TROX life

magazine feb/2012

Airport air.

The art of handling AIRports.

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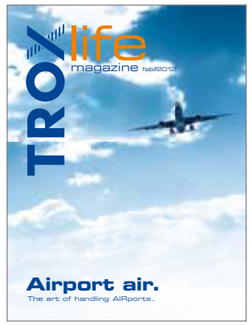


viewpoint

Aviation and air handling.

What do TROX and the aviation industry have in common? Obviously, anyone saying aerodynamics would be correct! It is crucial for both. However, many people may not know that our company founder, Heinrich Trox, was in a leading position at an aircraft manufacturing plant for many years before he became the managing director of a well-known German air conditioning systems manufacturer based in Bonn.

There, he realised the opportunity to specialise in design and production of components for this industrial branch, which had many parallels to his past activity in aircraft construction. In 1951, he founded Gebrüder Trox GmbH in Neukirchen-Vluyn together with his brother Friedrich. On his private property, he began the production of ventilation grilles in a building of 110 square metres. That was how the business got off to a flying start…

With the production of air handling units we have now come full circle. TROX has grown from a manufacturer of components into a provider of comprehensive systems in ventilation and air conditioning technology. We are now taking a trend-setting step into a new era.

This year will see the inauguration of the Berlin Brandenburg (BER) Airport in the German capital, one of the most modern and important airports in Europe. Just south of the old Schönefeld Airport, a completely new airport building and new runways are being created. TROX is providing almost all the ventilation and air conditioning components for this ambitious airport project. Beside our background in aircraft technology, it is a nice occasion for dedicating this issue of TROX life to the fascinating theme of airports.

We hope you find this issue interesting and thank you for „flying with us“. Enjoy the read!

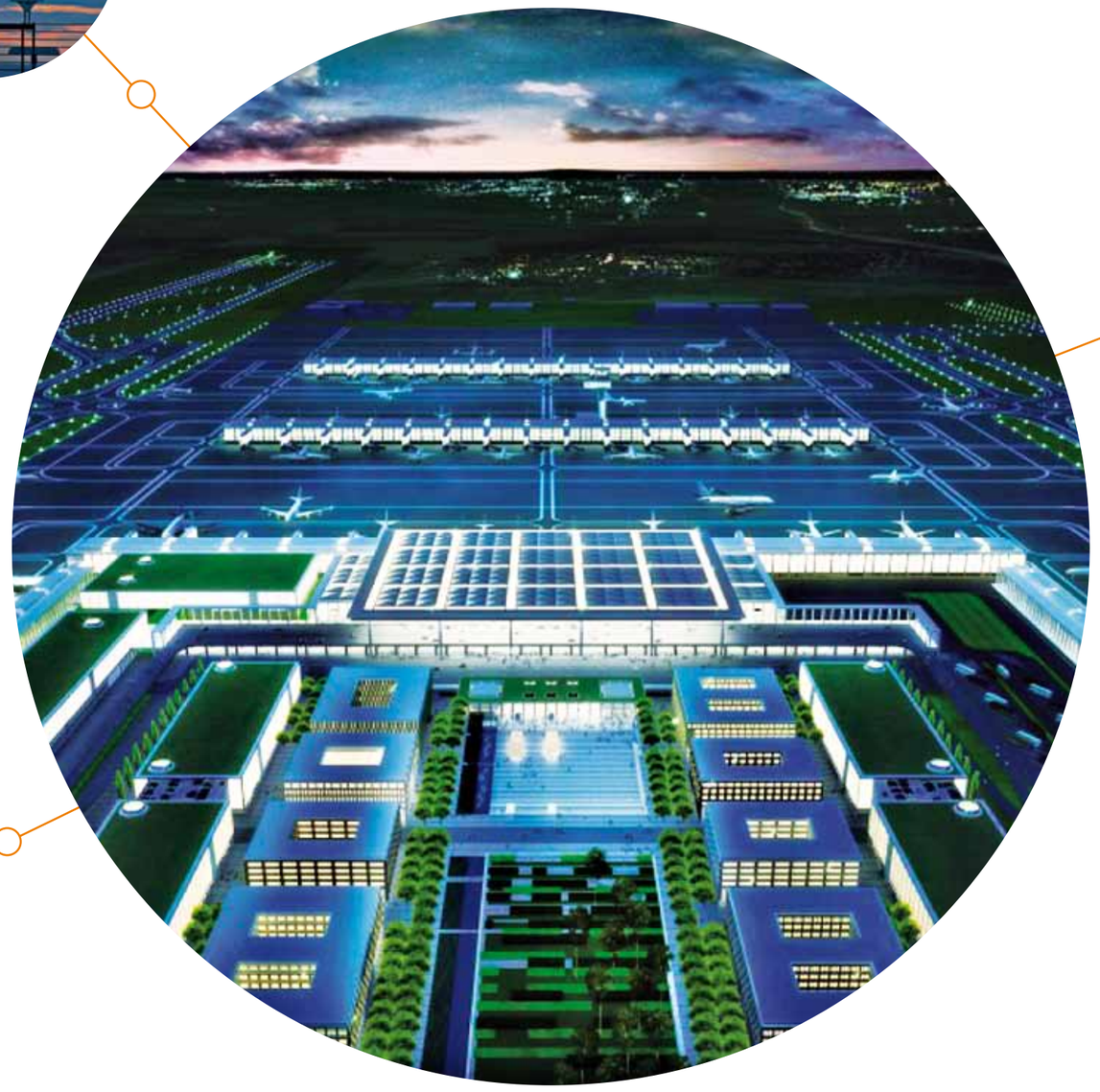
Lutz Reuter
Chairman of the Board of Management of TROX GmbH

It is already thought of as one of the most ambitious airport projects in Europe – Berlin Brandenburg Airport (BER), set to be inaugurated on 3 June 2012. Thanks to its central location, it offers fast and easy access to all important European destinations.

BER.
Berlin Brandenburg Airport.

Photo: Alexander Obst/Marion Schmieding, Berlin airports

The former Schönefeld Airport has been expanded by 970 ha so that the new airport covers an area of 1,470 ha, which corresponds to around 2,000 football pitches. In the future, all air traffic to the capital region will be concentrated to the Berlin Brandenburg Airport. Tegel and Schönefeld will be closed. The new airport will create 40,000 new jobs, employing 73,000 people in total.



BER airport terminal: Its midfield position between the two runways ensures short distances despite the size of the airport. All gates for domestic and international flights are found under one roof and can be reached in a matter of minutes.

Photo bottom left, centre, right:
gmp Architekten/JSK International/Björn Rolle, Berlin airports

Next generation of airports.

BER represents the next generation of transport hubs. It links air, rail and road traffic optimally and to a degree of perfection hitherto unseen anywhere in the world. The capital region gets an easy-to-reach airport, conveniently accessible via the motorway. Passengers travelling by rail can reach the underground terminal station in only 20 minutes from Berlin's central station and can get to the terminal in a matter of seconds, using escalators and lifts.

Whether you arrive by car or by train, you can make your way to the check-in counters in a skip and a jump. The distance from the counter to the gates via security is also extremely short. Interactive touch screens and signage ensure easy airport use, everywhere in the building.

A major room air distribution challenge – the six-storey midfield terminal.

The one-roof concept.

All German, European and international arrivals and departures are brought together under one single roof, as BER is a so-called midfield airport. In other words, the terminal building sits between the two parallel runways, which can be operated independently of one another because of the distance of 1,900 metres between them. The terminal, gates and parking spaces are all located in a compact centre between the runways. This ensures that a large part of the noise generated on the ground will be kept within the confines of the airport.

The midfield terminal will have six floors and will initially have the capacity to process 27 million passengers. The concept allows for later expansion to process 45 million passengers. BER will have more than 25 passenger boarding bridges and 85 aircraft parking stands. Some stands will even be adapted for the wide-body airliner A380.

Photo above: gmp Architekten/JSK International/Björn Rolle, Berlin airports
Photo below: Marion Schmieding/Alexander Obst, Berlin airports

Architecture places great demands on air conditioning.

The architectural references to the regional history of construction, i. e. the large, clearly articulated façades and the geometry, which capture the architecture of Schinkel and Bauhaus, require great sensitivity when integrating air handling technology. Sustainability is another aspect to be considered: the planners needed to implement optimum use of energy in each and every part of the airport. They therefore introduced innovative heat recovery systems and regenerative energy sources, such as geothermal energy and cooling with rainwater, in the planning.

TROX components can be found in almost all areas of the airport: ventilation grilles, slot, swirl and ceiling diffusers, disc valves, external louvres, filters, multileaf dampers, air terminal units, and sound attenuators create a comfortable airport climate. Furthermore, fire dampers and smoke extract dampers as well as fire protection valves from TROX ensure effective and future-proof implementation of safety measures. Tunnel dampers in the underground railway station ensure the safety of passengers below the airport.

>>> BER

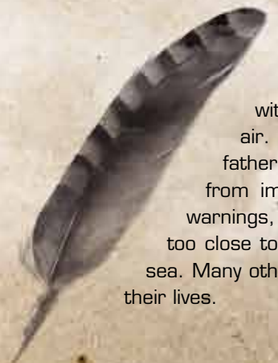
Technical equipment for all buildings – Airport Berlin.
- 50,000 sprinkler heads
- 10,000 smoke detectors
- 177 km pipework
- 210,000 m² sheet metal ducts for air distribution
- 170 air handling units for compartment air
- 4 energy stations, 34 transformers
- 2,400 km power cables and wires
- 60,000 lights
- 68 lift systems, 28 escalators and 16 moving walkways
- 1,300 sanitary facilities
- 10,000 loudspeakers

TROX components (excerpt).
- 1,731 grilles and 1,518 disc valves
- 702 slot diffusers
- 116 active chilled beams
- 165 external louvres
- 4,993 fire dampers and tunnel dampers
- 713 smoke detectors and 1,396 TROXNETCOM units
- 1,370 smoke extract dampers
- 1,139 circular silencers
- 632 air terminal units and 2,493 volume flow controllers
- 795 additional silencers

More than 17,000 TROX components, such as fire dampers and slot diffusers, provide safety and an excellent airport climate in Berlin.

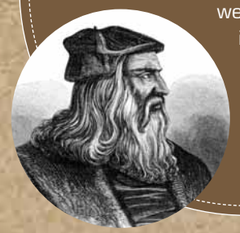
The dream of flying.

Pioneers of aviation.



As far back as in ancient times, man was fascinated with the idea of being able to fly like a bird through the air. According to Greek mythology, Icarus and his father made wings out of birds' feathers and wax to flee from imprisonment by King Minos. Despite his father's warnings, reckless Icarus became too exalted and flew too close to the sun; the wax melted, and Icarus fell into the sea. Many others emulated his attempt and often also paid with their lives.

Leonardo da Vinci **(1452 – 1519)** may well have been an engineering pioneer of aviation. He sketched different airplanes that were mainly based on his observations of birds and bats. Whether the airplanes were actually ever built is something we will never know.



In **1783,** the first aircraft in the world lifted off. According to the principle that hot air is lighter than cold air, the Montgolfier brothers took to the skies in a hot air balloon.

Some inventors lacked the crucial ascending force. In 1810 and 1811, Albrecht Ludwig Berblinger, a tailor from Ulm, Germany, built an airplane with which he intended to soar through the air like a bird. In **1811,** he took off from a bridge over the Danube, supervised by the King of Bavaria. Berblinger had, however, forgotten one thing: the cold river offered no upward winds to keep him in the air during his trials. His planned crossing of the river became a belly flop and he had to be rescued from the waves of the Danube.

On **1 July 1900,** the first steerable airship built by Ferdinand Graf von Zeppelin started its maiden journey. The later „Hindenburg" with a length of 245 m was the largest airship ever built. At a tremendous speed of 125 km/h, it transported up to 75 passengers from Frankfurt to New York in four days. On 6 May 1937, the Hindenburg went up in flames as the hydrogen inside the balloon ignited during the landing in Lakehurst. 36 people perished in the fire, 62 were rescued from the flames.

The first powered flight was completed in **1903** by Wilbur and Orville Wright. The brothers only flew 37 metres through the air in 12 seconds, but in 1905 they managed to stay up for 39 minutes.

The first flight across the English Channel took place in **1909:** a Frenchman named Louis Blériot flew from Calais to Dover in 37 minutes at an altitude of 100 metres. 10 years later, Alcock and Brown were the first to cross the Atlantic in an airplane. In 1927, Charles Lindbergh became the first pilot to make the journey alone.

The first commercial aircraft, the Junkers F13, was built by Hugo Junkers. At the beginning of the 1930s, aircraft were equipped with navigating instruments „for blind flying". Materials, engines and aerodynamics were continuously improved. The most commonly used aircraft in Germany was the Junkers Ju-52, affectionately called „Tante Ju" (Auntie Ju).

The Heinkel He 178 was the first aircraft in the world powered by a turbine jet engine. It took off on its maiden voyage on **27 August 1939** in Rostock-Marienehe; the pilot was Erich Warsitz.

ExtrAIR-ordinary reading.

The era of modern passenger air travel.

The increasing tensions and the beginning of the Second World War triggered the rapid development of aircraft. Shortly after the war, the age of modern civil aviation began, as shown in this outline.

ExtrAIRordinary

The largest airline in the world in 2010 was Delta Air Lines, based Atlanta/USA, with more than 1,200 aircraft and 110 million passengers. Hartsfield-Jackson Atlanta International Airport has the largest passenger volume with 89,331,622 travellers.

Source: Wikipedia

ExtrAIRordinary

Lufthansa subsidiary LSG Sky Chefs **is the market leader in onboard catering** with around 30 per cent market share.

ExtrAIRordinary

The first international airport was Croydon Airport, built in 1920 in the south of London.

ExtrAIRordinary

Gibraltar Airport is the only airport in the world to have a runway intersected by a public road. A barrier secures the runway during flight operation.

ExtrAIRordinary

The most scary airport ...

is undoubtedly the Chamdo Airport in Tibet at the highest altitude, at 4,334 m above sea level. Previously it was the airport in Hong Kong with its adventurous approach.

Lockheed Super Constellation

Douglas DC6

BellX-1

1947 The BellX-1 is the first aircraft to officially break the sound barrier. Unofficially, a Messerschmitt Me 262 allegedly achieved this in 1945.

1950s Propeller engines are used for civil aviation until the late 1950s.

End of the 1950s
Jet engines are widely used. The aircraft become faster and can carry greater loads.

1952 The age of modern commercial aviation dawns with the launch of the De Havilland DH 106 Comet by the airline BOAC.

DH 106 Comet

1955 Four-engined civil transport aircraft, such as the Douglas DC6 and Lockheed Super Constellation, are developed from military transporters. They fly non-stop across the Atlantic carrying around 90 passengers on board. Flight time from Düsseldorf to New York: approx. 13 hours at a speed of 311 mph.

1957 The number of passengers in transatlantic flights exceeds for the first time the number of passengers carried by ships.

Jumbo

Beginning of the 1970s The Jumbo jet marks the introduction of wide-body airliners for passenger transport.

1958 The Boeing 707 can carry twice as many passengers over larger distances and at almost twice the speed of propeller aircraft.

Boeing 707

Concorde

1976 Supersonic passenger airliner Concorde halves the travel time from Paris to New York to 3 to 3.5 hours.

1972 Maiden flight of the Airbus A300, the first European wide-body airliner.

Airbus A300

1990 Rapid increase in air traffic. Approx. one billion passengers travel by air each year. By the turn of the millennium, the figure would have already doubled.

Airbus A380

2005 The A380 starts its maiden flight from Toulouse. She can carry 555 passengers.

6 June 2012
The first airplane takes off from the Berlin Brandenburg Airport.

Cautious optimism.

The prospects for the global economy have become a lot more uncertain since the last forecast, presented in Helsinki in June. Stalling growth in the US combined with increasing worries about debt defaults in the Eurozone has led to a more downbeat view of short-term economic prospects across the Euroconstruct area. While the expected outturn for GDP in the Euroconstruct area in 2011 is not much different from Helsinki (1.8% vs. 1.9%) the prospects for 2012 are significantly weaker (1.1% vs. 1.9%).

The major assumption around this GDP forecast is that the Eurozone is able to weather its current financial crises. However, the risks are undoubtedly on the downside. Should Eurozone policy makers fail to convince investors that they have a credible plan for dealing with the issue of Greece's debts, there is a real risk of a financial crisis as in 2008.

For construction as a whole the worsening economic outlook has impacted on our overall projections. Whereas the recovery in construction activity had been expected to materialise in 2012 below its 2007 peak, it is now postponed until 2013.

The prognosis is similar for the non-residential sector. While output in the sector started declining a year later, in 2008, its peak-to-trough fall is likely to be around the same magnitude, 16% in real terms. Output totalled just under € 426 billion in 2010, a 4.8% drop on the previous year. The expectation for 2011 is of a further, albeit smaller fall of 1.4%, to just under € 420 billion.

Energy efficiency is an economic motor.
A transition to new types of energy, the finiteness of fossil fuels and the resulting rise in energy prices will make measures to promote energy efficiency the growth engine in the redevelopment and renovation sector. However, the interest in these issues and the willingness to save energy still vary considerably between different European regions.

France, Germany and the Scandinavian countries still set the pace in energy efficiency, while the other countries, e.g. in Eastern Europe, still have a long way to go to catch up. The demand for energy-efficient technology and constructive measures will increase disproportionately there.

Berlin Brandenburg Airport, one of the most impressive construction sites in Europe.

Left photo: Marion Schmieding/Alexander Obst, Berlin airports

Optimum aircraft air.

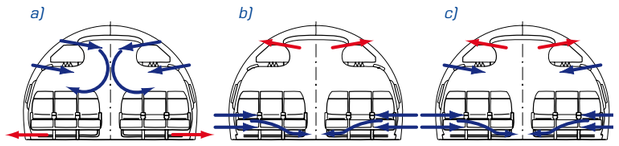
Comfort PAX vobiscum …

… may fresh air be with the passengers, or PAX, which is what the tourist industry would say! Air is becoming an increasingly important factor in deciding about the comfort of passengers travelling by air and, in turn, the competitive edge in modern aircraft cabins. The mixed air which is usually employed in planes may in some cases lead to disagreeable draughts and huge variations in temperature that are far from comfortable. For many years now, the Institute for Energy Efficient Buildings and Indoor Climate at RWTH university, Aachen, on behalf of Airbus, has therefore been investigating how to improve the cabin climate using a new air conditioning and ventilation concept.

Providing fresh air in the closed quarters of the aircraft with an outside temperature of –50 °C, a very high occupancy rate and the additional waste heat of modern flat screens is truly a challenge.

Determining passengers' comfort factors.

A broad study looks at novel displacement ventilation, conventional mixed air flow ventilation and a combination of the two types of ventilation, with the aim of improving passenger comfort. For this purpose, a mock-up cabin with the geometry of the Airbus 320 was built in the institute. The mock-up is used to conduct flow tests where temperatures and flow rates are measured. Using tracer gas, the air distribution in the three systems is measured, and the air exchange in the different seating positions (aisle, middle and window) and body areas in different volume flows are studied.



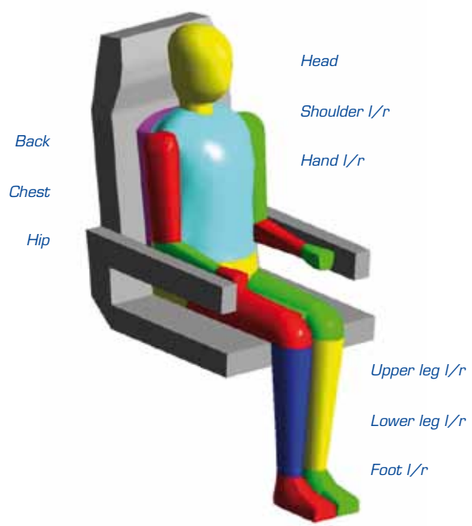
Air distribution by a) mixed air flow distribution, b) displacement flow and c) hybrid ventilation, a combination of both ventilation systems.

Flight air simulator for comfort assessment.

The mock-up cabin is also used to run tests with passengers. 35 test passengers sit through a three-hour „flight" in this cabin. During this time, the type of airflow in the cabin is varied and the test passengers are asked about their subjective perceptions and comfort in order to determine the ambient temperature (soft facts). „During the flight", the passengers fill out a questionnaire in which they give feedback about general thermal perceptions, but also about certain areas of the body. At the same time, the thermal conditions are measured (hard facts). This helps create a complete picture of the pros and cons of different types of ventilation in aircraft cabins.

TROX provided the diffusers in the mock-up for the test subjects.

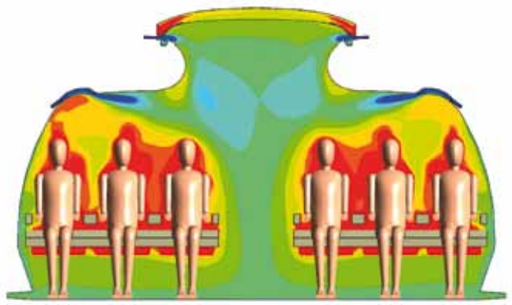
Based on the tests conducted with the test passengers, a new, detailed comfort model for passengers was developed, which serves to assess the sensory perceptions of individual areas of the body as well as thermal comfort.



Body zones of the comfort model

CFD*-air flow analysis – planning optimal ventilation systems as early as in the design phase for an aircraft.

The comfort model can also be used together with the aerodynamic calculation method as a tool for designing a suitable air discharge system while the aircraft is still in the development phase. CFD simulations offer the additional advantage of providing information for the entire flow field, not just for single measurement points.



Distribution of temperature and mixed flow air distribution in an aircraft cabin.

Based on the registered flow data, the detailed comfort model can be used to calculate the expected surface temperature of the body of each passenger. By combining the flow model and the comfort model, it is possible to make accurate predictions about passenger comfort.

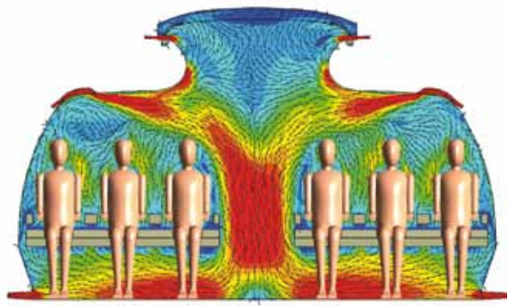
The bottom line: There is still room for improvement.

Flow tests, comfort assessments and CFD simulations serve to improve ventilation comfort and, in turn, the comfort of passengers.

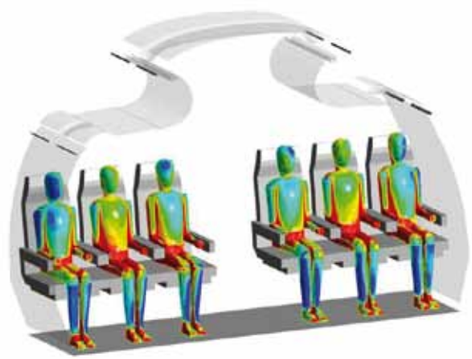
*Computational Fluid Dynamics are flow simulation models using computer software.

Measurements and simulations have shown the advantages of displacement ventilation over conventional mixed air flow ventilation: A lower risk of air draughts thanks to a comfortable vertical temperature distribution. Another great advantage is the lower energy consumption that can be achieved.

However, the subjective ratings from the test passengers have not produced any clear-cut conclusions. Therefore, special large-scale test series for hybrid ventilation systems are still being carried out with the aim of developing the ideal ventilation system of tomorrow for the aviation industry.



Velocity distribution and mixed flow air distribution in an aircraft cabin.



Passengers' body surface temperatures.

Air that gets around.

Room air distribution in airport buildings.

The most demanding requirements on ventilation and air conditioning in airport buildings have to be met in the departure hall. Due to specific requirements at airports, this is a space that requires ceiling height, very different functional areas and fixed workstations.

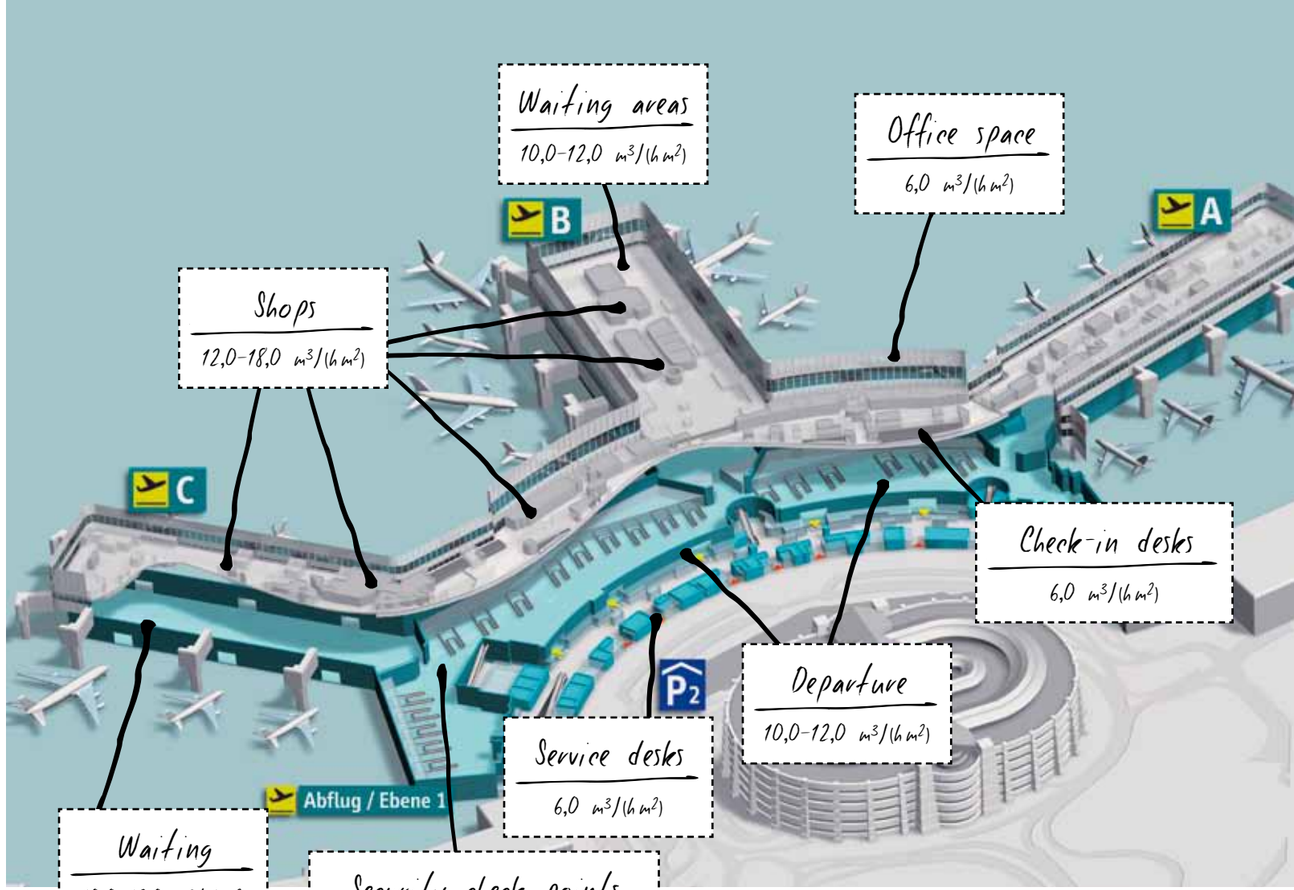
By Dr.-Ing. Thomas Sefker, Head of Research and Development at TROX GmbH.

According to regional building laws in Germany, airport buildings are considered „places of public assembly“. As a consequence, the buildings must be equipped with a mechanical ventilation system that provides sufficient outside air, and with smoke extract systems which ensure smoke-free escape routes (you can read more about this in TROX life Feb/2010, p. 9 ff.).

For workplaces in an airport building, the comfort requirements stipulated in the relevant guidelines for workplaces apply. To comply with these guidelines, a so-called „microclimate“ is established – with an independent air supply and individual heating and cooling possibilities. In addition, aspects relating to the use of the terminal and the high load fluctuations must be taken into account.

Classic air systems vs. air-water systems. General requirements for the ventilation and air conditioning of airport buildings.

For many air conditioning tasks, the room air is both contaminated by smells and pollutants and heated by external and internal thermal loads. Machines, people and solar gain cause thermal loads. Naturally, all this must be taken into consideration during the design phase, such that the air conditioning system can be sized accordingly. In assembly rooms such as departure halls, cinemas and theatres, people are the main cause of air contamination. Good air quality can only be achieved by providing an adequate quantity of clean fresh air that takes occupancy levels into account. In these cases, the required heating and cooling capacity is provided by the supply air temperature differential. In these cases, a classic air system with specific supply air flow rates of 18.0 to 24.0 m³/(hm²) is a good choice



for the air conditioning of departure halls. The air is generally supplied to the high halls via jet nozzles, whereas in functional areas with clear room heights of up to 6.0 m the air is supplied via suitable swirl or slot diffusers.

Today, air-water systems are being used more and more since the heating and cooling capacity of these systems can be provided independent of the required fresh air flow rate. In addition, air-water systems have the advantage that the thermal energy is transported more efficiently by water than by air, which means that water has a lower energy requirement to provide the same heating or cooling capacity. Ideally, the dissipation of thermal loads, particularly in airport areas with offices, shops and restaurants, is ensured by water-based heating and cooling systems.

The ventilation systems are designed as mere outdoor air systems. This means that the specific air flow rate can be reduced to 10.0 to 12.0 m³/(hm²) on average and depending on the number of people in the individual functional areas. Only densely occupied areas such as security check points must have a sufficient supply of fresh air of up to 20.0 m³/(hm²).

The functional areas are divided into several control zones. Using volume flow controllers with CO_2 sensors, for example, the volume flow rate for each zone can be adapted separately and according to specific requirements. At the same time, the actually required total air flow rate to be handled by the air handling units can be adjusted by means of frequency converters. This control strategy significantly reduces the costs associated with air transport.

The control strategy in the basic load supply is based on an air flow rate adjustment depending on the air quality and a separate regulation of the temperature by water-based systems. In peak demand times, the volume flow rate control is integrated into the overall regulation of the room air temperature.

Ventilation solutions for the departure halls of a terminal building

Air conditioning option 1 – jet nozzles:
Functional description

The supply air is discharged using jet nozzles installed at a height of 6 to 10 m. The angle of discharge is optimised for cooling. For heating, the jet nozzles must be electrically adjustable.

The arrangement and throw distance of the jet nozzles are optimised with the help of CFD* simulations. The point of air discharge into the occupied zone in the case of unilateral mounting and the discharge range of nozzles placed opposite one another must be taken into account. These areas must be away from stationary work stations.

Air conditioning option 2 - displacement flow:
Functional description

The principle of operation of displacement ventilation requires a supply air temperature below the room temperature. This creates a virtual „pool of fresh air". Through the natural convection of people and other heat sources, the supply air is taken from the pool of fresh air and heated.

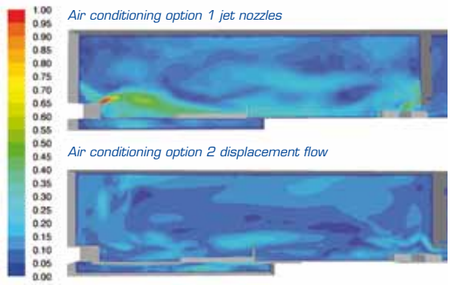
This is why the supply air should be discharged as close to the floor as possible, via displacement flow diffusers. They are either integrated into the structure of the departure hall or in combined energy and communication columns. The removal of extract air ideally takes place above the occupied zone, i. e. in the area under the ceiling where the used, contaminated air accumulates.

This concept is based on the idea that the temperature need only be regulated in the occupied zone. Outside this zone, the temperature may rise to 32 °C. However, it is important to ensure the air supply over large distances or surfaces.

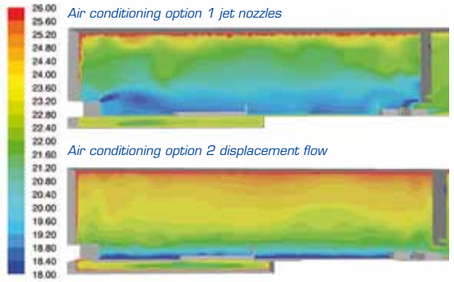
The heat generated by powerful, large heat sources or by floors heated by sunlight (solar gain) may cause too much fresh air to literally be driven away from the occupied zone. This means that the supply of fresh air to the remaining indoor zones can no longer be ensured.

The degree to which the pool of fresh air penetrates the room can also only be simulated using CFD. Due to the sensitivity of the system at high surface temperatures, the thermal simulation of the building and the CFD flow analysis must be considered together, in contrast to mixed air systems. In particular the stability of the thermal layers can only be displayed correctly by high-end analysis processes. The penetration depth of the displacement ventilation can be improved with additional measures, for example by a floor cooling system.

Computational Fluid Dynamics



CFD simulation results – room air velocities



CFD simulation results – room temperature

Typical design principles for a terminal departure hall (cooling)

Room air temperature	*22 to 27 °C*
Room cooling load (on average)	*50 to 60 W/m²*
Room cooling load (peak values) at maximum occupation	*70 to 80 W/m²*
*Design principle – fresh air flow rate (IDA 3)***	*10 to 12 m³/(hm²)*
Variable operation (e. g. CO_2-controlled) with temperature cascade in summer	*4 to 10 m³/(hm²) up to 15 m³/(hm²)*

Option 1 – jet nozzles

Air velocity near the ground	
- in the occupied zone, seating areas and work stations	*< 0.2 m/s*
- at the point of discharge into the occupied zone (install no work stations in this area)	*< 0.5 m/s*
supply air temperature of mixed air flow distribution	*16 to 18°C*
Partial cooling load coverage with mixed air flow distribution up to 80 W/m²	

Option 2 – displacement flow diffusers

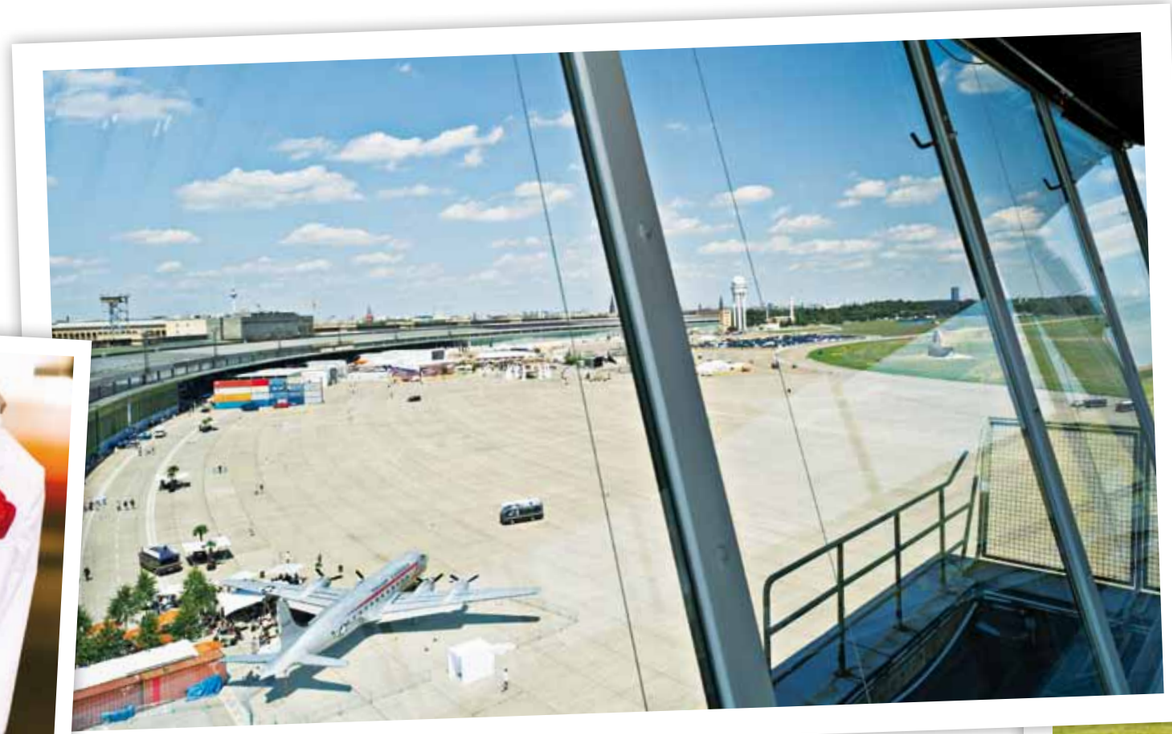
Air velocity near the ground	
- in the occupied zone, seating areas and work stations	*< 0.2 m/s*
- in the vicinity of the displacement flow diffusers (within 5 m)	*< 0.5 m/s*
Supply air temperature with displacement flow	*20 to 22°C*
Partial cooling load coverage by outside air	*20 to 40 W/m²*
Extract air temperature in the ceiling area	*up to 32 °C*

***IDA 3 = Indoor Air (indoor air quality, category 3) EN 13779*

... and then on to Tempelhof.

A former airport becomes a leisure park.

Since its closure for traffic in October 2008, the former Berlin airport Tempelhof is one of the busy metropolis' green oases. The approximately 220 hectares of large undeveloped green space that used to be an airfield are now a lush park where many families spend their leisure time. The open meadowland also helps regulate the temperature in the city climate.



The former airport which saw the landing of the „candy bombers", planes that flew food and other supplies into Berlin during the 1948 airlift, has a number of uses today: Fashion shows, bicycle races, vintage car rallies and even Sunday walks and barbecues.

On 8 May 2010, the new „Tempelhofer Freiheit" opened its gates to the public. Since then, the erstwhile airport has been open and accessible to locals and visitors from sunrise to sunset. Even on the first weekend that it was open, around 235,000 visitors poured into the park to see the vast space and use it for numerous individual and recreational activities. The grounds have definitely established themselves as an attractive retreat in the middle of the capital. Visitors come here to have a barbecue, go for walks, ride a bike or simply fill up on oxygen – the possibilities are endless. With over 220 hectares, the „Tempelhofer Freiheit" is Berlin's largest park; even larger than the Tiergarten. The spaces once just used for airport business will gradually be converted into a versatile, structured, urban landscape park accessible to the public; the park will also be available for large events, such as vintage car races, techno music festivals or fashion shows. Every interest can be catered for.

Several large projects are planned for the coming years, e. g. the International Garden Show (IGA) in 2017 and part of the International Construction Show (IBA) in 2020. On 26 August 2010, local press reported the plans of two Berliners to flood the former airfield and create a recreational lake for swimming and water sports in the park. The plans also involved an island with wind turbines. It is fair to say, then, that the future holds great things for the park.

For instance, the Berlin Senate plans to build a forum for cultural, media and creative industries. One of the sites it envisages is the listed former airport building, a location which is steeped in history and has been the centre of many a political clash of interests, such as the Berlin blockade.

The Berlin airlift was established on 25 June 1948, after the Soviet Union cut off all communications with Berlin and left 2.2 million people reliant on provisions from the outside. The first aircraft from the US Air Force, loaded with foodstuffs, approached Tempelhof Airport just 24 hours later.

US pilot Gail Halvorsen became famous around the world for throwing sweets out the window of his plane to cheer up children in the destroyed Berlin borough Neukölln. Mostly, he distributed packs of chewing gum, chocolate and raisins, that floated to the ground thanks to little parachutes that he himself had made with handkerchiefs: it was an action that received an enormous response in the media and became a global sensation. The expression "candy bombers" was coined.

More than two decades after the end of the airlift, Halvorsen returned to Tempelhof. From 1970 to 1974, he was airport commandant. During his last year of service, he was decorated with the Grand Cross of Merit of the Federal Republic of Germany: a hero sent from heaven.

„An airport that‘s fun …

An interview with the Spanish star architect Carlos Lamela.

… and celebrates the excitement of travel with lots of light, great views and a high degree of clarity“, those were the words of Pritzker Laureate Richard Rogers when he described one of the largest airport projects ever, Terminal 4 of the Madrid Barajas International Airport. Together with his Spanish colleague Carlos Lamela, he has created an extraordinary airport terminal which sets an example in terms of aesthetics, functionality and light. TROX life met Carlos Lamela in Madrid to have a talk with him about this unusual airport.

Señor Lamela, which was the greatest challenge for you when building Terminal T4?

An airport terminal is a huge building complex which is very difficult to plan due to its size and because it is subject to a number of conditions, both economic and political ones. What is more, once the concept has been approved, the completion of the project is very time-consuming. Because of that, we always try to think ahead.

However, planning ahead for ten or fifteen years of development in aviation is a very complex task indeed. The Barajas project was initiated at the end of the nineties as an airport terminal which had to take into account the rapid growth in both passenger and commercial transport. Naturally, this was reflected in our planning and especially in the architecture. We envisaged a beautiful, comfortable and very light building, in which users would feel comfortable and could easily find their way around. Also, the vision of great transparency was crucial to us from the outset.

You have a reputation for prioritising the environment. How can this be seen in the T4?

Interestingly, our studio and Richard Rogers' studio are both seen as forerunners in terms of ecology. Environmentally conscious design is essential to us.

View of the huge departure hall with TROX jet nozzles and displacement flow diffusers integrated into the pillars on the left and right of the passageway.

Richard Rogers' studio has worked to create sustainable architecture for many years now, not just in the UK, but in commendable projects realised by Richard around the world. Studio Lamela is driven by the same priorities, which meant that we shared a common vision right from the start

Together we developed proposals that were innovative but stayed within the limits of the sensible and feasible. The majority of our proposals therefore met with our client's approval. The direction of the pier, both in the main building and in the satellite building, was admittedly rather complicated to solve. We had kilometres of façades with strong morning or afternoon sunlight, so we developed an effective façade protection with interesting, very light-weight and transparent sun shades.

For the air conditioning, an innovative displacement ventilation system with low speeds was developed. It allows us to only treat the air in those zones occupied by people, so as not to supply large and unnecessary quantities of air to the entire volume of the pier.

Bamboo is rather an interesting choice of material for such a huge construction project, is it not?

We wanted to create a clear, refined ceiling structure, without any disturbing elements. Also, the material needed to be bright to make a pleasant aesthetic impression. For these reasons, we were considering wood. After searching for a noble material, we finally picked bamboo because of its great flexibility and because we wanted to design organic, wave-shaped surfaces. Also, bamboo is a rapidly renewable resource, which meant that we did not have to cut down more consolidated areas of forest. Bamboo offers good value for money and is easy to process in order to shape the segments the way we wanted. The only problem was compliance with fire protection regulations, but our project was certified on schedule.

Are you saying that the material did not exist in its current form when the building was designed?

Exactly. Many decisions were not made until the processes were already under way. You need to remember that we did not have much time to develop the concept for the tender. We only decided at the last minute to participate, so we only had four weeks before submission.

Initially, our concept did not list any specific materials. They were not selected until the required building documentation was submitted and during the construction phase. However, there was a lively, passionate and dynamic discussion throughout the two phases.

Integrated approach: ventilation components, like the TROX jet nozzles shown here in the baggage handling area, are an integral component of the architecture.

Also, you need to take into account that a proposal for a tender is not the same thing as a finalized design – at this stage, we have the great advantage of being able to sit down with the client and discuss the proposals together.

So certain things were still being decided as the construction progressed?

As I said, in our case we still had to make some decisions during the construction phase, since the project had to be realised in a very short time. Together with our client, we agreed to first solve fundamental aspects. This gave us the necessary scope for decisions which required greater analysis of potential solutions and materials.

Due to political circumstances and various conditions imposed by the market, a construction project of this type sometimes has to be carried out with deadlines that are very hard to meet. Passenger traffic in Madrid increased year on year, but the project allowed for no delays whatsoever. The terminal had to be built in record time. Only nine years elapsed from the time of the tender until inauguration, which is incredible for a building of this size, i.e., more than 1,100,000 m².

Energy efficiency was one of the central requirements for planners and architects, was it not?

Energy efficiency is an absolute must, both in architecture and in the industry. Any project which does not take energy efficiency into account will fail, sooner or later.

Señor Lamela, thank you very much for talking to us.

ExtrAIRordinary experience!

Airport hotspots around the globe.

TROX provides a comfortable indoor climate in the most important airports of the world. Accompany us on a journey in pictures around the world – from AMS/Schiphol to ZRH/Kloten.

Does one airport look like any other to you? If this is the case, you ought to take some time during your next layover to explore the following airports a bit closer. You won't regret it! TROX life shows you some of the most extraordinary airport attractions around the globe.

Need a breath of fresh air?

If you think the airport terminals are stifling, you might visit Terminal 1 of Narita International Airport in Tokyo to stock up on oxygen. Here, you will find an oxygen bar in which stressed passengers can pamper themselves with fresh air. Inhaling air with a 50 to 99 % oxygen concentration and cinnamon or eucalyptus aroma is said to improve your overall well-being and alleviate jet lag.

Culinary delights.

The restaurant „Top Air" in Terminal 1 of Stuttgart Airport is thought to be one of the best in the whole region. What's more, it is the only gourmet restaurant located on a German airport which has been awarded one of the coveted Michelin stars for over 20 years in a row. Top Air offers a sophisticated ambiance and top-class cuisine; even German food critic Wolfram Siebeck praises the venue to the skies.

Fresh woods and pastures new.

Getting bored waiting for your departure? How would you like to pass the time with a relaxing walk in the forest? Amsterdam's airport now invites travellers to take a stroll in the new 750-square-metre Airport Park and delve into the lush green while waiting for their boarding call. The interplay of flora and fauna creates a soothing park atmosphere. Projections of fluttering butterflies and birdsong played by speakers breathe authentic life into the park.

If you are up for a picnic, why not have a seat in the naturally decorated designer chairs. In the park café and shop, passengers can enjoy an organic sandwich or a fair-trade coffee, or buy some flower seeds, „made in Holland".

At Schiphol, you will also find a branch of Rijksmuseum Amsterdam, where you can admire the works of Jan Steen, Jacob van Ruisdaal and other Dutch masters. Temporary exhibitions display paintings from the museum's collections by, for instance, Rembrandt.

Let it slide.

In Changi International Airport in Singapore things may start to slide. The temptation is great, since "The Slide@T3" spans four entire floors. The giant slide is therefore not only the greatest slide in Singapore; it is the largest on any airport worldwide. The highest speed achieved on it is six metres per second.


Photo: Changi Airport Group

Anyone who spends money in the airport may take a ride in the slide – for every Singapore dollar (ca 0.60 euro) spent, you get two rides.

If you like it quieter, you won't be left wanting in Changi International. Airplanes are not the only ones taking off here – in Terminal 3, a butterfly house offers calm and diversion. Almost 50 species of butterflies flutter between tropical plants and a waterfall. Nearby is a pond with valuable koi carps.

And in the sunflower garden, you will soon forget that you are inside an airport.

Making money in the desert.

Those looking for luxury and high-end shopping are sure to find it at Dubai International Airport: in 2008, the turnover of the numerous duty-free shops and exquisite boutiques amounted to no less than 1.1 billion US dollars. The raffle and lottery booths in Terminals 1 and 3 also entice with great prizes, such as luxury cars (an Aston Martin DB9, among others), motorbikes and even 1 million dollars in cash. Ticket prices start at 93 euros.

A round on the turf.

At Frankfurt Hahn Airport in Hunsrück, Ryanair's planes take off and land, but only a few metres outside the terminal you will find the 9-hole golf course Hahn e.V. If you feel like playing a round of golf while waiting for depature, the green fee on weekdays is 20 euros. Quite a few passengers have already improved their handicap here.

The right kind of draught!

Germany's only airport brewery, „Airbräu", is located at Munich Franz-Josef-Strauß Airport – where else? It offers original Bavarian hospitality in a cosy ambiance. Besides the social beer garden atmosphere, guests can enjoy a varied program of performing artists. The sought-after oat soda is served fresh from the brewhouse in the adjacent tavern. Every month, around 2,200 half litres are tapped here.

Fair Trade.

Worldwide launch of the new Compliance Management System on 1 January 2012.

Fair and correct interaction with one another, with our customers, our suppliers and other business partners, as well as compliance with legislation and ethical principles have always been a primary concern for Heinz Trox and been essential for the success of the TROX GROUP.


Responsible in the future for the Compliance Management System at TROX: Simone Schrader and Thomas Michaelsen together with Thomas Lüthi (right in the photograph) from the WTS Group AG

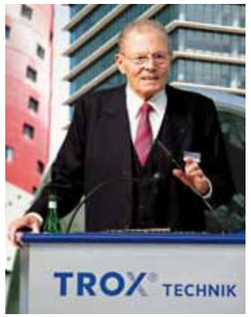
In the opinion of Heinz Trox, unfair business practices such as corruption, bribery, disloyalty and deceit are not a „necessary evil" to survive competition. Rather, the TROX GROUP aims to stand out thanks to the performance, price, quality and suitability of the high-quality products and services that it offers. Unfair forms of business conduct distort competition, lead to higher costs, erode customer and supplier confidence, and eventually jeopardise TROX's competitive edge and the jobs of our employees.

On 1 January, TROX defined the company's ethical principles in the **Business Conduct Guidelines** and installed a **Compliance Management System** with an unequivocal message:

We will refrain from any business which can only be generated by breaching laws or our regulations.

The guidelines constitute a minimum standard for all employees of the international TROX GROUP. They are intended to effectively prevent unfair business practices as well as to strengthen the belief that any attempt to influence competition through forms of unfair practice must be banned and prevented.

X-CUBE.
One-Stop Air Shop.



Heinz Trox welcomes the 150 invited guests.

On 13 October 2011, TROX ushered in a new era with the grand opening of the new production facility in Anholt. The X-CUBE marks a new milestone in TROX's 50 years of history. More than 150 guests were present to witness the launch of a new generation of air handling units. The X-CUBE pilot series came off the production line at the end of October 2011 and the first units were delivered to customers in December 2011. Incidentally, the first order was placed straight away – by handshake with a manager of one of the leading companies in the energy and building technology sector.

To accommodate the production of the X-CUBE, the production area in the Anholt plant was expanded by 15,500 m² to 52,500 m² with the new production facility. An adjacent plot of land of 75,000 m² has already been acquired for further expansion. As a result, TROX is the only manufacturer in Germany that manufactures almost all components to set up a central air conditioning system, thus offering a one-stop shop. TROX provides everything from external louvres and air handling units to air terminal devices and air terminal units.

The X-CUBE marks a new milestone in the market for air handling units and will become the new industry benchmark in terms of quality, reliability, energy efficiency, safety and hygiene. All components of a ventilation system, including the air handling unit, ideally complement each other and are „Made in Germany". This helps the customer reduce the time and money spent on designing and coordination work.

Sustainable architecture.

Sustainability is another area where TROX sets new standards. A near-surface geothermal system utilises the regenerative energy of the earth to heat and cool the production facility in an environmentally friendly manner. In the summer, the new facility will be directly cooled via the earth and in the winter a heat pump provides 70 % of the total required heat.

The new production facility also works as a huge field test area for the X-CUBE, which is used for the first time in an industrial setting.

4 2010

22nd Decision to construct a new production facility

27th Formation of the project team with project manager Ralf Joneleit

29th Information to employees: planning of the facility to begin in July 2010

7 2010

Planning phase for the new facility

29th Determining the facility size (15,000 m²) and the production processes

8 2010

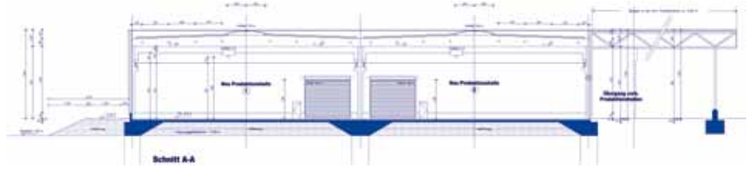
Purchase of further land, another 24,000 m²

Filling of the building site – 7,000 truckloads

9 2010

20th Application for construction permit

28th Determining the design



11 2010

10th Construction permit is given

11th Determining the machinery to be used

12 2010

8th Foundation stone ceremony

10th Employee recruitment for design/development

Construction begins

1 2011

1st Admission to German Association of AHU Manufacturers (RLT-Herstellerverband)

3 2011

6th Units are tested by TÜV Süd, Germany

15th Units are first presented at the ISH Trade Fair in Frankfurt/Main, Germany

4 2011

Completion of facility shell

7 2011

8th Completion of the configurator software

8 2011

27th Definition of the final AHU construction

Installation of TROX X-CUBE units in the new production facility

9 2011

Completion of production facility

10 2011

13th Opening ceremony

29th X-CUBE pilot production run

11 2011

1st Sales launch

12 2011

Delivery

Breaking the sound barrier.
The X-CUBE project was completed in record time, both in terms of planning the air handling units and building the production facility. Indeed, the X-CUBE team brought this project to life „at the speed of sound", while firmly focusing on providing the market with a future-proof, first-class product.

With the new 15,500 m² X-CUBE production facility (right in the photograph), the Anholt plant now has a total surface area of 52,500 m².

„This is your captain speaking …“

Sailors are not the only ones who like a good yarn. Some odd stories are told at high altitude too. TROX life has „listened in“ on the radio communication on board and with ground control and wants to share the following amusing episodes with its readers:

Pilot during final approach: „Please make sure when leaving the aircraft that you have not forgotten any luggage. Anything left on board will be equally distributed among the cabin crew. Please do not leave any children or spouses behind.“

Stewardess during the safety demonstration: „In the event of a sudden loss of cabin pressure, oxygen masks will automatically drop from overhead. Please stop screaming, pull the mask towards you and place it firmly over your mouth and nose. If you are travelling with a small child, put on your own mask before helping the child. If travelling with two small children, please take a moment now to decide which one you love more.“

Captain after a touch-and-go: „Ladies and Gentlemen, welcome to the airline's happy hour, where you get two landings for the price of one.“

Co-pilot after a bumpy landing: „Please remain seated as Captain Kangaroo bounces us to the terminal.“

First officer about on-board smoking: „This is a no smoking flight. Should you wish to smoke, please step outside.“ Following a pause for effect: „The current outside temperature is minus 35 °C.“

The captain on a flight with few passengers: „Ladies and Gentlemen, as you can see, our flight this evening is not particularly full. We therefore ask you all to occupy a window seat so that the competition thinks the plane is sold out.“

Pilot after a sudden jolt during landing on Mallorca, when the passengers start to applaud: „Thank you very much for applauding. However, it is relatively normal for us to extend the landing gear before landing.“

A pilot from Cologne gives a nod to his home city while approaching Düsseldorf: „Passengers seated on the left side of the plane may now admire Düsseldorf's most beautiful construction work: the motorway to Cologne.“

Heard over the radio…

The best anecdotes can be heard in communication with ground control:

Tower: „In order to avoid noise, please make a 45 degree turn to the right.“
Pilot: „What noise could we possibly make at 35,000 feet?“
Tower: „The crash when your 707 collides with the 727 in front of you!“

Pilot: „One of the landing lights is lit.“
Tower: „I should hope that more than one of them is lit.“
Pilot: „I meant that I can see smoke coming from it.“

Pilot: „In urgent need of fuel. Please instruct.“
Tower: „What is your position? I cannot see you on the radar!!!“
Pilot: „We are still parked on runway 2 and have been waiting for the refuelling truck for ages.“

Pilot: „Good morning Frankfurt ground control, KLM 242 requests permission for take-off.“
Tower: „KLM 242, estimated take-off in two hours.“
Pilot: „Please confirm: Two hours delay?“
Tower: „That is correct.“
Pilot: „In that case, forget the ‚Good morning'!“

Tower: „Please state your height and position.“
Pilot: „I am 1.80 metres tall and am seated on the left-hand side in front.“

Tower: „Say fuel state.“
Pilot: „Fuelstate.“
Tower: „Say again.“
Pilot: „Again.“
Tower: „Argh! Give me your fuel!“
Pilot: „Sorry, need it for myself …“

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