RENEWABLE THERMAL COLLABORATIVE

Colgate-Palmolive Factory

CASE STUDY
Solar Thermal at
Colgate-Palmolive Factory

LOCATION
Athens, Greece

INDUSTRY TYPE
Chemicals

TEMPERATURE RANGE
Up to 160°C

FACILITY TYPE
Household products manufacturing (fabric softener)

TECHNOLOGY DEPLOYED
Solar thermal (parabolic trough)

EMISSIONS IMPACT
Avoids approximately 39 tons of CO_2 emissions annually

Project Overview

In 2018, Colgate-Palmolive installed a solar thermal system on the roof of a manufacturing facility in Athens, Greece. Colgate-Palmolive is a publicly traded consumer products company operating globally in two product segments: Oral, Personal and Home Care; and Pet Nutrition. The Company's solar thermal project is part of an ambitious decarbonization plan outlined in Colgate's 2025 Sustainability & Social Impact Strategy and 2022 Climate Transition & Net Zero Action Plan.

After considering other renewable options at the Athens location, the Company chose solar thermal because it integrates with their existing system, could be installed without pausing production, provides a stable energy source, requires minimal space, and has a short payback period.

The initial project was so successful that Colgate-Palmolive installed a second system at the same location three years later and continues to assess solar thermal deployments at other facilities. The Athens-based system is a win-win, as it reduces Scope 1 emissions and achieves financial viability.

Project Description

In 2018, Colgate-Palmolive commissioned SARAVANOS SA, Process++, Solar++ to install a 132 m^2 solar thermal system on the roof of a fabric softener manufacturing facility in Athens, Greece. They installed Absolicon T160 rooftop parabolic trough collectors (76.4% optical efficiency) that rotate during the day to maximize solar reception and have an operational temperature of up to 160°C. The process control system integrates solar tracking, and the solar field inclines at 15° to reduce space requirements and improve efficiency.

Colgate-Palmolive plant engineer Evangelos Karageorgis and his team constructed and incorporated the solar thermal installations into the fabric softener reactor process with no interruptions to plant operations. Fabric softener manufacturing requires a constant stream of pressurized hot water at 40-50°C.

The installation was easily integrated into the existing boilers and hot water distribution system, enabling hot water from solar thermal to displace hot water from natural gas boilers.

After a successful first project, Colgate-Palmolive installed a second 132 m^2 solar thermal system in 2021. Each phase of installation took about four weeks.

Solar Thermal and Other Technologies

Colgate-Palmolive initially considered an electrification project featuring solar photovoltaics (PV), but eventually chose solar thermal because it offers better economic returns and offsets more emissions from onsite natural gas boilers. Solar thermal's greater energy density compared to PV meant the solar thermal installation would displace more of the facility's onsite energy requirements within the available rooftop space.

To increase onsite energy efficiency, Colgate-Palmolive installed a heat recovery system that resulted in a 50% decrease in cooling energy demand from the fabric softener reactor. Solar thermal can be designed to integrate with a variety of technologies, including heat recovery, solar PV, or storage.

Project Outcomes

The solar thermal system generates 163 MWh/year and displaces natural gas combustion from the onsite boiler, avoiding over 77,000 pounds of CO_2 emissions per year, the equivalent of driving almost 90,000 miles in a gasoline-powered car.[1]

The fabric softener process reactor operates with zero CO_2 emissions during all clear-sky daytime hours, and the solar thermal system provides heat to other processes in the plant during reactor downtime or periods of overproduction. Over the course of a year, solar thermal satisfies 70% of the fabric softener reactor requirements based on an operating schedule of 16 hours per workday. On cloudy days and at night, the natural gas boiler supplies between 0 and 100% of the plant's thermal energy, depending on conditions.

Solar thermal was a fiscally responsible choice for the Athens site, regardless of Colgate-Palmolive's environmental goals: replacing natural gas boilers with solar thermal resulted in net cost savings, with a short project payback period and a double-digit rate of return.

Colgate-Palmolive's Decarbonization Commitment

Colgate-Palmolive's Climate Transition and Net-Zero Action Plan sets a goal of reducing Scope 1, 2 and 3 emissions 90% from a 2020 baseline in alignment with Science Based Targets Initiative (SBTi) standards. This decarbonization roadmap guides Colgate-Palmolive's renewable thermal deployment strategy.

To support these ambitious emissions reductions goals, Colgate-Palmolive developed a financing program in 2011, known as "5% for the Planet." According to the Company's Climate Action Plan, this program allots 5% of Colgate-Palmolive's annual capital spending at manufacturing plants to "ensure that [their] global manufacturing sites identify, fund and implement climate, energy, water and waste projects that deliver environmental improvement and often cost savings." In 2021, Colgate-Palmolive also launched its "Sustainable Financing Framework" bond program that finances or refinances new and existing eligible projects across categories including "accelerating action on climate change" within "Renewable Energy." This bond program helped fund phase two of the Athens solar thermal project.

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1 Assumes 85% efficiency for a natural gas boiler and 100% utilization of hot water from solar thermal collectors. Equivalency based on EPA's Greenhouse Gas Equivalency Calculator.

Lessons Learned

Under the right conditions, solar thermal can be a financial win. Evangelos Karageorgis says that the cost savings from Colgate-Palmolive's solar thermal project speak for themselves, regardless of the added environmental benefit. The facility also offers financial security, as solar does not rely on volatile fossil fuel prices. According to Colgate-Palmolive Global Sustainability Manager DJ D'Agostino, "The savings helped this project become a 'no brainer' and a win-win for the planet and the plant's bottom line."

Dedicated funding can help organizations achieve their decarbonization goals. Colgate-Palmolive's "5% for the Planet" program helped get the Athens project off the ground and motivated facility managers to consider sustainability as one of many factors when assessing project viability. Other buyers could follow Colgate-Palmolive's example by allocating funds as a percentage of a capital budget or by creating a Revolving Loan Fund (RLF) that invests a one-time allotment of capital into an energy project and uses the returns to fund the next project.

Buyers without capital budgets could utilize Heat Purchase Agreements (HPAs). Similar to renewable electricity Power Purchase Agreements (PPAs), HPAs avoid large upfront capital expenditures by transferring project risk, upfront cost, operation, and maintenance to a third party.

One renewable project—covering less than 100% of thermal load—can have a big impact. Funding a first renewable thermal project provides the practical environmental and economic data organizations often require to deploy at scale. The first installation in Athens satisfied a relatively small portion of the fabric softener plant's heating requirements: 35% of the total thermal load. This first project showed that solar thermal can reduce plant emissions in a cost-effective manner without impacting facility operations, and Colgate-Palmolive went on to expand solar thermal at their Athens location with a phase two project, doubling the system size and capacity. The Company is now considering additional project locations at their manufacturing plants worldwide that could total many hundreds of megawatts.

Solar thermal integrates well with efficiency. By pairing solar thermal with an efficiency technology like waste heat recovery, the Company maximized their decarbonization impact and cost savings. Efficiency constitutes an important first step in many Scope 1 emissions reduction plans and can lead to further renewable thermal deployment opportunities.

Industrial facilities are well-suited for solar thermal. Industrial facilities like the Athens fabric softener plant can be ideal locations for solar thermal because they often (1) have available space for solar thermal collectors on rooftops or adjacent land and (2) have hot water requirements that integrate well with solar thermal, particularly to displace natural gas boilers used for water heating.

RTC Information: Next Steps for Interested Buyers

Buyers interested in learning more about solar thermal should:

- Find a list of solar thermal developers through the RTC's Partner Locator. Developers often work with buyers who have little to no prior solar thermal experience.
- Use Absolicon's Field Simulator tool to estimate energy savings and costs by inputting project location, production temperature, and current energy source.
- Join the RTC to participate in the RTC's Solar Thermal Working Group meetings, learn from other renewable thermal buyers, and connect with solar thermal providers. Contact the RTC's Executive Director, Blaine Collison, at blaine@dgardiner.com to learn more.

RENEWABLE THERMAL COLLABORATIVE

The Renewable Thermal Collaborative (RTC) is the global coalition for companies, institutions, and governments committed to scaling up renewable heating and cooling at their facilities. Learn more about our work on solar thermal as well as other renewable thermal energy sources at www.renewablethermal.org.

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