AUGURY

The Manufacturing Balancing Act

Can People, Planet and Profit all take center stage?

Table of Contents

THE MANUFACTURING STANDARD 03

IS PLANET + PROFIT POSSIBLE? 06

THE COMPLEXITY OF PROCESS HEALTH 08

BALANCING COMPETING OBJECTIVES 10

THE IMPORTANCE OF MACHINE HEALTH 11

OPTIMIZING ASSETS FOR BETTER PRODUCTION 13

THE ROLE OF INDUSTRIAL AI 14

WHERE DO PEOPLE FIT IN? 15

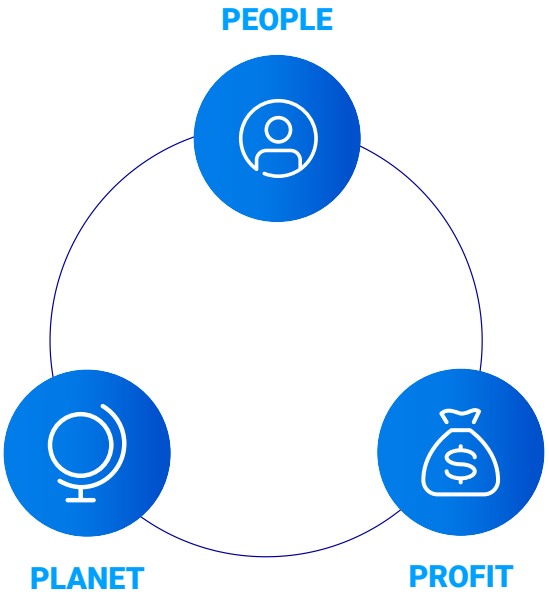
EMPOWERING YOUR WORKFORCE 16

THE 4TH “P” - PRODUCTION HEALTH 18

The Manufacturing Standard: “People, Planet, Profit”

In today’s global economy, manufacturers face a uniquely complex range of challenges. From ever-increasing competition, to greater consumer expectations, to rising energy costs and raw material prices, to supply chain disruptions—simply staying competitive is tougher now than ever before.

And yet maximizing profits is no longer the singular focus it once was for manufacturers. Terms like environmental, social, and governance policies (ESG), decarbonization and zero-emissions, and sustainability are now common goals alongside increasing the bottom line.



There are many reasons for this: from legislation to pressure from consumers, investors and even employees. But whichever way you look at it, **social (PEOPLE) and environmental (PLANET) concerns are rapidly gaining parity with "traditional" business goals (PROFIT) in boardrooms and factory floors throughout the world.**

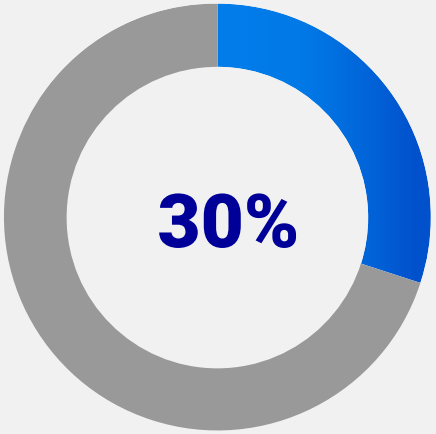
The problem, of course, is that these three priorities don't always go hand-in-hand.

To be sure, there are many clear benefits of this combined approach. For example, studies by McKinsey have shown that "a strong ESG proposition can help companies attract and retain quality employees, enhance employee motivation by instilling a sense of purpose, and increase productivity overall." In part that's because employees today—particularly of the younger generation—value connection and a sense of purpose as much as work satisfaction.

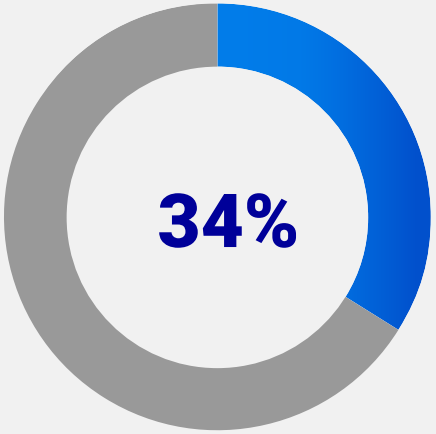
But in the context of manufacturing, there's no escaping the inherent conflict between sustainability objectives like cutting emissions and waste, and business targets like throughput, yield and quality targets.

> A strong ESG proposition can help companies attract and retain quality employees, enhance employee motivation by instilling a sense of purpose, and increase productivity overall.
>
> McKinsey

With entire industries committed to zero emissions targets, and when governments, investors and consumers are increasingly attaching a financial value to negative social and environmental impacts, **how can manufacturers juggle these competing goals?**



of global emissions created by manufacturers



increase in sustainability investing

Is Planet + Profit Possible?

Before we discuss juggling all 3 "**P**s", let's focus more specifically on the issue of **PLANET** vs. **PROFIT**.

Manufacturers are responsible for 30% of global emissions (some 16 billion tons of GHG)—so naturally, the manufacturing industry has become a lightning rod for government and media scrutiny around carbon emissions. As pressure mounts, this scrutiny has evolved into a real financial price tag. Manufacturers are increasingly being fined for the CO2 they produce, and incentivized to use greener alternative fuels and raw materials.

Sustainability is also top of mind for many investors. A 2019 study by KPMG illustrates the clear trend towards sustainable or "responsible" investing—with a 34% increase in sustainable investing assets across the five major markets in just 2 years (worth $30T). Clearly, that trend will only increase, as 81% of millennials expressed interest in "responsible investing."

What's more, according to McKinsey, **consumers across many industries are willing to actually pay more to go green.**

All of this has spurred a wide range of commitments across manufacturing industries—from "top-down" targets like the European Union's Cembureau 2050 Roadmap, to zero emissions in the cement industry, to "bottom-up" initiatives from companies themselves, like the Sustainable Food Policy Alliance focusing on reducing waste and emissions in the food industry, among other goals.

Even in the US, where there are far fewer regulations, 64% of manufacturers plan to transition to more renewable sources of energy in coming years, according to Deloitte.

GOING GREEN AT ANY COST? NOT SO FAST…

The same McKinsey study also showed that consumers will only pay more for greener goods up to a point. In fact, enthusiasm falls away sharply after a 5% price increase across all industries surveyed. For building materials, the number falls below 50% if prices were to increase by 10% or more. That's particularly significant given that industries like cement and steel are among the biggest polluters - and hence face the most aggressive CO2 targets.

And it goes without saying that for all the goodwill in the world, investors won't simply bankroll a company that fails to stay competitive.

And yet it's precisely here, in the nexus between PROFIT and PLANET, that the most glaring and costly contradictions exist on the factory floor.

The Complexity of Process Health

Process manufacturing in particular is fraught with complex tradeoffs between conflicting objectives related to process efficiency, like quality vs. waste, or throughput vs. energy costs. Sustainability targets make this challenge exponentially harder—both by adding additional conflicts like CO2 reductions vs. throughput, or quality vs. alternative fuels, as well as by exacerbating existing conflicts with extra scrutiny on areas like waste and energy intensity.

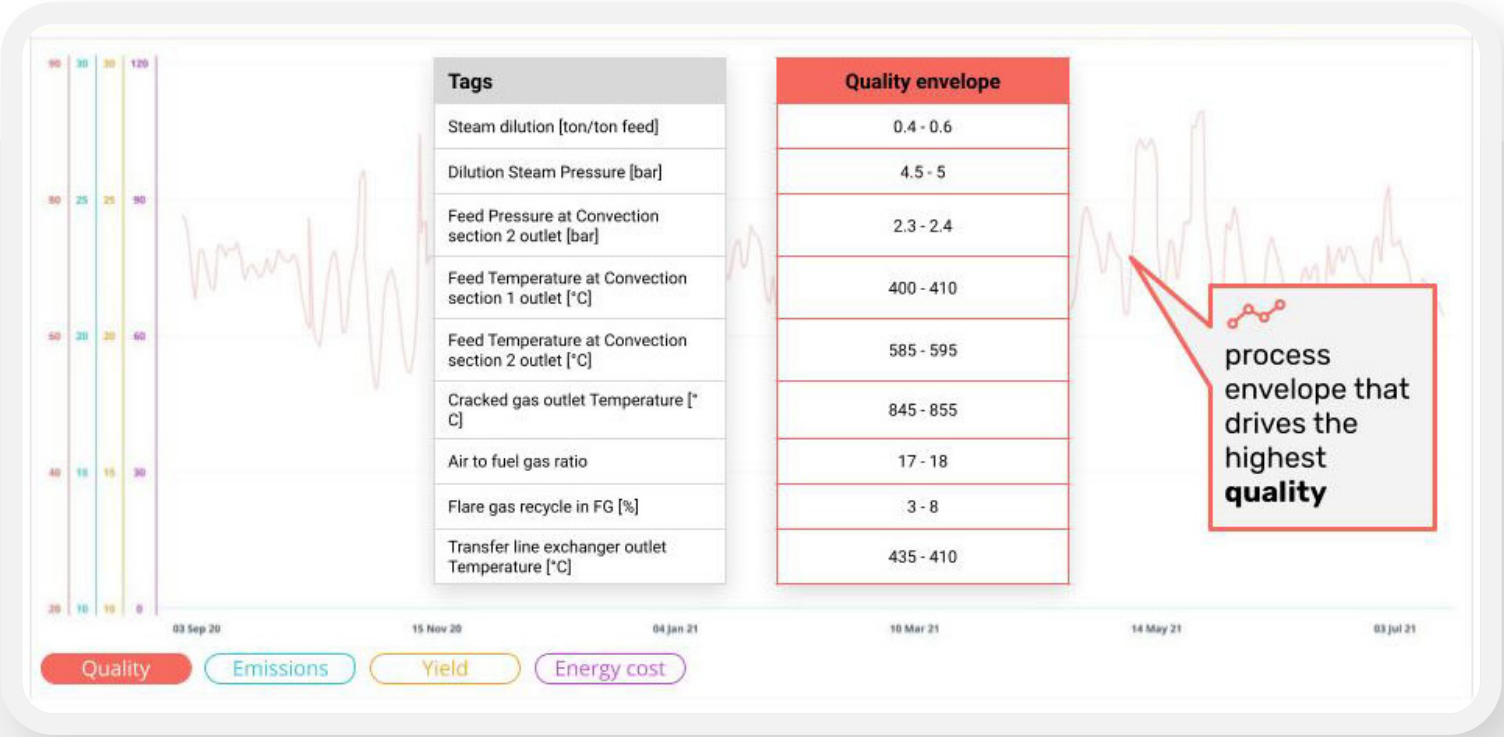
Against this backdrop, it becomes incredibly difficult to maintain optimum Process Health.

CONFLICTING OPERATING ENVELOPES

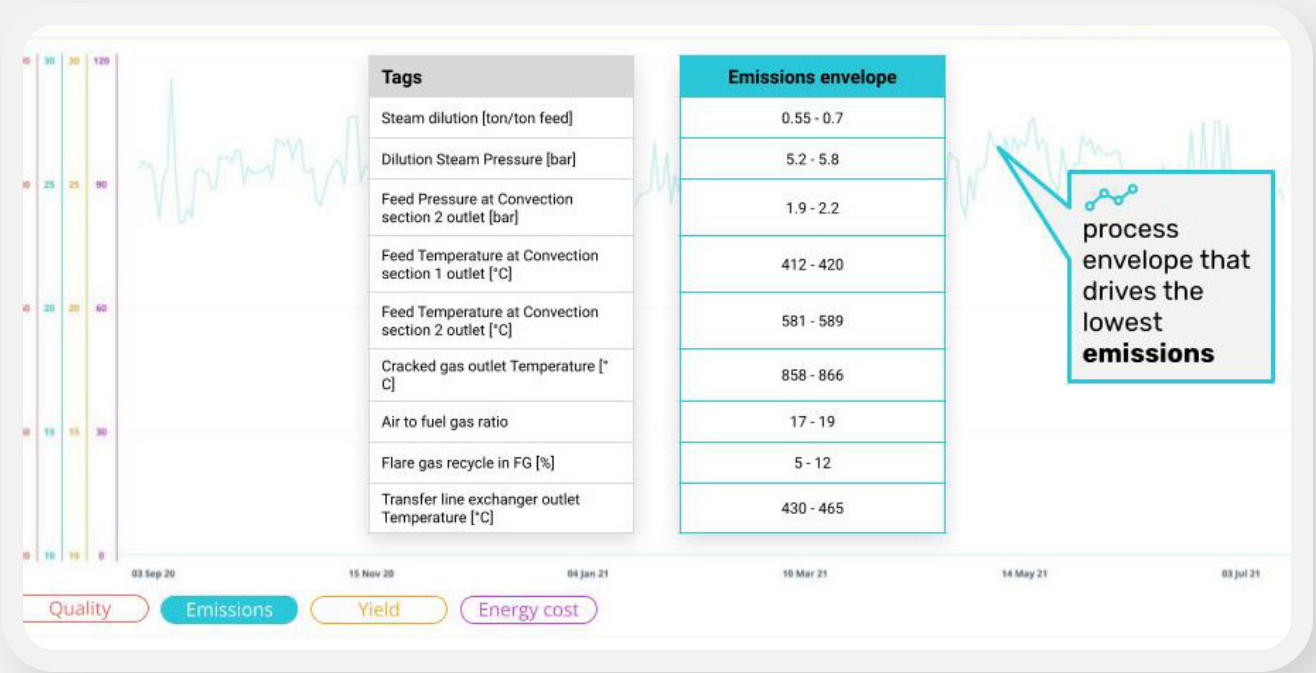
This complex reality finds its clearest expression when process experts seek to establish the optimal operating envelopes for a given objective by finding the optimal ranges across all process parameters.

For the sake of illustration, let's take a typical petrochemical manufacturing process.

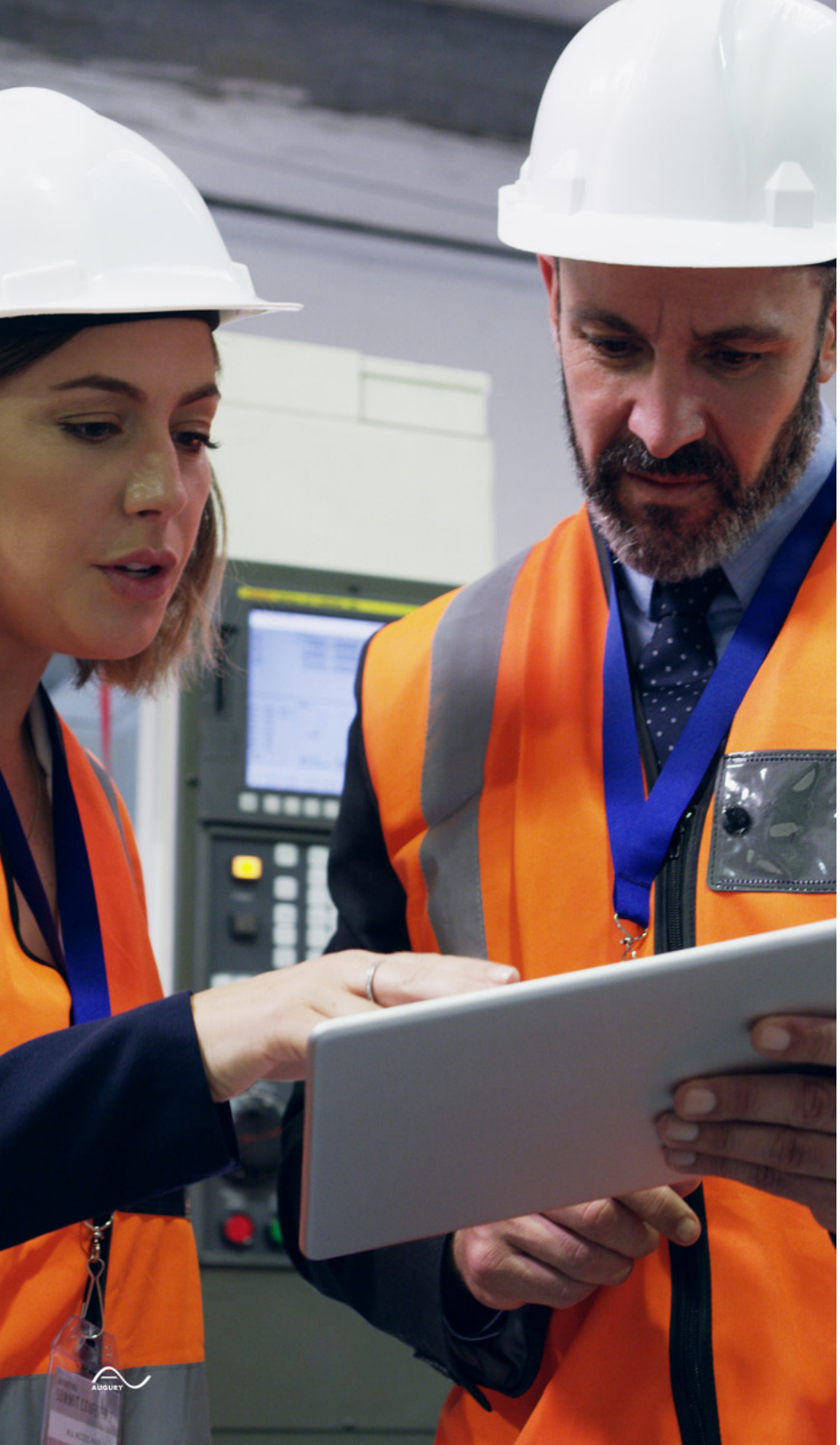
A key objective is to increase yield, and the operating envelope might look something like this:



But that same manufacturer also has emissions targets. To reach them, the ideal operating envelope would have very different ranges for these same data tags:



Of course, the same conflict likely exists when considering the other objectives on the line, like quality and energy costs.



Balancing Competing Objectives in a Dynamic Environment

Juggling is tricky—juggling such complex, competing objectives while everything is constantly changing around you seems almost impossible.

But that's exactly what manufacturers have to contend with. You aren't operating in a vacuum; **external factors beyond your control are constantly shifting, and impacting your process in different ways.**

On the most basic level it could be a seasonable shift in market demand that impacts your key objectives. For example, an ice cream factory will naturally prioritize throughput/yield in the summer months to meet a spike in demand, while in the winter months the operating envelope might lean towards another goal (quality, lower energy costs, etc).

But the reality is often far more dramatic and unpredictable: from unpredicted shifts in market demand, to weather patterns, to rising energy costs, to raw material variances; from wars, to global pandemics, and a million other global supply chain disruptions—all of these factors can influence your operating envelope at any given moment.

So even if you have pinpointed your ideal operating envelope at a given time, it might soon become obsolete.

The Importance of Machine Health

In addition to process-related objectives, improving the reliability and performance of the machines in your factories (Machine Health) is equally important.

In a recent Plant Services report, the majority of respondents reported that unexpected equipment failure is the biggest risk to hitting their production targets. But while manufacturing executives are painfully aware of this fact, they still struggle to find comprehensive solutions.

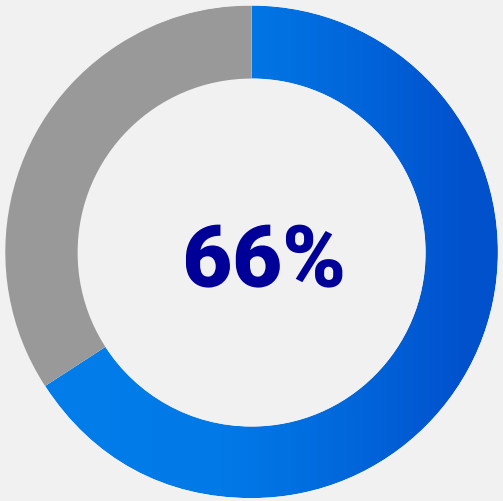
According to the report, 66% of maintenance and reliability teams today don't have visibility into the real-time conditions of their assets. Their best efforts are channeled towards reactive or preventative maintenance strategies, which are labor intensive and often lead to unnecessary maintenance tasks, further stretching short-staffed teams and the supply chain's impact on machine parts.

And of course, a machine's performance can directly impact the objectives associated with Process Health.

CONTINUOUS MACHINE DIAGNOSTICS

Machines need maintenance in order to run properly, but knowing which machines to prioritize, and how much maintenance is enough, is often easier said than done.

Predictive maintenance solutions continuously monitor the performance and condition of machines. That data is then analyzed to provide maintenance and reliability teams with insights that can predict equipment failure and advise how to prevent the failure through corrective maintenance.

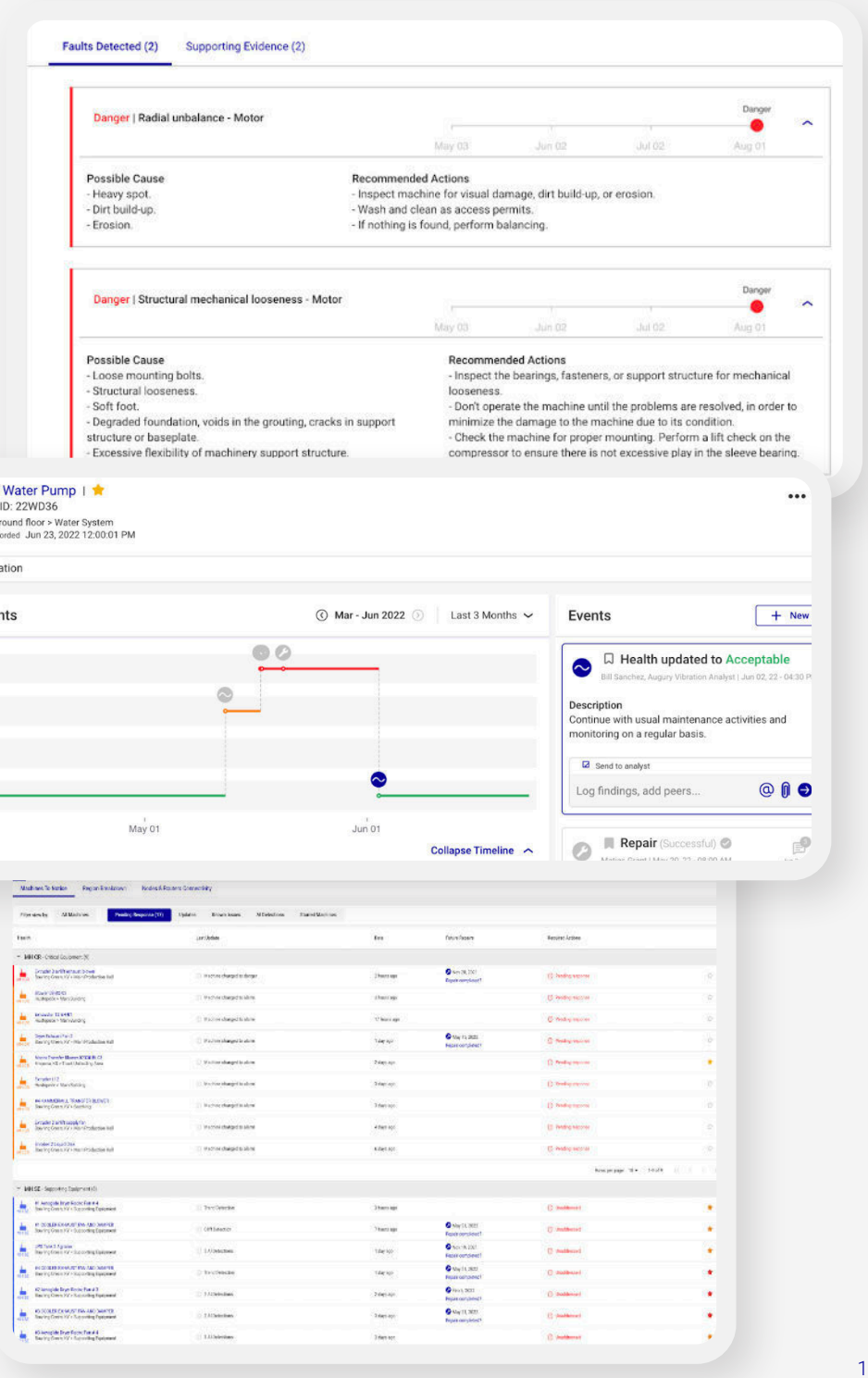


of maintenance and reliability teams today don't have visibility into the real-time conditions of their assets

For example, take this Machine Health alert that details the exact issues and recommended course of action for this compressor:

Once the maintenance team takes action, the machine moves back to an acceptable status while the event is recorded as part of that compressor's history.

And with clear visibility into the machine health status of your monitored assets, you can easily prioritize maintenance activities, collaborate across shifts and teams, break down silos, and capture knowledge.



Optimizing Assets for Better Production

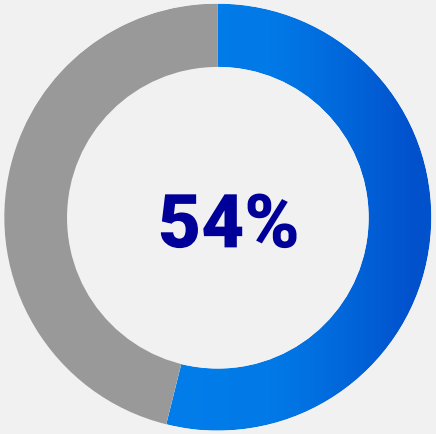
While Machine Health is usually associated with **PROFIT** (reducing downtime, improving asset care, and increasing capacity), machines not performing optimally also contributes to emissions and waste.

Rotating equipment accounts for about 54% of U.S. industrial electricity consumption and those that vibrate more than normal due to issues like misalignment are less energy efficient and friction energy losses can occur due to lack of lubrication of bearings.

Faulty or inefficient machinery also creates products with defects, which must be thrown away. That creates waste of goods, not to mention the energy and raw materials used during the production process. And every part or machine that needs replacing or repairing comes with a CO2 price-tag—from actually transporting the parts/people for repairs, to manufacturing the parts/machinery themselves.

The good news is optimizing asset performance benefits both **PROFIT** and **PLANET**. **Healthy machines can run at capacity and with less downtime, leading to less waste and more efficient energy use.** As noted in an industry study from EPRI, optimizing the performance of rotating assets can reduce energy consumption by 12-15%.

But how can manufacturers juggle both Machine Health and Process Health?



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optimizing the performance of rotating assets can reduce energy consumption by **12-15%**.

The Role of Industrial AI

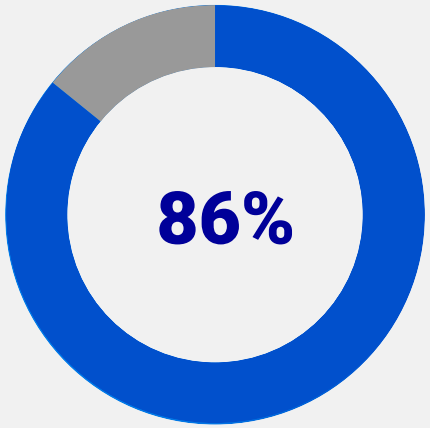
Overcoming the complex, data-oriented task of improving machine performance and solving process inefficiencies requires purpose-built industrial artificial intelligence (AI).

The fact is the demand for industrial technology is rapidly increasing for manufacturers of all kinds. According to *Industrial AI and AIoT Market Report 2021–2026*, 33% of manufacturing organizations have fully or partially adopted AI solutions.

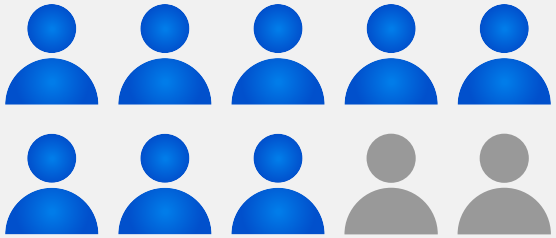
Process manufacturers—those that create products by combining supplies, ingredients or raw materials using a formula or recipe—lead the pack according to the study, with the two most widely adopted solutions being Predictive Maintenance (Machine Health) and Operational Excellence/Process Optimization (Process Health).

This is just one of many illustrations of the growing realization that complex manufacturing processes can be mastered with the help of AI and that the combination of Machine Health and Process Health solutions is the best way to achieve that.

That doesn't mean "lights-out manufacturing"—which is at best a far-off aspiration, but for most manufacturers an unrealistic and even undesirable goal. The goal here is to **empower manufacturing teams to make the right decisions with purpose-built AI technology**. With those solutions, manufacturers can optimize performance across all objectives by transforming their maintenance and production strategies for optimum performance.



One report suggested an **86%** rise in manufacturer employee burnout during the first year of the pandemic.



8 out of 10 manufacturers reporting that unfilled job positions were having a moderate-to-high impact on maintaining production levels.

Where Do People Fit In?

Amid the push for profitability and sustainability, the People at your plants feel the stress. The COVID-19 pandemic triggered greater focus on the problem of employee burnout in the manufacturing industry. One report suggested an 86% rise in manufacturer employee burnout during the first year of the pandemic. But regardless of COVID, the constant push for ever-greater efficiency was already translating into more and more pressure on both the people who power your plants, as well as their employers themselves.

Just prior to the pandemic, PwC's Annual Manufacturing Report noted that British manufacturers faced the largest shortage of skilled workers since 1989. A similar crisis is playing out in the US, with 8 out of 10 manufacturers reporting that unfilled job positions were having a moderate-to-high impact on maintaining production levels.

This in turn creates pressure on the existing workforce to deliver beyond their numbers, while manufacturing organizations find themselves locked in a never ending battle over a very limited pool of skilled, qualified people.

Empowering Your Workforce

The **PEOPLE** shortage makes it even more difficult for manufacturers to reach their full **PROFIT** and **PLANET** potential—a fitting illustration of how closely the three "**P**s" are linked.

But they're also linked in another way. The combination of human and AI that optimizes machines and processes for the benefit of Profit and Planet is also key to upskilling and empowering the People who run operations.

Real-time, AI-driven insights empower existing employees to reach the next level of efficiency and productivity, in particular by taking over time-consuming data collection and analysis tasks. With Machine and Process Health data, your process engineers, operators, and maintenance and reliability teams can make the right operation decisions at the right time, empowering them to transform their schedules and create higher value work.

Manufacturers in all industries have reported on these benefits.

The Vice President of Operations at chocolate manufacturing giant Lindt put it this way: Applying Industrial AI to process health "**enables us to reach a new level of production efficiency. It enables the people that are actually operating the machines to make much better decisions.**"

While an Analytics System Engineer III at the U.S.'s largest roofing manufacturer commented that one unexpected benefit from machine health monitoring was people **"started more readily adapting other software and analytics packages that our company provides and are available. For some, this helped them become more data-driven in many aspects of their careers."**

AI also combats the workforce shortage in other ways—for example, by attracting top talent eager to use cutting edge technology, or by enabling more remote working, thereby geographically expanding the pool of talent available for a given factory.

As the Senior Vice President from a multinational consumer goods corporation put it: **"The new generation is much more interested in the digital capabilities that give them the early signals in terms of what is happening on the equipment" and that these new capabilities are "an accelerator to the journey we all are on to eliminate losses and to improve the efficiency of our manufacturing** systems."

THE 4TH "P"—
PRODUCTION HEALTH

Ultimately, using industrial AI to optimize Machine Health and Process Health unlocks overall Production Health for manufacturers.

This means better business outcomes, an empowered workforce, and benefits to the environment—a perfect balance of the 3 "**P**"s.

Again, this is not about taking people out of the equation. It's about hybrid intelligence and the collaboration between human experts and technology. It's about providing more knowledge so teams can overcome obstacles and successfully optimize their operations.

The stakes couldn't be higher. As mentioned before, manufacturing accounts for 30% of the world's emissions. In addition to that, 10-20% of capacity of a given plant or production line is "shadow capacity" that is never actualized and it's reported that the worker shortage could cost the U.S. economy up to $1 trillion by 2030.

Manufacturing can no longer be a zero sum game and **improving the sustainability of operations is increasingly providing a competitive advantage**. Luckily, the solutions that can create healthier production for the benefit of business and society are available now. With AI insights into machines, processes, and operations, all the 3 "**P**s" can finally take center stage.

Machine Health x Process Health leads to

PRODUCTION HEALTH

$1T

Unlocked Productivity

ARC

26-76M

Metric Tons Reduced CO2 Emissions

ARC

1B

People Upskilled

WEF

AUGURY

Production Health Starts Here

Optimize your machines & production processes today