

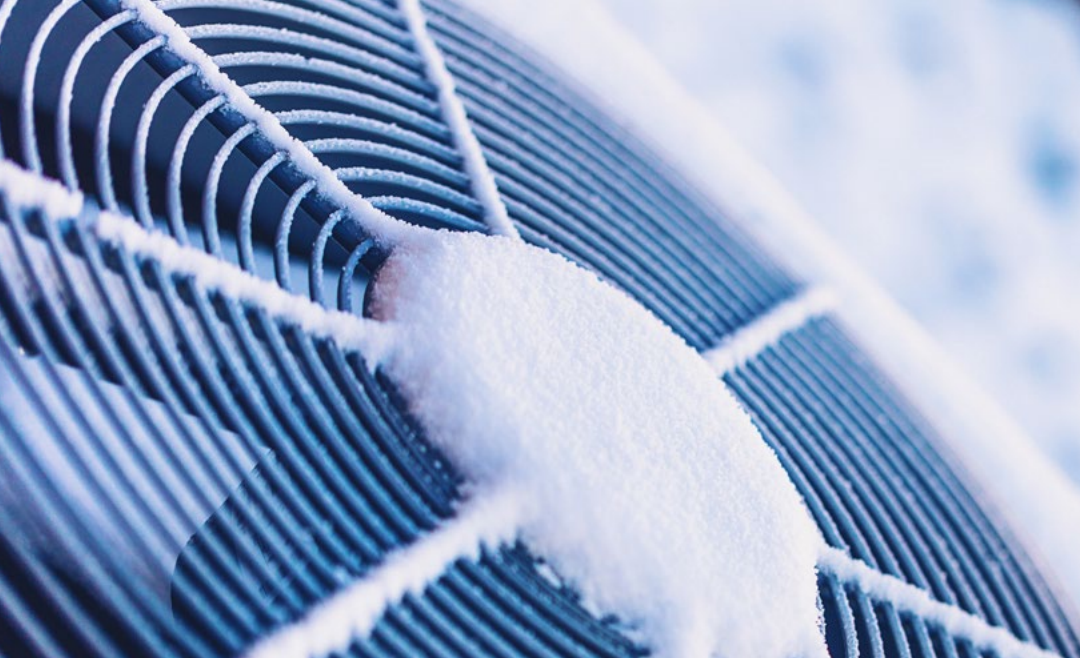
A close-up photograph of a tray of frozen berries, including strawberries, raspberries, and blueberries, surrounded by crushed ice. The berries are coated in a thin layer of white frost. The background is a soft, out-of-focus grey.

SOLUTIONS

**DRYING
SOLUTIONS**

**FOR
COLD STORES**

 **TROTEC**
AT WORK.



HOW GOOD IS THE PROTECTION OF YOUR COLD STORE AGAINST THE FORMATION OF ICE AND FROST?

It is not only due to the extremely low temperatures that frozen storage facilities in the food industry impose high demands on air-conditioning technology. As early as in the construction planning phase there are climate-related characteristics to be observed for the increasingly complex product storage processes so as to ensure the efficient cooling operation of a cold store on a long-term basis.

But even the most sophisticated planning in advance can not completely resolve the most common problem of modern cold stores. Icing!

When putting goods into storage or removing them from the warehouse warm air inevitably streams in from the access points and passageways. Owing to the sub-zero temperatures of as low as $-25\text{ }^{\circ}\text{C}$ prevailing in the warehouse the

moisture first precipitates on the cold surfaces in form of condensate and then freezes. At the same time cold air from the cold storage flows back into the loading area.

Modern air locks and air curtains can reduce the amount of warm air invading the space, to be sure, but this unwelcome climate exchange cannot be prevented altogether.

The result is an uncontrolled formation of ice in the cold store.

In addition to the surfaces the evaporator fins also freeze over leading to a reduced cooling capacity in the cold room. The energy demand increases, the cooling capacity is reduced and the maintenance costs are evidently higher.





THE FORMATION OF ICE IN A COLD WAREHOUSE IS EXPENSIVE AND DANGEROUS.

An insufficient or even lacking humidity regulation in the cold store involves numerous risks and is just plain bad for business with the costs skyrocketing. Hence, you should protect your goods and employees from these cost-intensive dangers.



The formation of ice and frost can entail the following disadvantages:

■ **Hygiene problems**

Condensate on the floors, walls and goods are the ideal breeding ground for mould and bacterial growth. Both warehouse and cooling technology have to be cleaned with increasing frequency.

■ **Increased risk of accidents**

Icing and slippery ground in the loading zone increase the risk of falling. Ice chunks falling from the ceiling could injure employees. Slipping forklift trucks are an incalculable risk.

■ **Inefficient cooling**

With an iced up cooling technology the low temperatures can hardly be maintained. Parts of the cooling technology have to be defrosted more and more often which costs time and money.

■ **Unfavourable working conditions**

Fog and misted up strip curtains obstruct your view when working. The bar codes on the products are rendered illegible by the rime.

■ **Damaged product packaging**

Rime and dripping water soak moisture-sensitive product packaging. And goods with a compromised packaging can no longer be put up for sale. The amount of rejects increases, the profitability shrinks.

■ **Damage to technology and inventory**

Optical proximity switches and light barriers become prone to errors. Humid surroundings lead to corrosion damage and promote malfunctions throughout the entire cooling technology.



END THE ICE AGE IN YOUR COLD STORE.

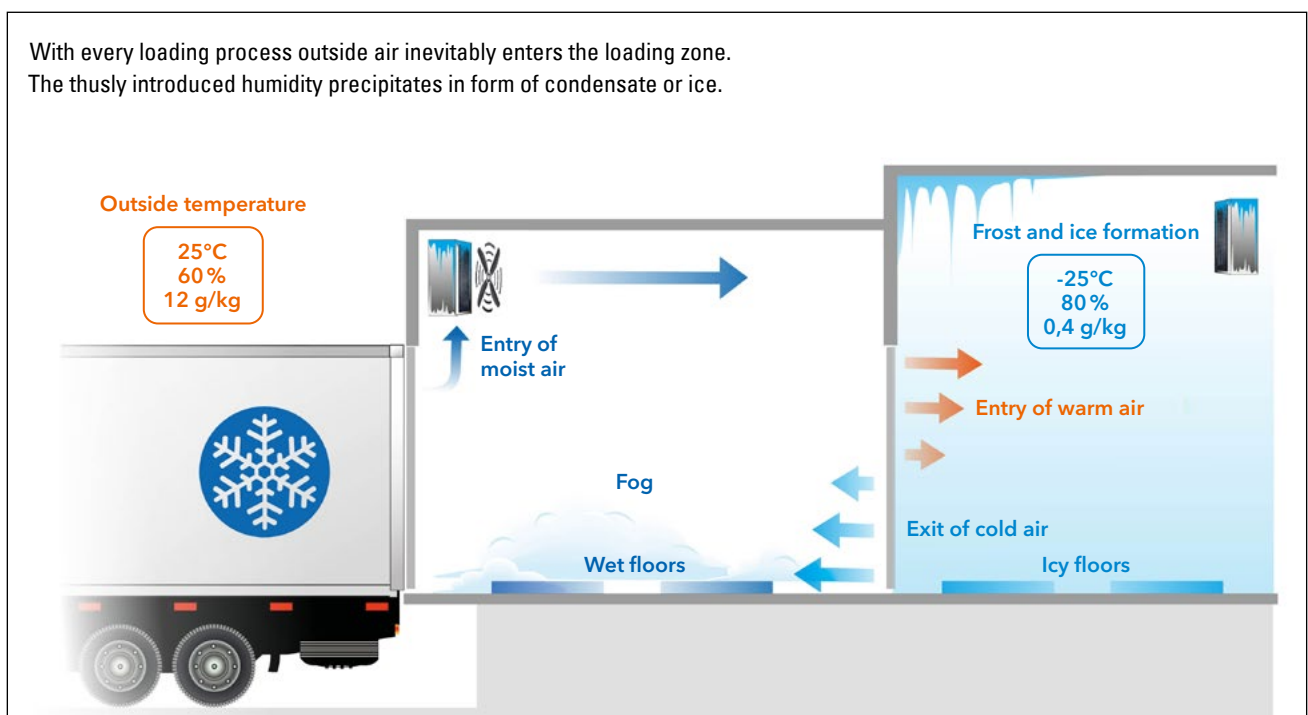
Humidity control avoids the formation of ice and high consequential costs.

When warm and moist air from the loading area enters the warehouse, condensate forms on cold surfaces and freezes to ice. Apart from the previously described problems, frost in a cold store implies one thing above all else: high costs!

With an uncontrolled humidity level a great deal of the energy essentially required for cooling is spent on converting the moisture contained in the incoming air into ice. The cooling process becomes inefficient, the energy consumption grows and the cooling technology suffers from the effects of these icy conditions.

Thick layers of ice on the evaporator reduce the cooling capacity. And along with the then required defrosting of the evaporator the energy consumption rises drastically. If for instance every fourth or fifth defrost and cleaning operation can be prevented by using a suitable industrial dryer from Trotec, this would already mean a great cost advantage with regard to energy consumption and personnel deployment.

By this alone the purchase and application of a desiccant dehumidifier will pay off after a few years.





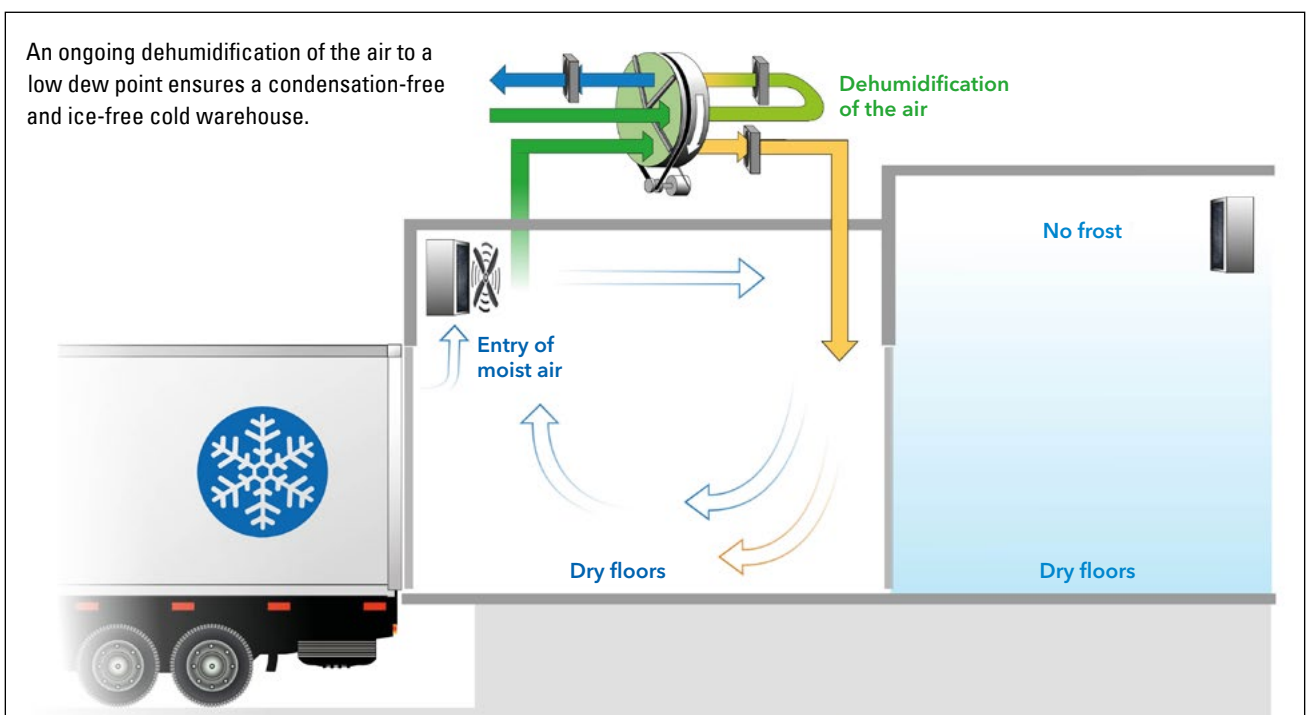
KEEP MOISTURE FROM ENTERING THE COLD STORE.

Eliminating moisture where it is formed.

In the climate conditioning of the cold chain logistics the dew point is reduced by use of dehumidifiers so no condensate can form.

Decisive for condensate formation are the transition areas in the cold chain logistics. At the ramp, where the goods are loaded from cold storage into the truck, the humidity level must be reduced before loading, so the change of temperature cannot cause the formation of fog and ice at the gate to the cold store air lock.

In loading areas of cold storage houses, fluctuating loading cycles depending on the surrounding climate lead to various air currents and turbulences at ramps or cold store air locks, which can hardly be calculated. The consequence: unnecessary additional costs due to an overestimated demand or - even worse - solutions not working sufficiently in real life. Therefore, the specialists of our industrial service team analyse the individual requirement situation on site, determine the specific demand for devices and in consultation with you develop a tailor-made project solution right up to the exact positioning of the devices.





YOUR ADVANTAGES WHEN DRYING COLD STORES.

Using Trotec dehumidifiers of the TTR series for the dehumidification of cold stores you'll benefit from the following advantages:



Less ice, fog and snow in the entrance area.

The functionality of doors and gates is maintained whilst maintenance costs are reduced. Corrosion damage is avoided. No malfunctions at light barriers and proximity switches.



A safer working environment for your employees.

Clearly reduced risk of accidents resulting from icy floors in the cold store. Dry loading zones are essential for the safe use of forklift trucks. Mist-free strip curtains ensure clear vision and safe access.



No damaged packaging. Prevention of rejects.

The stored goods remain free from ice and hoarfrost. Packaging is protected against soaking up. Nothing impairs the legibility of bar codes on the packaging ensuring high-quality products and smooth handling procedures.



Fewer defrost operations required since the evaporator rarely freezes up.

A properly dimensioned dehumidification system can drastically reduce the number of required defrost operations. Consequently, the energy costs are substantially reduced as well.



Cooling with a higher cost efficiency.

The failure-free operation of door control systems facilitates the quick and trouble-free loading and unloading in a minimum of time. This reduces the inevitable energy loss.



Reduced maintenance costs.

With ice-free cold stores you can extend the maintenance intervals at evaporators and gates. The accompanying costs are reduced to a minimum.



Stationary TTR desiccant dehumidifiers from Trotec can be connected to your ventilation systems quickly and without difficulty. And using our mobile desiccant dehumidifiers you can regulate the humidity level wherever an acute need arises.

Find out more on the following pages.



Mobile TTR desiccant dehumidifiers

Dehumidification performance: from 8.4 kg/24 h to 52.8 kg/24 h
Nominal air volume: from 80 m³/h to 480 m³/h

Stainless steel desiccant dehumidifiers of the TTR series

Dehumidification performance: from 12 kg/24 h to 24 kg/24 h
Nominal air volume: from 155 m³/h to 250 m³/h
Also available with booster fan.



DEHUMIDIFIERS OF ALL PERFORMANCE CLASSES FOR THE PERFECT FROZEN STORAGE CLIMATE.

For mobile or stationary applications – our TTR models are always the first choice.

With our industrial desiccant dehumidifiers of the TTR series we at Trotec can offer ideal application solutions for maintaining the constant pourability and flowability of hygroscopic products in storage, transport and dosing systems – even in cold environments with a low dew point.

The devices, "made in Germany" and are exclusively available only from Trotec, represent the current state-of-the-art when it comes to a series of desiccant dehumidifiers on the market.

Owing to a comprehensive standard equipment as well as numerous equipment options, the compilation of a virtually tailor-made solution to meet your individual needs can be realized quickly and at low cost – upon request supplied with bacteriostatic sorption rotor with hygienic design.

With both the smaller TTR models for mobile applications and the larger industrial dehumidifiers for stationary continuous operation an efficient and permanent dehumidification with a high capacity can be implemented even at low dew points.

All TTR models are extremely durable, require only little maintenance and can be flexibly configured. They operate according to the TTR Trisorp Dual principle with dual air circulation for pressure-neutral recirculation operation. Each of these air circuits has a separate fan that can be adjusted independently via an infinitely variable electronic regulation.

For the permanent outdoor use we can provide our special weather protection equipment comprising: weather protection grids at air inlets, additional seals, exhaust pipe arc for humid air, Plexiglas flap protecting the operating elements.

Mobile versions of the TTR industrial desiccant dehumidifiers.



Transport frame



Stackable



Trailer solution TTR Cargo



Stationary industrial desiccant dehumidifiers of the TTR series
 Dehumidification performance: from 86.4 kg/24 h to 1,790.4 kg/24 h
 Nominal air volume: from 750 m³/h to 13,300 m³/h

THE TTR TRISORP DUAL PRINCIPLE - INNOVATIVE AND POWERFUL.

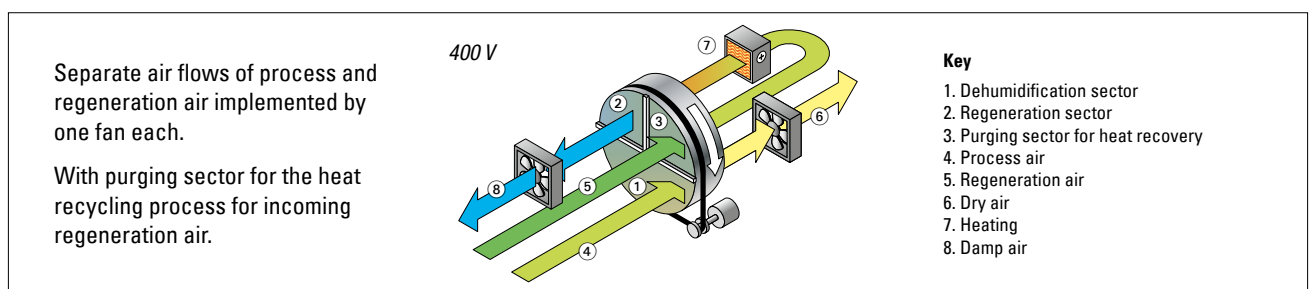
The TTR series brings the necessary flexibility to meet your needs.

Using the control unit that goes by the name of Duoventic, volume flow and degree of humidity can be configured quickly and independently for all TTR devices without the need for conversions or external throttle valves: extremely dry air with a low air flow rate, larger volumes of dry air or maximum circulating air performance with a moderate ratio of dry air.

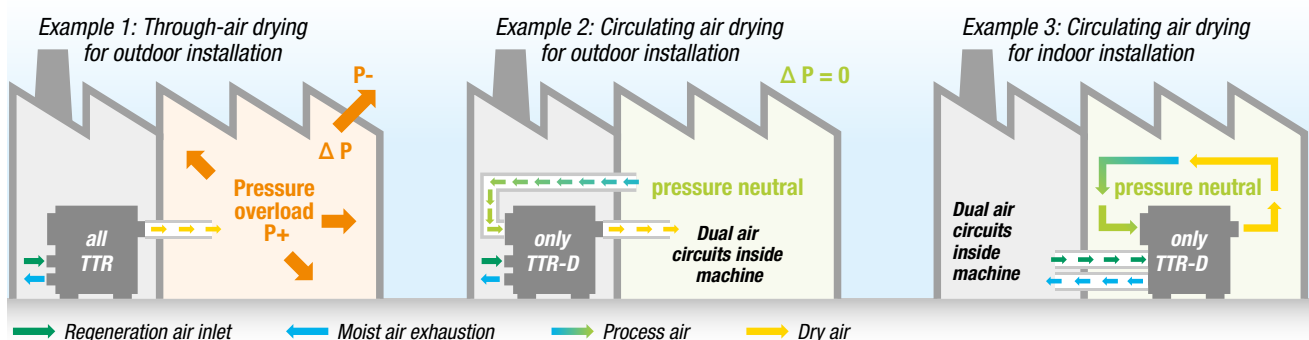
Unlike the conventional ventilation mode, recirculation operation with dual air circuits allows an energy-saving dehumidification combined with higher drying rates. Depending on the technical on-site conditions, electric or steam

heaters but also process waste heat can be used as heating medium for the regeneration air so as to reduce energy costs. Due to the configurable air direction reversal TTR dryers can also be flexibly integrated into existing process sequences even with pipe connections – in case of a given operating site the dry air can be blown out as needed towards the left- or right-hand side and the humid air can be discharged in the opposite direction.

Further available to optimally adjust the devices to your specific application requirements is a comprehensive range of additional equipment options.



Typical applications of the TTR Trisorp Dual principle:



TTSL® BRINGS EVERYTHING SO CLOSE TO YOU THAT YOU'LL ALMOST THINK YOU'RE THERE TO EXPERIENCE IT FOR YOURSELF!

The system solution for the remote monitoring of all climate parameters and system statuses at several sites

The Trotec TTSL® platform for the remote monitoring of your climate data and system statuses gives you an extensive and central view to all relevant data.

TTSL® is a modular, cloud-based complete system for measurement data acquisition, including a variety of sensors and interfaces, large-range gateways and a user-friendly application for storing, analysing and documenting the measured data.



With TTSL®, sensitive values such as the humidity level, temperature or system statuses at different sites (e.g. control centres/radar stations) can be monitored, in order to take action if required - without an employee having to be present on site.

Advantages of TTSL® remote monitoring:

- A platform for all data and application scenarios: Remote monitoring, remote control, analysis and documentation of processes and machinery
- Monitoring, analysis and control simply from anywhere via smartphone or the office PC
- Modular design for customised adaptation and extension
- A variety of sensors and interfaces: Temperature, humidity, filling level monitoring, surface temperature, resistance humidity
- Ensures maximum responsiveness - without cost-intensive personnel on site
- Permanent monitoring of the equipment increases the system efficiency
- Multi-client capable system - customisable to employees and customers

PLAY IT SAFE.

With our best practice industrial services.

Since every industrial undertaking has characteristic process flows, installations and facilities, every air treatment solution demands case-specific device configurations.

All in all, the combined effects of air currents, humidity conditions and temperature fluctuations are often hard to calculate on a purely theoretical basis, e.g. in airlock areas or on conveying paths.

The consequence: Unnecessary additional costs due to an overestimated demand or - even worse - solutions not working sufficiently in real life.

Hence, Trotec provides not just dehumidification technology but tried and tested dehumidification solutions!

Our dehumidification specialists analyse the processes directly on site, carry out room climate measurements to detect problematic areas and then develop a tailor-made solution right up to the exact positioning of the devices.

Before the planned stationary units are installed, our service team first works with mobile versions of the drying units as part of a trial run. These can be put up without any difficulty or the need for structural changes.

During this validation phase we document all relevant climate parameters such as air temperature, relative humidity, dew point or flow rate for a final optimization of the requirement calculation.

Trotec is the only provider of this advantage:

Thanks to the unique option of non-binding trial operation you will invest solely in solutions which have verifiably proven their worth in everyday operation meeting your individual on-site requirements.

The stationary units will not be ordered until you are fully satisfied with our concept.

The only costs incurred consist of an inexpensive hiring flat rate for the time of test operation.





**EXPERTS FOR
ALL-ROUND SOLUTIONS**
AIR TREATMENT AND MORE

The Trotec Trade Division is one of the leading equipment partners for air treatment solutions in trade and industry.

In addition to drying systems, we can offer a complete range of machines for climate conditioning – covering the sectors of heating, humidification, ventilation and air conditioning right up to air purification. Furthermore, we provide manifold measuring devices for building diagnostics, damage detection, quality assurance and industrial maintenance.

If desired, we will be pleased to realize customer-tailored special models

Example XTR 2300, complete system for air conditioning in an industrial production hall. Individual design with air-cooled desiccant dehumidification, Flowmatic flow rate control of dry air, humidity and temperature regulation, post-tempering of the process air and thermal decoupling as well as insulation of the outer layer to prevent condensation.



We not only have the appropriate devices in all product categories, but also comprehensive application expertise acquired over many years.

Your advantages with Trotec:

- System-independent consultation
- Purchase, hiring, service - all from a single source
- One contactperson for all inquiries



Unlimited services

Trotec has nearby stores all over Europe. Our network of subsidiaries is growing steadily to make sure our quick and competent on-site service is available for you regardless of the location.

You also need an individual drying installation?

**Just give us a call.
We would be happy to advise you personally:**

Tel. +49 2452 962-777

Or send us an email to kam@trotec.com.

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Best conditions for your success

With corporate divisions for industrial equipment and services that are linked up intelligently, the Trotec Group is one of the prime international addresses for professional complete solutions regarding climate control and measuring technology for building diagnostics.

We can offer our industry expertise acquired over many years, products of a high quality and a comprehensive range of services - all from a single source!

Benefit from the experience our experts gathered from numerous installations - especially for applications in the bulk material processing industry. We will be pleased to advise you personally and in detail. Feel free to contact us by phone or e-mail - we look forward to your inquiry.



 **TROTEC**
AT WORK.