



I N N O V A T I V E
T E C H N O L O G Y

E F F I C I E N T F O R E N E R G Y
O P E R A T I O N S

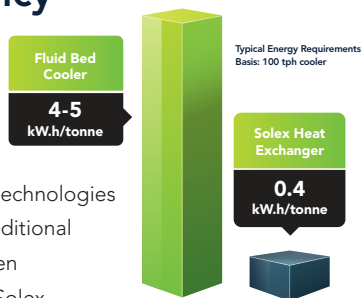


D R I V E N B Y I N N O V A T I O N

SOLEX TECHNOLOGY DESIGN ADVANTAGES

Energy Efficiency

The Solex heat exchanger is capable of cooling and heating various products using up to 90% less energy than traditional technologies requiring the use of air. A traditional fluid bed cooler uses between 4 – 5 kW.h/tonne, while the Solex heat exchanger uses 0.4 kW.h/tonne.



Near Zero Emissions

Emissions, dust and odours are eliminated because air is not used in our indirect heating and cooling process.

Near
ZERO
emissions

Zero Product Degradation & Contamination

Slow and controlled movement of the product through the heater or cooler prevents product abrasion and degradation, so that there is no change in particle characteristics or quality. As the product does not come in contact with air or fluid there is no contamination of the final product.



Stable Final Product Temperatures

The mass flow design moving the product through the heat exchanger at a uniform velocity, combined with long residence times produces even temperature distribution for the final product.

The final product can be heated or cooled to a specific temperature enabling constant storage, packaging and transporting temperatures year round, independent of ambient weather conditions.

Customized, Compact & Modular Design

The vertical configuration gives the heat exchanger a small installation footprint and it can be easily integrated into a new plant or retrofitted into existing plants. The equipment is ideal for capacity increases and streamlining facility processes. The custom design provides operational flexibility with variable conditions (ex. temperature and moisture) and different energy sources (steam or water).



Reduced Installation & Operating Costs

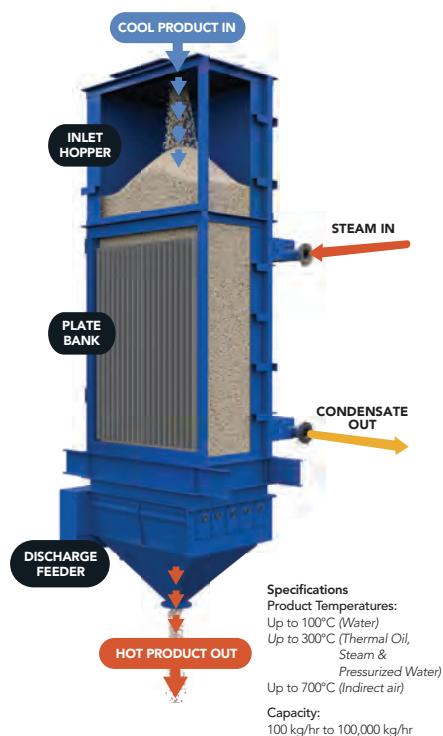
Solex technology is designed to operate without moving parts, offering simple installation, virtually zero maintenance and years of reliable operation. The custom design and easy access to the heat transfer areas and individual plates for cleaning or replacement reduces downtime and lowers overall maintenance expenses.



Heating, Cooling, Drying of Bulk Solids

We don't predict the future – we engineer it.

Our ability to develop innovative, scientifically sound solutions for previously untested applications is what sets us apart. Our technology is now being used in ways even we couldn't have imagined before we were asked to develop them. If you have an idea for using our technology in a new way or an application that's never been attempted, we are excited and capable of taking on that challenge.

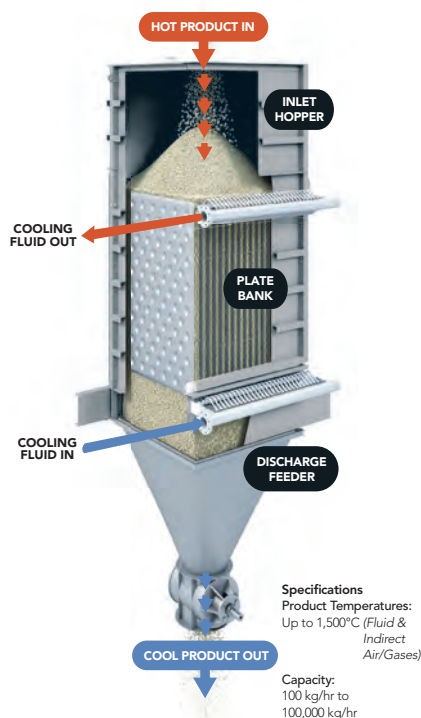


Ultra-Efficient Bulk Solids Heating

Solex heat exchangers can heat bulk solids to uniform temperatures up to 700°C while using up to 90% less energy, producing near zero emissions and using a significantly smaller installation footprint than traditional methods. Heating is achieved by conduction as steam, hot water or thermal oil flows through the heat exchanger plates.

Waste heat from elsewhere in the facility can be captured and reused, improving efficiency and generating even greater cost savings.

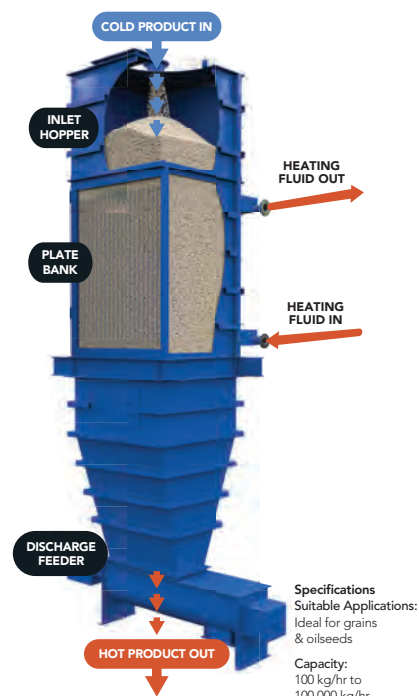
The vertically-oriented modular design with no moving parts, allows for capacity increases and eliminates bottlenecks while reducing maintenance costs at the same time.



Cool Bulk Solids with 90% Greater Efficiency

Our heat exchanger technology is capable of cooling bulk solids from 1,500°C indirectly by conduction, consuming up to 90% less energy. It is engineered to handle substantial thermal stresses without cracking or damage, while offering guaranteed thermal performance for a superior end product.

Waste heat can be recovered and used elsewhere in the facility. As no outside air is added to the product in the cooling process, emissions, fines, bacterial and odour contamination are virtually eliminated.



Drying & Conditioning Bulk Solids

Unlike conventional drying and conditioning technologies, Solex technology does not use blowing hot air to heat the product – reducing product loss, lowering the risk of contamination and increasing efficiency by up to 90%.

Our technology heats bulk solids indirectly through conduction, significantly increasing the moisture-carrying capacity of the cross-flow air for precise temperature and moisture control.

Waste heat can be used to power the process, reducing costs and energy consumption even further.



The Solex Approach

We specialize in finding innovative solutions to our customer's problems, adapting and customizing our technology for more energy-efficient, cost-effective solutions across applications.

We collaborate closely with you throughout the entire lifecycle of the product, from engineering and development to installation, training and ongoing support.

Y O U R O N G O I N G P A R T N E R I N I N N O V A T I O N

Initial Assessment

We begin an open dialogue about your application and the solution you need developed. We will answer any questions and learn all that we can about your specific situation and requirements.

- Mass Flow Testing – determine material flow characteristics and ensure uniform velocity within the unit.
- Thermal Property Analysis – test the thermal conductivity of your sample materials to measure heat conduction. Specific heat values for many bulk solids are readily available in our extensive database and testing is not always required.

Lab Testing

We conduct extensive analysis and evaluation of the thermal properties of the bulk material and determine the material flow characteristics.

Lab Testing Includes:

- Material Property Analysis – determine particle size, distribution, bulk density, moisture content and angle of repose to establish ideal feeder design parameters.
- Flowability Testing – determines optimum heat exchanger plate spacing.

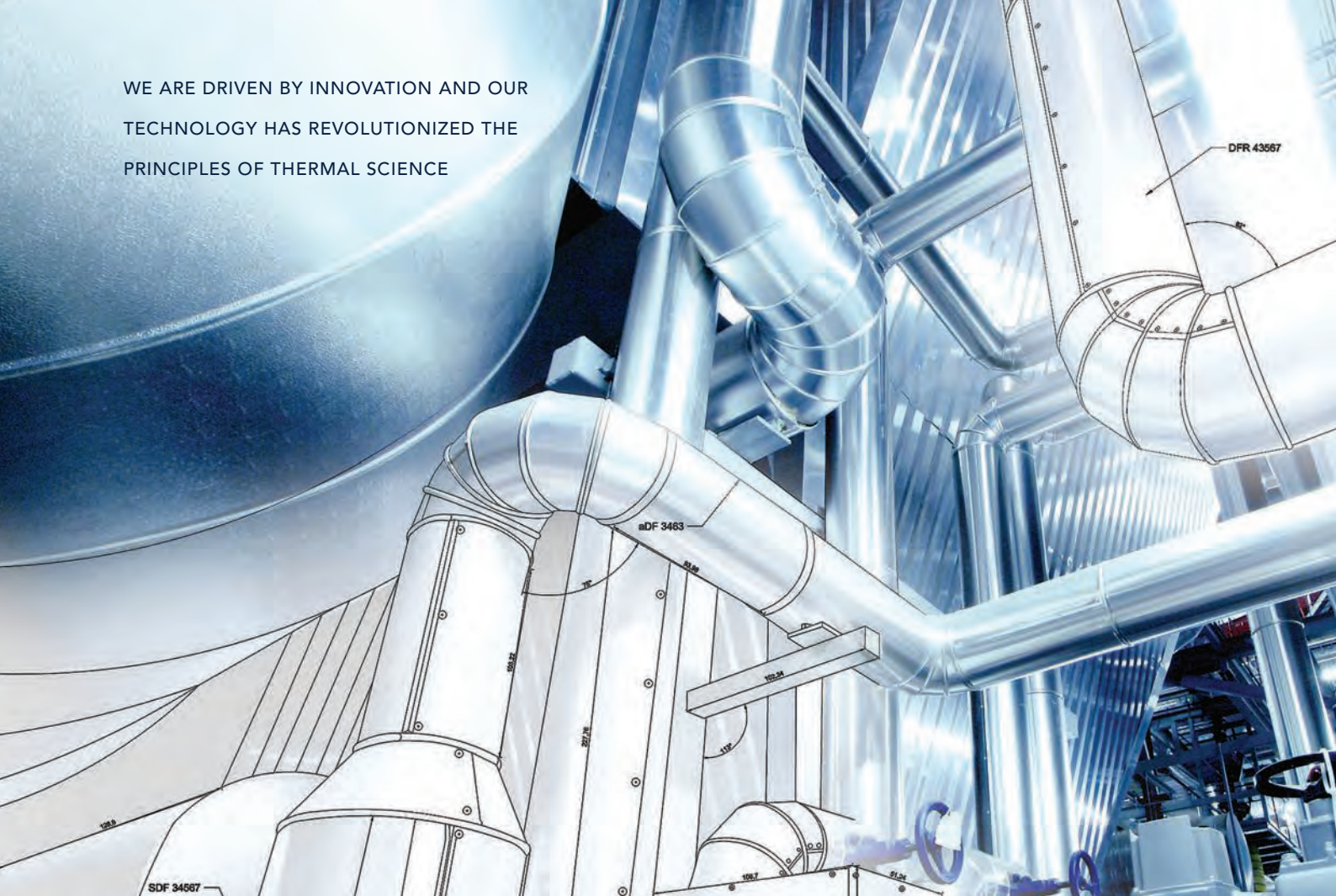
Thermal Modeling

Using **ThermaPro**, our proprietary theoretical thermal modeling software, we are able to calculate product temperature profiles at every point through the heat exchanger. This ensures that the heat exchanger being used in your application will perform as expected and meet your unique process requirements.

On-Site Pilot Testing

In some circumstances, on-site pilot testing may be commissioned as a means to prove the concept in the field under realistic process conditions, using test units that closely duplicate full-size equipment.

WE ARE DRIVEN BY INNOVATION AND OUR
TECHNOLOGY HAS REVOLUTIONIZED THE
PRINCIPLES OF THERMAL SCIENCE



This on-site testing is used to analyze and validate the following for your specific application:

- Equipment thermal performance
- Product flowability under true process conditions
- Heat exchanger performance over an extended time period
- Successful operation through typical plant cycles, including possible upsets
- Successful operation with a typical or specific product mix

Equipment Commissioning

Prior to your installation a Solex technical services representative may assist with pre-commissioning supervision and supply a pre-commissioning checklist to ensure you're prepared for installation. Once installed, a qualified Solex technical services representative will be on-site to ensure your heat exchanger has been installed correctly and is operating according to your specifications.

Performance Optimization

Our customer support team is able to validate and verify equipment and process performance in the field. We can work with you to identify opportunities for improvement in operational processes and efficiencies, including ways to reduce costs, reuse captured energy and ensure a superior end-product.

On-site Training

During commissioning all operators receive on-site training, covering every aspect of the equipment operation and proper maintenance. Additional end-user training is available upon request after commissioning has been completed. We arm you with detailed maintenance procedures to ensure your equipment will operate reliably for the long-term.

Ongoing Maintenance & Spare Parts

With international distribution, we're able to quickly supply both spare and replacement parts for all Solex heat exchangers. Every Solex heat exchanger is designed and built to offer our customers the highest possible quality and reliability. We stand behind all of our products with a comprehensive warranty.

Retrofitting, Refurbishing & Repurposing

In many cases it's possible to retrofit, refurbish or repurpose old equipment that is still in operation to extend your equipment's life, expand your capacity or adapt the equipment for use in another application or location.

Patented* Solex Technology – How it Works

Indirect heat transfer with Solex plate technology offers highly efficient heat transfer solutions for a wide range of free flowing bulk solids. The small installation footprint, innovative channel configuration and compact design results in high heat transfer efficiency and very low energy losses and near zero emissions. Solex technology ensures the accurate and even temperature profile for the end product.



Slow & Controlled Product Flow

Free-flowing bulk solids pass slowly downward between a series of vertical hollow heat exchanger plates.



Indirect Plate Cooling, Heating, Drying & Conditioning

Heating and cooling is achieved as steam, hot/cool water, thermal oil or air flow through the plates to heat or cool bulk solids by conduction. Drying requires that hot water, steam or waste heat flow through the plates to heat the material and evaporate moisture. Cross-flow air is used to remove moisture from the product.



Vertical Configuration

Bulk solids pass through the vertical unit by gravity, using no moving parts.



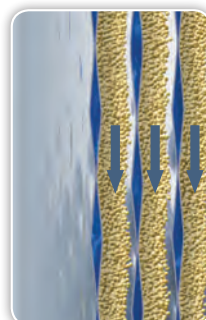
Mass Flow Technology

The mass flow discharge feeder creates uniform product velocity through the heater and regulates the product flow rate.



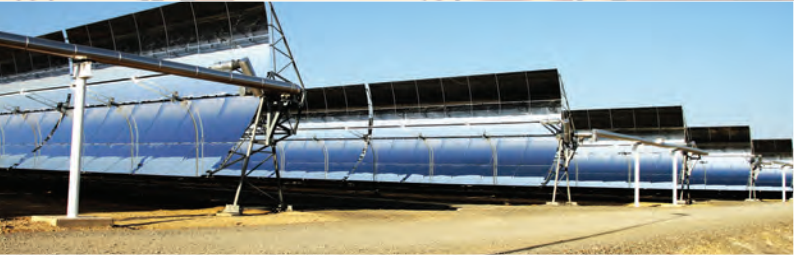
The Solex Heat Exchanger

Solex technology uses welded heat transfer plates installed in a reinforced fabricated casing, finished to meet ASME or PED pressure vessel codes. This simple, yet advanced design offers reliable operation and easy maintenance with highly efficient heat transfer. Flexible hose connections are used between the exchanger plates allowing for thermal expansion while preventing cracking. The hose connections and manifold allow for easy removal of individual plates if necessary. Full height access doors also allow for full access to the exchanger plates for easy inspection, cleaning or plate removal. The unit is constructed with 304L/316L stainless steel, carbon steel and high-grade alloys.



*www.solexthermal.com/resources/patents

WE BRING THE MARKET'S MOST EFFICIENT
HEAT EXCHANGE SOLUTIONS FOR ENERGY
CAPTURE, STORAGE AND RECOVERY



Powering the Next Generation of Energy Capture, Storage & Recovery

From thermal energy storage to carbon capture, here are just a few ways we're redefining what's possible for energy:

High Temperature Applications

Solar thermal technologies are demanding higher temperature ranges to improve system efficiencies and capture more energy that can be converted into grid power. At temperatures where conventional fluids fail, flowing solids such as ceramics or sand materials are being used as alternatives for capturing and converting thermal energy over to power. Flowing these solids through our heat exchanger technology expands the range of temperatures available for energy applications.

Energy Storage Using Solids

One of the main challenges of solar energy is that it is intermittent in nature. Our higher temperature heat exchanger systems (up to 1,500°C) make it possible to address this problem by storing thermal energy within the power plant using heated solids material such as ceramic or sand. This would allow power plants to shift their power production based on electricity demand rather than solar supply. This would allow the power plant to run 24/7.

Phase Change Energy Storage

To improve costs and lower the footprint for thermal energy storage, technologies such as phase change materials are being developed. Thermal energy storage is already employed by solar thermal facilities using molten salt.

Latent heat from changing phases is much greater than sensible heat from mere temperature changes. The ability to use phase change energy also drastically reduces the size of the energy storage device required. To accomplish this, phase change requires heat exchangers that can handle both liquid and solid materials – often at the same time. Our technology is up to the task.

Carbon Capture

Next generation methods of carbon capture are being developed using solid sorbent material to capture CO₂ from power plant flue gases and concentrate this gas into a high-purity stream of CO₂. Solex technology can significantly improve overall efficiency by pre-heating or pre-cooling the sorbent at various process steps. With the right technology, this CO₂ can be sequestered or used in chemical processes instead of being released into the atmosphere, improving efficiency and reducing the plant's environmental footprint at the same time.



Energy Recovery

Overall energy efficiency can be improved by capturing and reusing lost or waste heat that is intrinsic to all industrial processes. Waste heat is an emission-free substitute for other forms of energy such as fossil fuels and electricity.

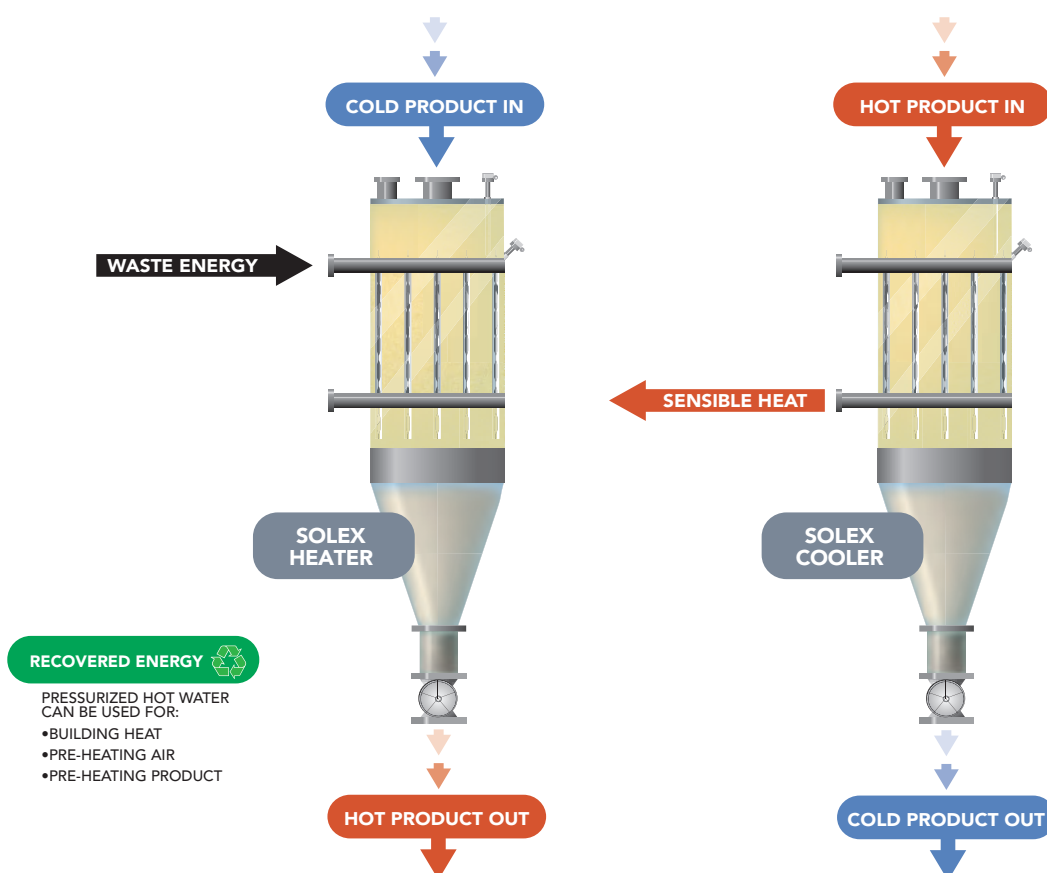
90%
Efficiencies

Thermal energy recovered from liquid or gaseous waste streams can be utilized within the Solex heat exchanger to heat a bulk solid. This is ideal for preheating or preconditioning products such as plastics, oilseeds, glass cullet, etc.

Thermal energy from the cooling process for a bulk solid can be recovered by the Solex heat exchanger and can then be used for preheating boiler feed water, raw materials, combustion air or other bulk solids elsewhere in a plant.

The heat recovery loop can be optimized for maximum energy savings, coupled with custom pre-heater/conditioner design that allows for a wide range of operational flexibility.

Custom solutions can be developed to recover energy from multiple sources, which would typically be inefficient to use in other technologies. Optimizing the energy recovery loop can lead to uninterrupted plant operation in all seasons and maximum steam savings.





A P P L I C A T I O N S & I N D U S T R I E S



BIOSOLIDS



CEMENT



CHEMICALS



FERTILIZERS &
PHOSPHATES



FOOD PRODUCTS



FOUNDRY SAND



METALS



MINERALS & SANDS



OILSEEDS



POLYMERS



POTASH



PROPPANTS



SUGAR



OTHER APPLICATIONS
& INNOVATION



Sales & Technical Services

- A Solex Technical Services Representative is onsite to guarantee proper installation of the heat exchanger unit and that it is commissioned according to specifications.
- A Solex Technical Services Representative can provide onsite training of equipment operation and detailed maintenance procedures.
- Solex Customer Support can verify and validate equipment performance in the field and help to identify opportunities for improvements in operational processes.
- With international distribution, we're able to quickly supply both spare and replacement parts for all Solex heat exchangers.

SOLEX HAS GROWN TO A GLOBAL COMPANY OF OVER 500 HEAT EXCHANGER UNITS
INSTALLED IN MORE THAN 50 COUNTRIES WORLDWIDE





You'll Always Work with an Owner

Solex is an entirely employee-owned company, with a team focused on delivering superior results and service to our customers.

It's the collaboration, expertise and broad technical backgrounds of our tightly-knit team that empowers us to find innovative solutions where others cannot.

**EMPLOYEE
owned**

Your partner in innovation from concept to completion

We work with you at every stage of the process – undertaking complex thermal modeling to find optimal solutions, conducting pilot testing when required and ensuring your installation is both seamless and optimized.

Our international team is ready to provide sales and technical support whenever and wherever you need. We've delivered customized solutions for clients in more than 50 countries.

At Solex we guarantee the kind of service that can only come from having an investment in your success.

www.solexthermal.com

Solex Thermal Science – Corporate Headquarters

Suite 250, 4720 – 106 Ave S.E.
Calgary, AB, T2C 3G5, Canada

Solex Thermal Science – Brasil Ltda.

Rua Helena, 218, Cj. 707
Vila Olímpia, São Paulo-SP,
CEP: 04552 – 050 Brazil
Tel: +55 11 3044 4961



P A T E N T E D * T E C H N O L O G Y T H A T
M A X I M I Z E S E N E R G Y E F F I C I E N C Y



Solex Thermal Science Inc. | 250, 4720 – 106 Ave. S.E. | Calgary, AB, Canada | T2C 3G5 | info@solexthermal.com | +1 866 379 3500

W W W . S O L E X T H E R M A L . C O M

*www.solexthermal.com/resources/patents