology revolution of vegetation management

With the growing season approaching, PES caught up with Renu Robotics' CEO Tim Matus to find out the latest on autonomous technology in the solar industry and how it can help solve issues around vegetation while keeping costs and energy use in check.

PES: Tim, it's always good to talk to you. When we've spoken in the past, you've always done a great job of bringing us up to speed on how Renu Robotics' autonomous technology is solving the solar industry's growing vegetation management problems. So what's the latest on Renu and its plans for 2023?

Tim Matus: I'm happy to talk to PES again. We continue to grow and we have a lot planned for 2023. In the last year we've more than doubled in size, while fulfilling orders for existing customers and talking to new ones almost every day. In early 2019, there were a handful of us and now we're 50+ employees and growing. We're in the process of looking for another building to expand our operations, engineering, manufacturing and Mission Control.

Our primary core market remains US utility-scale solar power plants, but we've also entered the commercial airport market, which we anticipate will continue to grow. On the solar side, we're operating in 16 states from Maine to Hawaii.

PES: We note Renu is operating solar facilities at utility-scale across the US and we see industry projections of exponential growth not only in the States, but also globally. So with more bigger solar facilities going online every year, that means more acreage and growth potential?

TM: Absolutely. Current projections estimate there are more than one million acres in the United States alone to maintain and that's growing as we speak, especially after the Inflation Reduction Act (IRA) became law. It's led to a massive amount of investment in the solar industry and incentivizes decarbonization efforts, which favors a product like the all-electric Renubot.

Plus, with the Solar Investment Tax Credit (ITC), there's a section that applies both to commercial solar and utility-scale solar facilities. The combined IRA and ITC tax credits can save companies building new solar facilities as much as 40 percent in some cases.

The growth of the solar industry is rapidly expanding on every continent and is likely to do so for a decade or more. Even before the pandemic, there were labor shortages, reliability issues, damages and safety and environmental concerns during routine mowing at these facilities. The Renubot is becoming the preferred solution.

PES: It would seem like with the diversity of the sites in the US, it's a great opportunity to prove your worth. What does the timetable look like to expand in other parts of the world?

TM: We're getting almost daily enquiries from all over the world about when the Renubot will be available abroad. That's to be determined based on several key market-driven factors, but we'll be expanding at some point in the future.

Every day we continue to hone our understanding of vegetation management issues on utility-scale solar plants. Every solar site is different in its design and specifications, so the Renubot's ability to navigate precisely is a prerequisite, considering the limited space between the rows of panels and the wiring underneath.

We've developed artificial intelligence for autonomous operations and use multiple sensors for situational awareness. There are a number of other technological and communications capabilities that make it an autonomous vehicle unlike anything on the market today.

Our Generation-3 is designed specifically for vegetation management on large solar plants and other energy facilities. Real-time Kinematic GPS provides horizontal accuracy within two centimeters.

PES: We've noticed one differentiating factor with the Renubot is that it allows O&M managers the flexibility to mow at night, correct?

Tim Matus

TM: Yes, that's right. The fact it can mow at night has been a game changer for some O&M managers since it has never been done before. They like the fact that the grass can be mowed at night in a certain sector of the facility before crews arrive in the morning for maintenance or repairs. This is an industrial machine that's rugged, reliable and significantly cuts vegetation management costs and carbon emissions.

PES: You mentioned how Renu is learning all the time and with more Renubots now out in the field than at any time in your company's history, how have lessons learned translated into the bot's capability and performance?

TM: It's a good question and I'd start by saying the Renubot was designed by solar O&M professionals specifically for vegetation management on these locations. This collective experience internally supported by conversations with asset owners and O&M managers were the guidelines we used in enhancing the Gen-3.

It has a streamlined body frame that is only 28-inches high to safely mow under panels and solar site infrastructure. The bot's powered by a high-energy lithium battery, so its weight is optimized utilizing the latest battery storage techniques and rapid-charging capabilities. It can mow 100 acres or more per month. We use the 5-5-5 rule as a general guide, meaning it takes five hours to fully charge and the bot can mow five acres during a five-hour span.

When its lidar detects something in its path, maybe some equipment that has been left behind, the bot stops, can go around it as well as wait for the object to be removed. It can mow a 15-degree incline with no problem, go through ditches and has a self-adjusting mowing deck, from 1.5 inches to 9.5 inches, for maximum flexibility.

Its innovative features include controls for energy usage optimization, self-diagnostics

and operational area setup. The bot's enhanced environmental assessment capability will allow it to utilize data so it can learn and assess the facility infrastructure as it travels.

The more discussion there is about climate change and the world's use of renewable energy as it strives for a carbon-free economy, the better it is for the fully electric Renubot, which is great for the environment and certainly helps in the fight against climate change.

PES: You've spoken about the Renubot as a Robot as a Service or RaaS model. Besides the bot itself, what are the other components in the model?

TM: Many people are familiar with a SaaS model for software, so our RaaS model is a complete system for vegetation management. The Renubot can mow in the field anytime in a 24-hour period and when it completes its 'cycle,' it returns to its Recharge Pod to replenish its battery and can receive software updates there or in the field from Mission Control.

The Recharge Pod is 7.5 feet wide and 11 feet long. It's five feet in height, so the bot has plenty of room. It houses the electronics for charging and RTK communications. The pod weighs about 1,200 pounds and we coordinate with customers so there's a flat, level surface where it will sit, preferably on concrete or a gravel base.

When the bot approaches, the pod doors are opened and the bot slowly enters, connecting the charge contacts on the back of the bot and near the base of the pod. The pod provides protection in all climates and is normally equipped with three individual converters for charging. A customer can add converters for a quicker charging cycle – up to six, in fact. But a pod with three converters is typical and its electrical setup can be either standard AC or DC or both, depending on the electrical availability.

If there's an area where electricity isn't readily available, our Solar Charger is the solution. This is the redesign of the original Solar Skid, but now each skid is a more compact three-panel configuration. The new configuration is three skids together to comprise one solar charger, which is connected to the Recharge Pod. Each skid is a self-ballasting unit that produces 1,200 to 1,500 watts with a 5 to 25 kilowatt-hour (kWh) battery storage option. If a customer wants a faster charge, then we can add more skids or another complete charger. It's another environmentally friendly component that means O&M directors will never have to worry about fuel spills again.

The other critical piece we've built in the RaaS model is Mission Control. It's located in Renu's corporate offices where technicians continuously monitor, control and update the bots in the field. System access can allow for security checks, software updates and adjusting maintenance schedules.

Mission Control gives owners and operators peace of mind with a secured and encrypted data flow, allowing for a high-level overview of their facilities' maintenance plan. Whenever it's convenient, asset owners and O&M providers can monitor performance, location and schedules with computers, tablets or cell phones through the Mission Control customer portal.

This center allows for automatic reporting, triggering of alerts and allowing for text or email messages to be sent to any device. Mission Control also is linked to a Service Management System, allowing for a seamless transition for 'trouble tickets' and maintenance repair documentation.

It also offers automated predictive analytics through machine learning. This leverages the built-in automated reporting and notification system to alert users of reliability and/or maintenance concerns.

PES: Renu's growth the last five years is certainly impressive. What's on the horizon?

TM: There are several ideas being discussed about the future of the Renubot and most are in the categories of other O&M measures, such as cleaning, inspection or security.

When we're talking to customers we're also asking, 'what do you need a bot to do for your facility?' The answers are usually similar to the concepts I've mentioned and sometimes they're not, but we'll make market-driven decisions in the end.

Our new Solar Charger and the Recharge Pod's future modifications could range from aesthetic design changes to standardization of AC/DC charging capabilities.

Mission Control will have the future expansion, which will range from enhanced reporting and mapping to video and image capture.

There also will be far more data collection possibilities to help O&M managers. Additional real-time communications and chat capabilities between operators and a facility's O&M staff also are being considered.

We're not only solving problems in the field, but Mission Control is giving owners and operators more confidence with a secured and encrypted data flow about their facilities' maintenance. It's true that more and more asset owners and O&M managers are realizing the Renubot can significantly cut maintenance costs and provide an invaluable carbon-free solution to their annual maintenance issues.

PES: Would you agree that as the solar industry grows, technology will continue to develop to meet demand?

TM: No doubt about it. We saw an increasing demand for vegetation management in which an industrial autonomous mower was the

solution and it needed an ecosystem around it, so we developed Mission Control for oversight and the solar charger for remote charging needs. We've responded to customers' requests on how Renubot can be a turn-key solution for their solar or energy facility and have continuous oversight and data collection that benefits the facility.

Giving customers flexibility is why we offer either ownership or a lease model. But when they compare what they're currently paying for vegetation management, owning a fleet of Renubots makes fiscal sense.

PES: Tim, thank you again for taking time to give us an update on Renu Robotics' growth. We look forward to talking again soon.

TM: My pleasure and it's always great talking to PES Solar. I look forward to catching up again in the future.

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