Case Study:

Innovative Breakthrough in Solar Engineering

Solar's big dust problem

"Global soiling transmission losses are 3-4%, costing the world a predicted $4.1-7.2 billion in 2023."

- Fraunhofer Center for Silicon Photovoltaics CSP

The solar energy market has grown at an accelerating rate in recent years, with the industry experiencing a rapid cost decline of 85% in the past decade alone.[1]

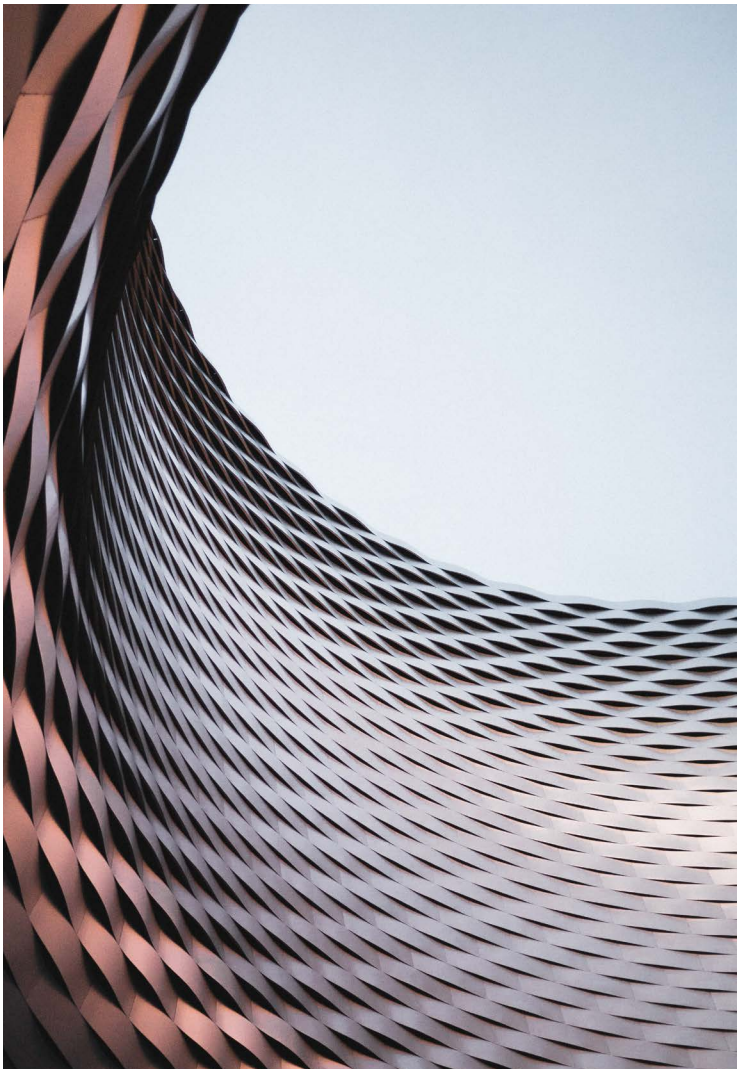
Although solar energy is increasingly accessible, the industry still faces challenges and growing pains. A surprisingly tricky problem is impacting the conversion of solar energy across the globe: dust on the panels. Referred to in the industry as solar panel "soiling", solar farms in all regions of the world are experiencing this common issue. Photovoltaic (PV) power generation is inhibited by dust and other particulates accumulating on the surfaces of the panels, leading to radiation transmission losses of 2-50%, depending on the region in which the solar farm is located[2]. In 2019, the Fraunhofer Center for Silicon Photovoltaics CSP calculated that global soiling transmission losses are 3-4%, which will cost the world a predicted $4.1-7.2 billion in 2023[3].

[1] 2022 Renewable Energy Industry Outlook. Deloitte, Mar 2022.

[2] Power loss due to soiling on solar panel: A review. Maghami et al, Universiti Putra Malaysia, June 2016.

[3] Techno-Economic Assessment of Soiling Losses and Mitigation Strategies for Solar Power Generation. Ilse et. al, Fraunhofer Center for Silicon Photovoltaics CSP, Sept 2019.

The cost of excess dust and pollutants



Although the answer may seem simple – to clean the panels – this solution is costly in terms of:

ENERGY

Energy to power the cleaning equipment. Since solar panels cool down at night and collect dew in the morning,dustandotherairpollutants go through a process of cementation when attaching to the surfaces of the panels, making it difficult to clear without high-powered robotic cleaning equipment. This equipment can be expensive in terms of energy and money, and the cleaning process itself can be harmful to the environment.

MONEY

The National Renewable Energy Laboratory in Colorado, US estimates that "a one-time cleaning for a 10-megawatt solar farm – which provides enough electricity to power 2,000 homes for a day – can cost an estimated $5,000"[4]. If a 10MW farm cleaned their panels once per month, they would need to budget $60k annually.

Our client owns and operates over 45 solar farms with thousands of panels, located in very humid regions of the world with considerable amounts of dust and pollutants in the air. The engineering team needed to find a way to keep the panels from becoming covered in sticky dust to improve the energy conversion rate of their solar farms. They turned to **Goldfire**, an Accuris product they relied on consistently for things like solar panel layout, installation, and other tasks, to see if it could help them here as well.

[4] Scientists Studying Solar Try Solving a Dusty Problem. National Renewable Energy Lab. Apr 2021.

The Problem

THE CLIENT

A leading renewable energy corporation operating 45+ solar energy farms across the world

USERS

VP of Innovation, Design Engineers, Research and Development

PAIN POINTS

The VP of Innovation tasked the engineering team with finding solutions across disciplines, specifically looking at solutions found in nature. The team set out to look for water-repellent properties that could be reproduced in a laboratory and fitted to the conditions of their solar panel systems.

THEY CAME TO ACCURIS WITH THE FOLLOWING CHALLENGES:

- To find a solution in nature that they could mimic in their design; this is important to their company.
- Finding relevant information was time-consuming and unsuccessful. The team was manually searching for information, reading through documents one by one to find an answer.
- A lack of specialized expertise in scientific fields like biotechnology, botany, and biomimicry made it difficult to know where to look for the answer.
- Traditional search engines would output a list with keywords based on the search query, but nothing in context.
- There was a high probability the team would miss something important due to the above considerations.

The Solution

Equipped with Goldfire's cognitive search abilities, the team turned to the world of plants to find an answer. They surfaced relevant pieces of information across multiple engineering disciplines and scientific industries. Within 2 days, Goldfire pinpointed a key finding in a 2019 article discussing superhydrophobic surfaces, which led the team to the answer they needed. In this publication, the authors spoke about the ability for the lotus leaf to self-clean, shedding water droplets, dirt, and other particles due to the multi-scaled waxy bumps on its leaves. This is known as the "lotus effect".

The team then located a second paper from 2015 describing a super hydrophobic transparent coating that could be used as a paint on cars, marine equipment, wind turbines – and solar panels. Based on the chemical properties of the lotus plant, a manufacturer had developed this super hydrophobic coating that mimicked the lotus effect, creating a self-cleaning mechanism for whatever surface it was used on. When applied to a solar panel, the water droplets and dust particles would simply roll off the panel, rather than attaching and cementing to the surface.

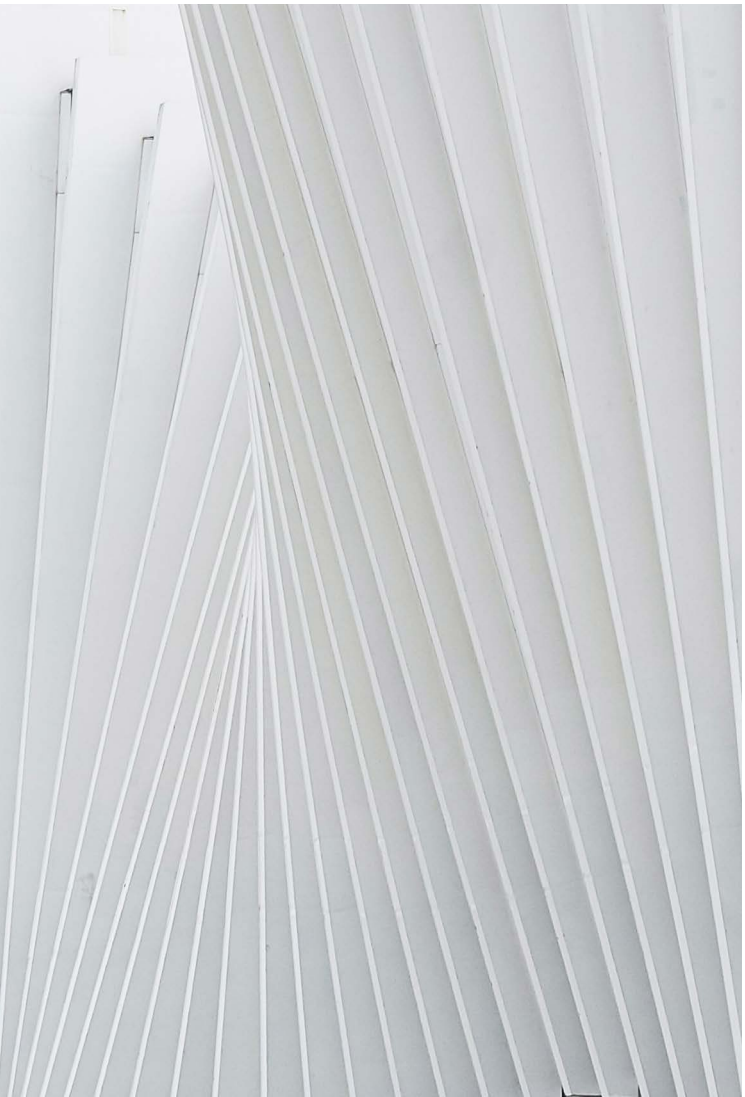
Goldfire is powered by state- of-the-art machine learning and natural language processing technologies, which enable it to connect information across industries and disciplines – much in the way a human brain makes cognitive connections.

Our client surfaced this research using Goldfire, leveraging knowledge that had formed over billions of years in nature toward an innovative breakthrough in alternative and renewable energy.

- Goldfire's AI-powered cognitive search leads the user to the answer. It goes beyond a list of key words, connecting the dots between disparate sets of knowledge based on context and semantics, sifting through information and pulling out relevant materials like the human brain would.
- Machine learning and natural language processing analyzes the query in context in 6 different languages, providing answers and relevant knowledge across industries.
- Indexing of scientific and technical publications around the world, across industries, and across engineering disciplines makes it easier and less time consuming for users to find the answers they seek.

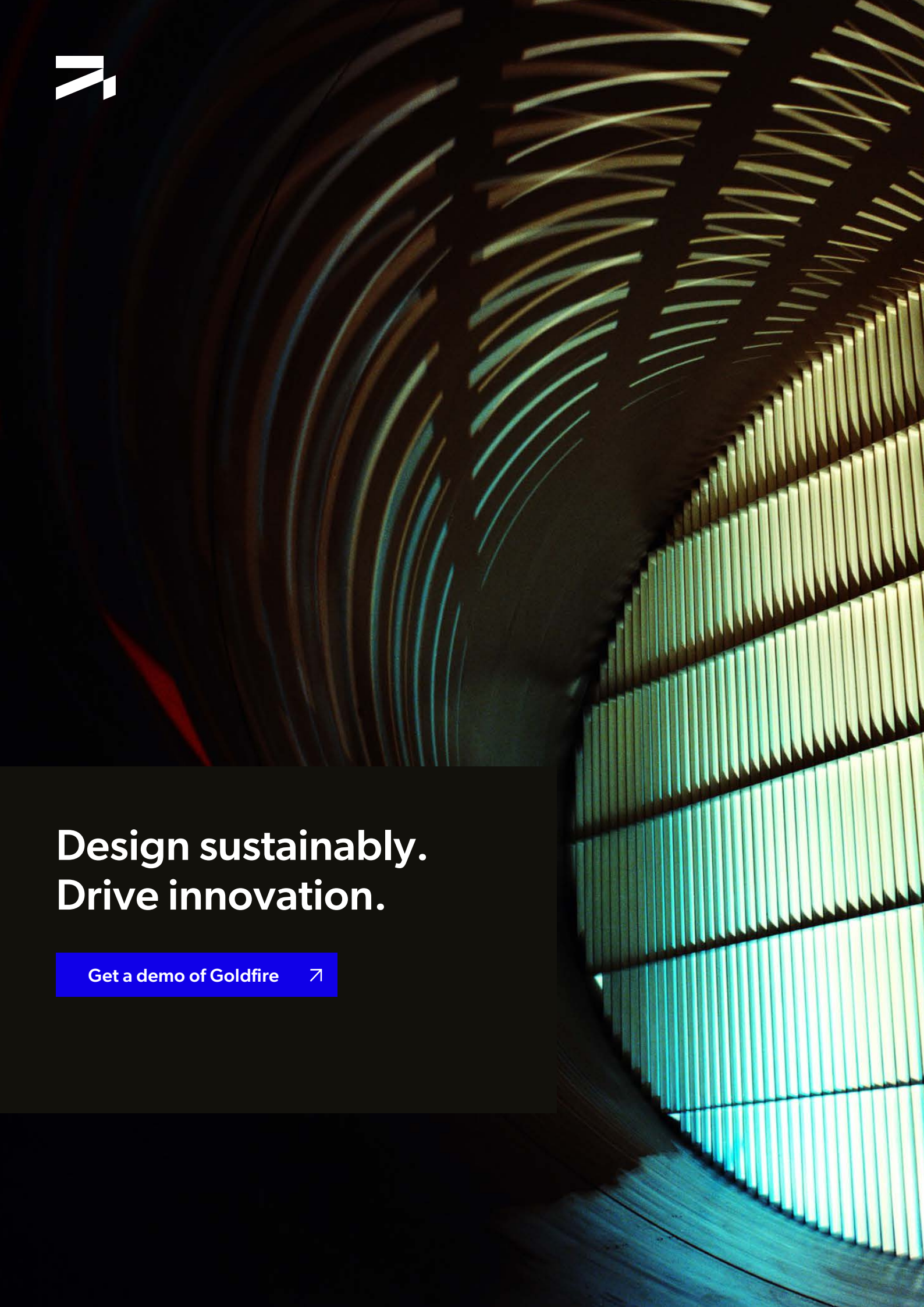
The Results

Our client surfaced the answer they needed within 2 days of starting their search. Without Goldfire, the answer would have taken them weeks or months to find. Through Goldfire's indexed patents, the research team located a manufacturer of the paint mimicking the lotus effect and passed this information along to their product team, who could then apply the knowledge to their existing products.



WITH ACCURIS, THE RESEARCH TEAM:

- Saved valuable time, energy, and money by leveraging the power of AI with Goldfire
- Identified a self-cleaning method found in nature that could be applied to their challenge
- Located a manufacturer of the super hydrophobic coating, streamlining their process to solve the problem and apply a solution to their existing product
- Saved weeks of engineering time that could be applied to other challenges, like the laying out of solar farms and reducing time to value for their new farm locations
- Tested and verified a reliable new method of conducting research with Goldfire, which they could apply to other innovative projects and renewable energy product lines



Design sustainably. Drive innovation.

Get a demo of Goldfire

ABOUT ACCURIS

Accuris is an engineering-focused technology company that drives $500MM in annual recurring revenue through AI-powered data and workflow solutions. For over 60 years, engineers have relied on our data and technology to innovate and solve problems, reducing their ideation time by 70% and eliminating product and process failures by up to 5 times.

We work with over 6,000 global customers and 650,000 engineering end users in over 100 countries and dozens of industries – including aerospace and defense, energy, sustainability, construction, architecture and more.

Accuris partners with 400+ Standards Development Organizations to support their non-profit mission, streamlining your access to 2.3 million engineering standards for innovation and progress across the globe. Accuris brings you technology with the knowledge built in – so you can build a better world.

For more information, visit: **www.accuris.co**