Intelligent distillery: How AI is rewiring economics of bioenergy

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In an exclusive interview with AgroSpectrum, Anand Mahurkar, Founder & CEO of Findability Sciences, explains why the next frontier in bioenergy competitiveness lies not in producing more fuel, but in producing it more intelligently through AI-driven process optimisation and predictive infrastructure

In an exclusive interview with *AgroSpectrum*, Anand Mahurkar, Founder & CEO of Findability Sciences, argues that artificial intelligence is emerging as the hidden engine of modern bioenergy systems, transforming everything from feedstock management and fermentation efficiency to energy optimisation and ESG compliance. He contends that the greatest losses in bioenergy plants arise from small, recurring inefficiencies that conventional systems fail to detect, but which AI can identify and address in real time. As India accelerates beyond its E20 ethanol blending target and looks toward higher ambitions, AI-powered process intelligence is becoming a critical competitive advantage for sugar mills and distilleries. Looking ahead, Mahurkar envisions AI-enabled bioenergy facilities evolving into intelligent, self-learning energy nodes that enhance grid resilience while delivering stronger economic and environmental outcomes.

How is AI changing the economics and performance architecture of modern bioenergy systems?

The economics of a bioenergy plant are not lost in one big failure. They bleed out through small, recurring inefficiencies, inconsistent fermentation, excess steam use, suboptimal feedstock allocation, equipment that degrades quietly. Conventional systems show you what is happening. AI tells you why, and what to do before the loss compounds.

What makes this urgent is the scale of what is at stake. India crossed the E20 blending milestone in November 2025 ahead of target, and the conversation has already moved to E22. That ambition requires every distillery and sugar mill to perform at its best. At Findability Sciences, we believe the next competitive edge is not just in how much ethanol a plant produces, but in how intelligently it produces it. The margins in bioenergy are not lost in one big failure — they bleed out quietly, every shift. AI makes that bleeding visible before it becomes a crisis.

What inefficiencies inside bioenergy plants can AI identify and optimise better than conventional systems?

The biggest losses are the invisible ones, not alarms going off, but margins leaking out every hour. Take an integrated sugar-distillery operation. The decision on how to split output between sugar, ethanol, and power export is often made quarterly, when the data is telling you something new every shift. That is a data problem, not a capital problem.

What AI does is unify the information that already exists, SCADA, lab results, maintenance logs, feedstock quality — and make it actionable in real time. On a 10,000 TCD mill, even half a percentage point of additional sugar recovery translates to tens of crores over a season. The data has always been there. What was missing was the intelligence layer connecting it. The data already exists in the plant. It just isn't unified, and it isn't used to decide. That's the gap AI closes.

Is bioenergy underestimated as a sector compared to solar, wind, and green hydrogen?

Honestly, yes. Bioenergy doesn't photograph as dramatically as a wind turbine or a solar array, so it tends to get less attention in the clean energy conversation. But it is already the largest source of renewable energy globally, accounting for more than 50% of all renewable energy use in 2023. In India, it is expected to grow up to 45 per cent between 2023 and 2030.

What makes bioenergy different, and more relevant to India, is that it sits at the intersection of energy, agriculture, rural livelihoods, and industrial productivity. When we work with sugar mills or distilleries, we are not just optimising energy output. We are improving the economic health of entire farming communities connected to that plant. Bioenergy doesn't photograph as well as a solar farm. But it's the only renewable that also feeds a farmer, runs a mill, and powers a village — all from the same crop.

How difficult is it to integrate intelligent systems into legacy industrial infrastructure?

It is challenging, but the challenge is rarely technical. Most plants have PLCs, SCADA systems, ERP platforms, lab systems, and manual records all running in parallel with very little talking to each other. The answer is not to rip and replace. The answer is to build an intelligence layer that sits above all of it and makes sense of the data collectively.

The harder challenge is trust. An operator who has run a fermentation process for 15 years is not going to act on a recommendation from a machine unless he understands why that recommendation was made. At Findability Sciences, we design specifically for that. AI should augment what the operator already knows ,not override it. When that relationship works, adoption happens naturally. An operator with 15 years on the fermentation floor knows things no algorithm does — yet. Our job is to make AI earn that operator's trust, not bypass it.

Could process intelligence become the hidden competitive advantage in industrial decarbonisation?

I think it already is - for the companies paying attention. Decarbonisation is not only about switching energy sources. It is also about using less energy, wasting fewer inputs, and recovering more from what you already have. The IEA calls energy efficiency the "first fuel" of the clean energy transition, and for industrial sectors, process intelligence is how you actually implement that idea.

McKinsey's research found that energy companies with advanced AI capabilities achieve total shareholder returns up to 2x their peers. In agro-industrial terms, that gap will show up not just in profitability but in ESG credibility, which is increasingly what large offtakers and lenders are asking for. Decarbonisation is not just about switching fuels. It's about wasting less of what you already have. Process intelligence is where that actually happens.

How critical is machine learning in managing variable bioenergy feedstocks?

It is fundamental. Sugarcane is not a consistent raw material. Moisture content, sucrose levels, trash load, and how long the cane sat before crushing, all of it affects fermentation and yield. A plant running grain-based ethanol faces its own version of this with maize or broken rice quality variations across procurement cycles.

Machine learning helps you get ahead of that variability instead of reacting to it. Our Super 50 AI Farmers programme in Jalna, Maharashtra is built on exactly this, giving real-time advisory to farmers on crop conditions, which feeds back into better feedstock quality for the mill. Better farm intelligence leads to better plant performance. That circular benefit is what makes AI genuinely transformative in this sector, not just useful. Sugarcane is never the same crop twice. The mill that can read that variability in real time — and adjust before the fermentation tank tells you something went wrong — is the mill that wins the season.

Are companies beginning to see AI-enabled energy optimisation as a compliance necessity?

That shift is happening faster than most people realise. A year ago, energy efficiency was primarily an operations conversation. Today, it is a board-level one. ESG scrutiny from investors, carbon accounting requirements from export partners, and sustainability disclosures tied to green financing, all of these require plant-level data that most companies currently don't have in an auditable form.

AI doesn't just optimise the process, it creates a continuous, verifiable data record of how efficiently and responsibly a plant is operating. That is increasingly non-negotiable for companies wanting access to institutional capital or serving buyers with sustainability mandates. Optimisation used to be a productivity lever. It is now a licence to operate. AI-enabled optimisation used to be a productivity conversation. Today it's a licence-to-operate conversation. That shift happened faster than the industry expected.

Where does AI-powered bioenergy fit into future smart and resilient energy grids?

Unlike solar or wind, bioenergy is dispatchable, you can manage it. A sugar mill with a co-generation unit, a distillery, and biomass residue is essentially a local energy node. With AI, that node can become intelligent: forecasting feedstock availability, optimising how it balances sugar versus ethanol versus power export on any given day, and responding to grid demand signals in real time.

India has 499 distilleries with a combined annual capacity of 1,822 crore litres as of mid-2025. If even a fraction of those plants become AI-optimised energy nodes, the contribution to grid stability in agricultural belts becomes genuinely significant , not just as energy producers, but as intelligent, responsive infrastructure. A sugar mill with co-gen and a distillery is already a local energy hub. Add AI, and it becomes an intelligent grid node that responds, adapts, and optimises in real time. That's the future we're building towards.

Does the long-term value of AI lie in automation alone, or in predictive, self-learning infrastructure?

Automation is table stakes. Any plant can automate a routine task. The real value is in a system that learns , that gets sharper as it processes more seasons, more feedstock variations, more production cycles. That is the infrastructure we are building at Findability Sciences: not a fixed automation layer, but a self-improving intelligence that becomes more valuable the longer it runs.

For sectors like sugar, ethanol, and dairy, which operate at the intersection of biological variability and industrial precision, that capability is not a future concept. It is the difference between a plant that performs consistently and one that leaves margin on the table every single season. Automation solves for today. Self-learning AI solves for every season that follows. That's the difference between a tool and an asset.

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