



PROAVIA

French technologies

for

**SUSTAINABLE
AIRPORTS**

COMPANIES DIRECTORY



PROAVIA - French Airport Technology

The professional association PROAVIA was founded in 1976 as a joint initiative of the Directorate General of Civil Aviation, French equipment manufacturers, and consultants to the airport and air traffic control sectors. Its dual goals are to promote French know-how in these sectors as well as to inform the market about innovations and trends in France and throughout the world. In line with these goals, PROAVIA has created this directory to highlight French expertise in sustainability in airports.

Handling increasing numbers of passengers every year, airports are at the cutting edge of technology in many ways. Solutions designed to serve passengers as well as airlines, airport operators and air traffic controllers must be innovative and the same applies to solutions that protect the environment.

This first edition of the directory ***“French technologies for sustainable airports”*** identifies a range of innovative solutions available to airports to improve

Whether in sustainable design, construction, and maintenance, energy production, water treatment or waste management, French companies have ideas, solutions and experience that can be of value.

their ecological impact and energy efficiency. The products and services presented are proven solutions that can help airport managers meet their internal commitments to sustainability, as well as the Airport Carbon Accreditation programme goals set out by Airport Council International.

Whether in sustainable design, construction, and maintenance, energy production, water treatment or waste management, French companies have ideas, solutions and experience that can be of value. PROAVIA helps you match your needs to the solutions. ■



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Edito

Innovative solutions and respect of the ecosystem

While the main role of airports is to accommodate aircraft and their passengers, the immense range of activities necessary for their operations makes them cities in their own right. The word “aerotropolis” is now used to describe them.

Several billion passengers and vehicles pass through airports around the world and several million companies take part in the operation of airports and the provision of services to passengers.

It is therefore up to airport managers to limit their ecological footprint as much as possible to improve the sustainability of their development while balancing technical realities, safety and security requirements and economic interests.

The protection of the airport environment lies at the heart of our concerns and that is why we have created this directory. The companies in it offer innovative solutions for airports that respect the ecosystem of which they are a part.

Whether it's about sustainable construction, reducing noise and carbon emissions, conserving energy and water or waste management, the directory highlights products and services developed in France that will help airport managers make the right choices to meet their environmental commitments.

We hope that the solutions presented will lead to decisive breakthroughs in reducing greenhouse gases, combating climate change and foster carbon neutrality at airports.

Let's work together for the future of our airports and our planet!

Happy reading ■

Jean-Luc RAULINE
President

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01dB - ACOEM Group

Noise and air quality monitoring

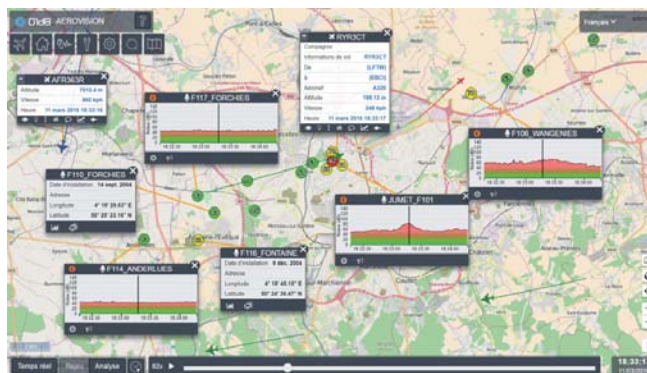
►►► Overall mission

The ACOEM Group is committed to sustainable development by helping companies and public authorities limit their environmental impact by offering products and services through 8 different brands.

01dB and ECOTECH, ACOEM brands provide solutions to prevent and control air, noise, vibration pollution for several applications including airport environmental management. We offer a fully automated and comprehensive noise and flight tracking management solution with a high level of reliability. Comprised of approved DUO or CUBE smart noise monitors and the AEROVISION supervision web service, this solution enables airport managers to implement sustainable development policies in conformance with environmental noise regulations.

►►► Main products & services

- **01dB AEROVISION :**
The aircraft noise and flight tracking management system provides all the tools needed for monitoring, analyzing and reporting on environmental impacts.
- **01dB DUO & CUBE :**
The most advanced noise monitoring stations.
- **ECOTECH SERINUS range :**
A full range of smart air quality analyzers to determine human exposure to pollutants.



►►► Airport references

France : Paris CDG, Paris Orly, Lyon Saint-Exupery, Nice-Cote d'Azur, Toulouse, Bordeaux, Marseille, Strasbourg, Nantes

Europe : Liège, Charleroi

World : Bogota (Colombia), Hongqiao Shanghai (China), Making Airport (Taiwan), Kaohsiung (Taiwan), Phuket (Thailand)

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6D SOLUTIONS

Sustainable roadways and surfaces

▶▶▶ Overall mission

Airports are taking steps today to adapt to climate change. Higher temperatures and moister soil conditions will have a great impact on runways, taxiways, and all paved areas.

6D Solutions have demonstrated durability in the roadway market for over 20 years, the same durability required for airport runways and taxiways. Durability means less expense in maintenance and re-engineering and less carbon emissions from maintenance equipment.

The company pays close attention to the life cycle of its products to minimize waste in the production and installation phases. Its fibreglass-based materials are derived from silicates and therefore emit no greenhouse gases in their production. Independent laboratory testing takes place to continuously monitor its environmental performance.

▶▶▶ Main products & services

CIDEX and **ROTAFLEX** asphalt reinforcement systems

▶▶▶ Airport references

France : Paris CDG and Orly

Europe : London Heathrow, Dundee (Scotland)

World : Marrakech (Morocco), Mauritius

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ADB SAFEGATE

Energy efficient airfield lighting / optimized airport operations

►►► Overall mission

As an ISO 14001 certified company, we regard care for the environment as an important pillar of our Corporate Social Responsibility. We endeavour to reduce our environmental impact as much as possible by working closely with our employees, customers, suppliers and the communities in which we operate.

ADB SAFEGATE pioneered the use of intelligent LED technology for airfield applications and has invested heavily in energy-efficient power systems. Moreover, a majority of components in our new generation of products are recyclable and no harmful substances are used in their production.

Our automated apron management and aircraft docking systems are designed to shorten the time from touch-down to gate. Eliminating delays shortens gate waiting times, resulting in less fuel wastage.

►►► Main products & services

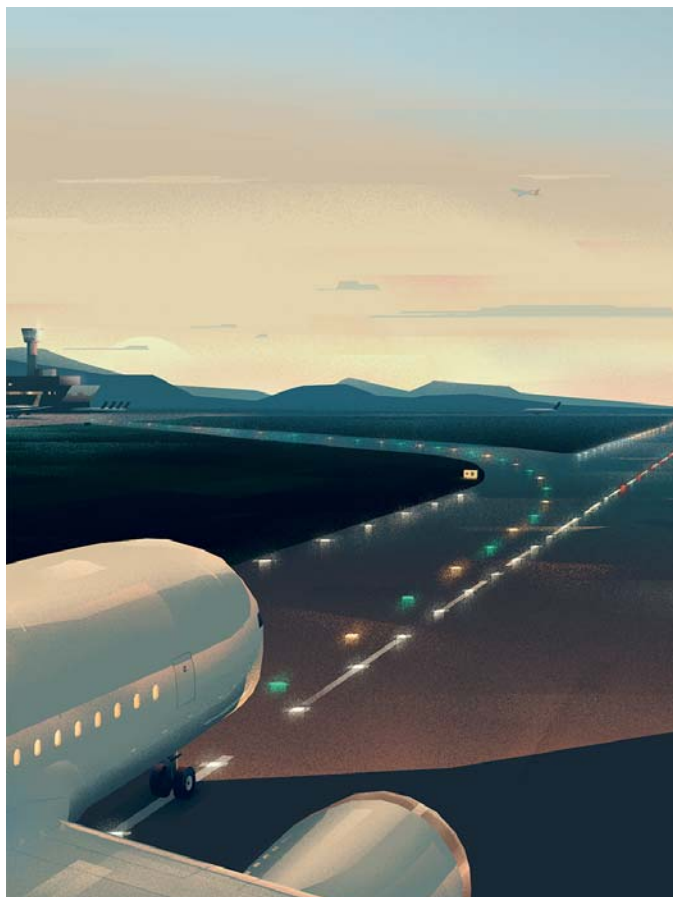
- Operations analysis and strategic planning
- Solutions design
- Systems integration and project management
- Energy-efficient airfield lighting systems
- Apron Management Solutions
- ATC Systems and Solutions.

►►► Airport references

France : Bâle Mulhouse, Bordeaux, Brest, Cannes, Clermont Ferrand, Deauville, Le Bourget, Lille, Lyon St Exupéry, Marseille, Nice, Orly, Roissy Charles De Gaulle, Toulouse, Valenciennes, and many more

Europe : Athens, Arlanda Stockholm, Barcelona, Brussels, Dublin, Frankfurt, Gatwick, Gdansk, Geneva, Hamburg, Heathrow, Madrid Barajas, Munich, Oslo Gardermoen, Schiphol, Vienna, Warsaw, Zaghreb,...

World : Abu Dabi, Ataturk, Atlanta, Colombo, Denver Intl, Dubai, Changi, New Beijing International Airport, New Delhi, New Hamad International, New Istanbul Airport, Miami Intl, OR Tamo and many more



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ADP INGENIERIE

Sustainable building design

►►► Overall mission

ADP Ingénierie (ADPI) provides a full range of design services for the whole airport (and airport cities) putting adaptable functionality, connectivity and sustainability at the forefront of its mission.

ADP Ingénierie takes a global approach to its projects, re-thinking airports as ecosystems and considering how an airport can positively interact with its environment and participate sustainably in the broader community. From lessons learned in operating airports managed by the ADP Group throughout the world, ADP Ingénierie continuously applies this experience in the search for innovative solutions and improvements.

Energy performance and the comfort of occupants are placed at the forefront of its architectural design with sustainable design guidelines applied from the outset of projects.

►►► Main products & services

- Consulting and masterplan optimization
- Eco-building architecture and Green Building Rating Systems certification
- Environmental engineering and quality optimization for building and infrastructures
- Modeling

►►► Airport references

France : Paris CDG and Paris Orly, Le Bourget, Toulouse, Lyon

World : Manama (Bahrain), Manama (Bahrain), Chengdu (China), Dubai (UAE), Doha (Qatar), Santiago (Chile), Nairobi (Kenya), Shanghai, Kathmandu (Nepal), Bogota (Colombie)

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ALPHA-AIRPORT

Environmentally sound lighting systems

►►► Overall mission

For the large number of smaller airports with medium-intensity airfield lighting throughout the world ALPHA-AIRPORT has developed special autonomous LED lights with solar panels and batteries able to illuminate medium-intensity runways. An HMI system can control and monitor these autonomous lights with the advantage of avoiding cabling and an additional power supply, and to minimize civil works.

A trailer is used to store, transport and load a maximum of 84 lights. The light distribution is very convenient as there is no connection, making the deployment of the complete set of lights very easy.

This equipment is based on renewable energy and less consumption of associated materials, meaning a greener solution compared to existing products on the market.

►►► Main products & services

The **LED FELUN System** consists of portable lights designed for permanent airfield or emergency runway lighting.

The recharging of batteries is done through solar panels.

Main features:

- High performance LED with long load life.
- The HMI PLC works with the lights through the ZigBee protocol enabling data to be collected from the lights.

►►► Airport references

France : Chartres

Europe : Poland

World : DRC (Kinshasa)

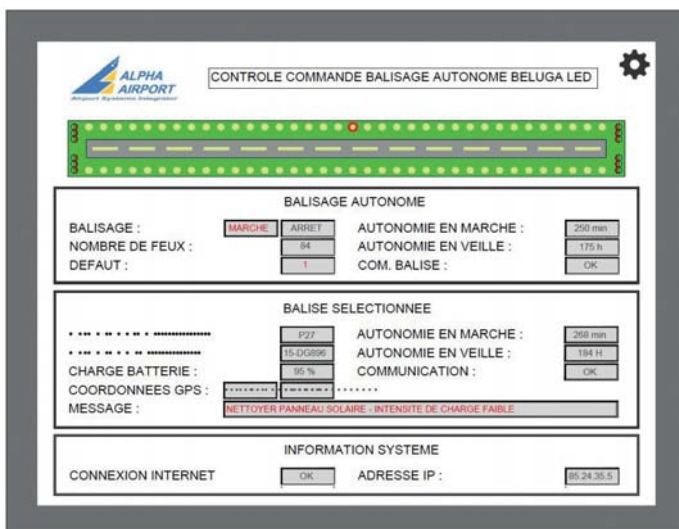
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ALSTEF

Energy savings in baggage handling systems

►►► Overall mission

Baggage Handling Systems (BHS) account for a substantial portion of any airport's total energy consumption and are, naturally, a ripe area for innovation to yield gains in energy efficiency.

Alstef is at the forefront of increasing BHS energy efficiency for airport customers in both existing and new installations. The company has achieved 50% savings in energy consumption by upgrading the gear-motors in existing conveyors for large-scale systems. Alstef's «*wave concept*» uses advanced control software to momentarily stop conveyors running when there are no bags on them, along with engineering to ensure that the start/stops do not affect the lifetime of motors and other mechanical items.

ALSTEF is strongly committed to the Quality, Health, Safety and Environment approach.

►►► Main products & services

- **BAGVEYOR** - our newest BHS range features with low-friction «*channel type*» belts and IE4 standard gear-motors. Delivers up to 15% decreases in electricity consumption.
- **BAGCLAIM** - carousels with friction drive designed to provide very low energy consumption and very low noise levels, thanks to a special arrangement of the drive group that constantly adapts the friction level of the carousel.

►►► Airport references

France : Paris Orly, Paris CDG, Nice, Toulouse, Lyon

Europe : Istanbul Atatürk, Basel, Zagreb, Moscow Sheremetyevo, Helsinki

World : Montreal, Dubai, Mauritius

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ANTEA Group

Environmental engineering / site remediation / sustainable infrastructure

►►► Overall mission

ANTEA Group is an environmental engineering company active in four major areas: site remediation, water purification, sustainable infrastructure, and renewable energy.

They bring a multi-disciplinary, end-to-end approach to environmental problems, starting with collecting and analyzing data, proceeding to proof-of-concept demonstrations of technical solutions, and, finally, ensuring integrated project management with a wide array of partners.

The company has forged close relationships with multinational clients, accompanying them throughout the world.

►►► Main products & services

- Environmental assessment studies
- Project engineering
- Engineering consulting
- Strategic planning

►►► Airport references

France : Nantes, Fort de France (Martinique),
Strasbourg, Paris, Lyon, Cayenne (Guyane),
Toulouse

Europe : Bâle (Switzerland), Liège (Belgium),
Maastricht (Netherlands)

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ATERMES

Eco-friendly bird repellent in airfields

►►► Overall mission

As a supplier of high-tech solutions to defense and security industries, ATERMES is constantly looking for ways to use the underlying technology to protect the environment.

They have developed an automated, laser-based system (A-TOM500) which repels birds on runways, reducing the risk of bird strikes. Traditional methods such as pyrotechnic systems and sound alerts have proved to have short-lasting effects since birds get used to them.

The A-TOM500 laser is perceived as a menacing «*green predator*» by birds which can be activated randomly thereby ensuring birds don't become accustomed to it. The system has low energy consumption and can be operated by renewable energy sources where feasible.

►►► Main products & services

- A-TOM500 Automatic Laser Bird repellent

►►► Airport references

France : Beauvais

Europe : Spain, Norway, Romania

World : Bangladesh, China

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AUGIER

Low-energy airfield lighting / Energy efficiency (electricity transmission)

►►► Overall mission

AUGIER manufactures products dedicated to optimizing and saving energy.

With its COMPACTO range of constant current regulators and transformers, Augier helps airports to minimise energy usage while ensuring airport operations are never disrupted.

Its well-known DIAM4100 (SCR CCR) is designed and optimized for low maintenance and best performance for all types of loads.

►►► Main products & services

- Airfield lighting
 - **DIAM3100** : Stackable low power version of the DIAM4100, up to 6.5kVA
 - **DIAM4200** : new full sinewave generation IGBT CCR which allows no harmonic, perfect efficiency (99%) and no power factor degradation
- Apron & car park lighting
 - **COMPACTO** : Range of dimmers which brings 30% less energy consumption and return of investment in as little as 2 years.
From 3 kVA to 144 kVA

►►► Airport references

France : Nice, Marseille, Lyon

World : Hong Kong, Sydney

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AUTOMATIQUE & INDUSTRIE

Energy management systems, resource optimisation

►►► Overall mission

AUTOMATIQUE & INDUSTRIE is a leading French company in the engineering, development and implementation of smart automation and software solutions for airports. The company's expertise covers energy management, distribution, regulation and monitoring, including reducing energy consumption.

AUTOMATIQUE & INDUSTRIE has the technical capabilities and expertise to successfully implement airport energy management projects, guaranteeing seamless integration with existing systems.

►►► Main products & services



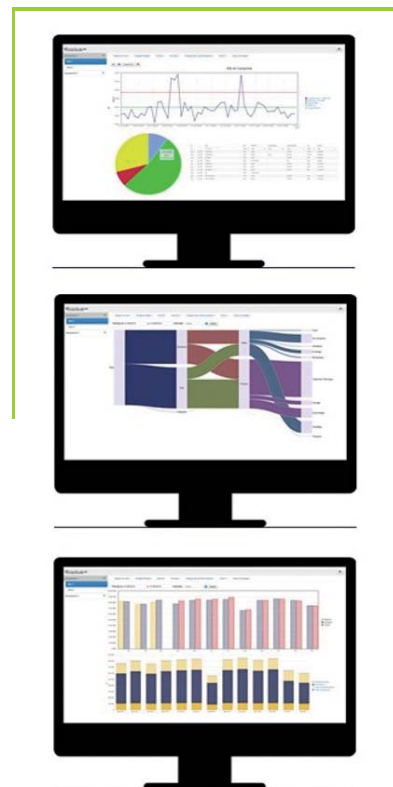
- **CACTUS** : Energy Management Software (www.cactus-energy-suite.com)
- Smart and big data analysis
- Predictive Models
- Quality data analysis
- IoT and cybersecurity
- Energy-saving Building Management Systems
- HVAC energy optimisation
- Consulting services
- Turnkey integration on-site
- Employee and staff Sustainability Training Program

►►► Airport references

France : Paris, Lyon, Nice, Bordeaux, Lille, Brest, Clermont Ferrand, Brest, Pau, Nancy, Villacoublay, Orléans, Grenoble, Nancy, DOM-TOM...

Europe : Rome, Larnaca, Debrecen, Fetesti, Bobocu, Zadar, Bezmer, Tuzla...

World : Jeddah, Ryadh, Teheran, Montevideo, Cotonou, Dubaï, Libreville, Melbourne, Sunshine, Bamako, Reggane, Butuan, Male Abidjan, Phisanulok, French Polynesia, Akwa Ibom...



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BIOFLUIDES

Heat recovery from waste water



►►► Overall mission

Biofluides has devised an innovative solution for reusing heat from wastewater in apartment blocks, restaurants and hotels which is otherwise flushed down the drains.

Using off-the-shelf technologies, Biofluides has patented a process that combines a heat exchanger with a heat pump to recover wasted heat, resulting in cost savings of between 40% and 75% compared to traditional gas and electric water heating systems.

The company's technology has been chosen by Bouygues as one of the green technologies showcased in its «Green Office» outside Paris where Unilever's French headquarters is located.

The objectives are:

- To lower the cost of heating domestic water
- To reduce greenhouse gas emissions by 70%
- To produce domestic hot water with renewable energy

►►► Main products & services

- ERS (Energy Recovery System) combining heat pump and heat exchanger
- «Green water» for reusing water from ERS for toilets *(under development)*

►►► Airport references

In discussions with restaurant and hotel concessions.



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Photo credit @ nikoja

BOOSTHERM

Energy recovery from waste heat

►►► Overall mission

Cooling and refrigeration units produce great amounts of heat which is wasted in the surrounding air.

Boostherm's patented technology recovers this heat and uses it to heat water, using otherwise wasted energy.

Customers typically break even on their investment within 2-3 years.

Airport concessionaires such as restaurants and hotels can enjoy great benefit from Boostherm's solutions as can the airports themselves in meeting their overall CO₂ emission reduction goals through the contributions of their tenants.

►►► Main products & services

Heat recovery units (design and fabrication)

►►► Airport references

France : Paris CDG (feasibility study for Sodexho)



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BOUYGUES CONSTRUCTION

Design and technologies for low environmental impact and Near Zero Energy airport

►►► Overall mission

The biodiversity aspect is a key element and the company has been recognized by the French Environmental agency for its “national biodiversity strategy”. Bouygues Construction is also a founder member of the CIBI committee in charge of the international certification scheme “Biodiversity”.

Bouygues Construction is one of the pioneers of «near zero energy» buildings in France and one of the first builders to introduce «energy performance guaranty» for public buildings. The company actively invests in innovative research for integration of renewable energy production and efficient energy storage systems. Projects with specific application to airports include new optimized energy efficient production, and the reduction of environmental and social impacts as well as carbon footprints.

►►► Main products & services

- Management of environmental and social impact assessment.
- Design, construction and operation of energy efficient and environmentally certified airport.
- Comprehensive and ecologically friendly site construction works («Ecosite and Greensite office» programmes for sustainable on-site construction).
- BiodiverCity certification methodology for assessing the biodiversity impacts and solutions.

►►► Airport references

France : Lyon Saint Exupéry

Europe : Zagreb (Croatia) - LEED Silver
Larnaka (Cyprus)

World : Iqaluit (Canada) - LEED Silver
Antananarivo (Madagascar)



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CFG SERVICES

Geothermal energy

►►► Overall mission

Of all the renewable energy sources available to an airport one of the most innovative, and potentially most attractive, is geothermal energy.

CFG Services has unique expertise in identifying the geothermal potential of airport sites and in prescribing the most technical and economical means to exploit this potential.

The company has implemented a deep geothermal heating system at Orly Airport (14MW) which is connected to the heating and hot water supply network of the airport. New adjoining buildings will be connected soon.

In many places, geothermal energy can deliver clean (no greenhouse gas emissions) and sustainable energy at a very competitive cost.

►►► Main products & services

- Ressource assessment
- Feasibility studies (subsurface - powerplant)
- Regulatory studies
- Drilling engineering
- Geothermal plant installation and monitoring
- Consulting
- Corrosion, scaling, microbiological expertise

►►► Airport references

France : Paris Orly,
Fort de France (Martinique - feasibility study)



ADP worksite in 2010 (Paris-Orly Airport)

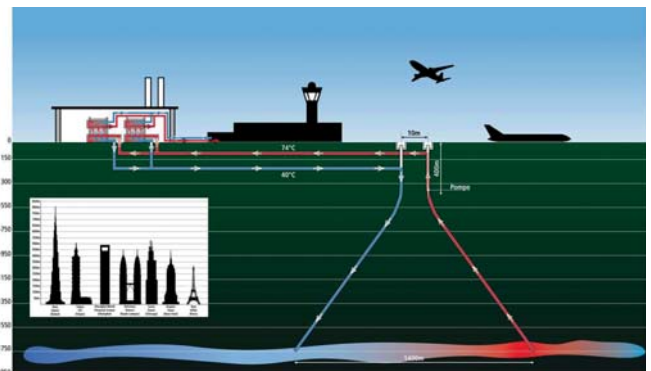
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Schematic of ADP geothermal facility



ADP heat exchangers

CODRA

Energy management and control systems

►►► Overall mission

CODRA is a provider of high quality, robust SCADA software solutions for facility monitoring and control. Airports considering ISO 50001 certification of their energy management would benefit from the software's ability to integrate with a wide variety of BMS and its open architecture.

Areas in which Panorama solutions meet the needs of airports include: Energy management, Building management systems, Security hypervision (Access Control, CCTV, Fire Detection), Aid unit operations, Airport lighting, Baggage sorting, and HV/LV monitoring.

►►► Main products & services

- Codra is the publisher of the Panorama Software Suite :
 - **Panorama COM** : Front-end communication gateway,
 - **Panorama E²** : SCADA / HMI software,
 - **Panorama H²** : Data Archiving & Reporting tools.
- Codra is also managing industrial, technical and embedded IT projects.

►►► Airport references

France : DP, Airbus, Air France, DGAC, Liebherr, Safran Turbomeca, Snecma, Thales, Airport of : Paris-Orly, Paris Roissy-CDG, Bâle-Mulhouse, Nice, Toulouse

Europe : Charleroi, Dublin, London Gatwick, London Heathrow, Manchester

World : Dubaï, Mohamed V Casablanca, Los Angeles

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COMATELEC-SCHRÉDER

LED-based lighting systems

►►► Overall mission

Founded in 1951, Comatelec-Schröder is a member of the Schröder Group of 48 companies spanning four continents.

We design and develop smart solutions that turn public and private areas into secure, comfortable, sustainable, and intelligent environments. We are your one-stop partner from design to after-sales services for all your lighting and control systems plus a whole range of other smart solutions.

►►► Main products & services

- Outdoor lighting: terminals, aircrafts parkings stands, aprons, de-icing areas, pathways, inbound and outbound roads, car lots, tunnels & underpasses, architectural, perimeter security,
- Indoor lighting: departure, security, shopping zones, airline hangars, warehouses and workshop, parkings facilities

►►► Airport references

France : Paris Orly and Roissy, Toulouse-Blagnac, Point-à-Pître, Airbus Toulouse factory plant and HQ

Europe : Brussels (Zaventem), Liège (Bierset)

World : Canada: Quebec, Toronto

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DEPROFUNDIS

Cooling energy from deep water

►►► Overall mission

De Profundis is passionate about helping airports find new ways to reduce their energy use. One of the most innovative ways is through using sea water to meet the massive cooling needs of airports in warmer climates, known as Sea Water Air Conditioning.

They bring a global approach to their projects addressing the potential impacts on habitat as well as the socio-economic impacts on local fishing communities with whom they seek sustainable collaboration.

The company played a prominent role in the latest COP 22 environmental summit, showcasing its solutions for reducing energy use at Marrakech airport.

►►► Main products & services

- Engineering and project management
- Consulting in renewable energy

►►► Airport references

France : Nice Cote d'Azur : feasibility study

World : Marrakech; Kingston, Montego Bay
(Jamaica) : feasibility studies; Male (Maldives)

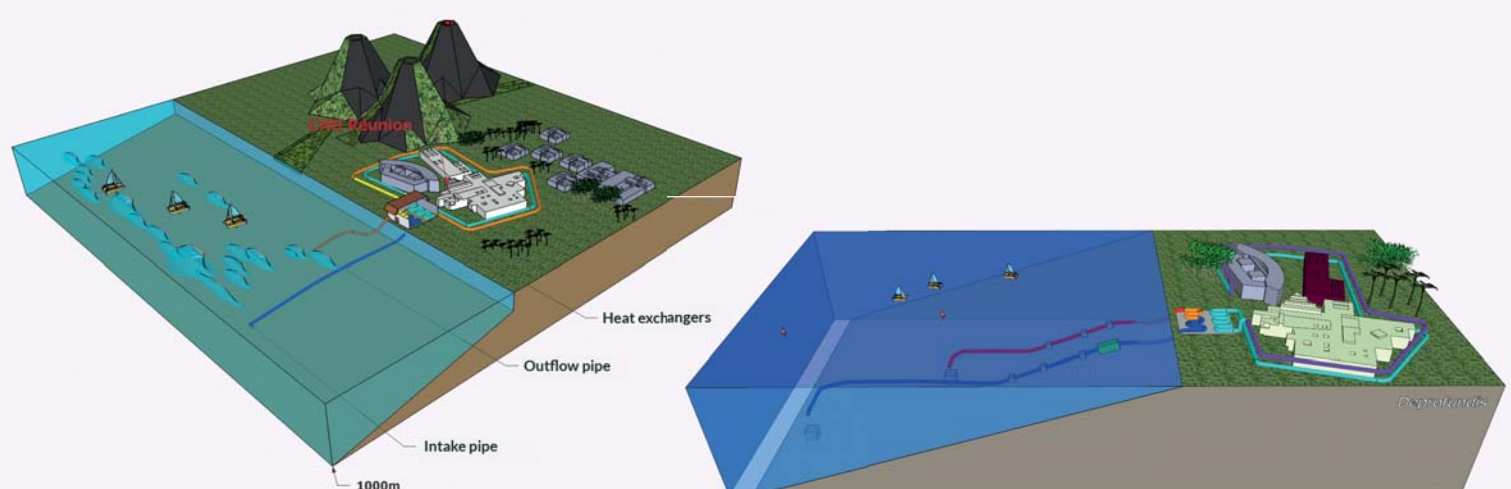
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DRIVECO

Electric mobility with renewable energy

►►► Overall mission

Since 2010 DRIVECO has been at the cutting edge of new technologies in sustainable mobility. DRIVECO introduced innovative and integrated solutions for charging electric vehicles directly from 100% solar energy. Ensuring a local clean energy source is the future of green electrical mobility for all.

DRIVECO has developed state-of-the-art solutions, working together or autonomously, in real-time to feed all types of vehicles and adapted to all modern needs for private and public transportation. Our solar recharging station handles up to 8 vehicles. By networking these stations and their integrated storage facilities, Driveco offer a 24/7 facility for charging electric cars to commercial and professional fleet operators and carpark operators.

►►► Main products & services

■ PARASOL

a solar PV canopy for charging electrical vehicles and energy storage in its batteries and feed-in to the grid

■ KINO

charging stations for personal and professional use

■ Smart Grid

interconnecting PARASOL units and KINO units to optimise energy production and supply in real time.

►►► Airport references

Looking for opportunities

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DSNA Services

Noise and environmental quality modelling

►►► Overall mission

DSNA Services is the expertise and consultancy office of the French Civil Aviation, founded by DGAC and ENAC in 2013.

DSNA Services delivers customizable and innovative solutions for its global client network spanning regulation and safety, operations and operational training in civil aviation.

Building on the long experience of the French air navigation services provider, DSNA Services offers efficient operational tools to visualize and analyze trajectories and assess A-SMGCS. These tools allow airport operators and ANSPs to view and analyze actual and potential environmental impacts of new routes/airspace.

DSNA Services is also at the forefront of detection, surveillance and tracking of drone activities to protect airports and facilitate a safe drone insertion into air traffic systems.

►►► Main products & services

- **ELVIRA** : a unique software to visualize and analyze air traffic impact on the environment and safety issues
- Consultancy services related to air navigation (environmental-friendly procedures, airspace optimization...) and environmental regulation
- Operational training in partnership with ENAC

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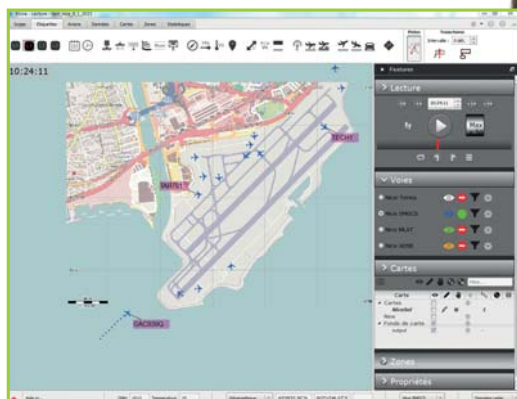
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►►► Airport references

France : Paris CDG, Paris Orly, Nice, Toulouse

Europe : Belgium



EASYMILE

Self-driving electric vehicles

►►► Overall mission

Autonomous electric vehicles (AEV) are becoming a reality much faster than has been predicted, particularly in sites where traffic can be securely controlled such as in airports.

With their large fleets and 24 x 7 operations airports are already seeing a clear business case for AEVs.

EasyMile is one of the leading actors in this innovative field, covering all aspects from vehicle design to feasibility studies. They have already proven the operational viability of AEVs at more than 50 sites in 14 countries, and in mid-2017 they will be introducing products for the ground services market (baggage tugs, passenger navettes).

►►► Main products & services

EZ10 Driverless electric shuttle

►►► Airport references

France : A contract with a major airport soon to be announced.

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Copyright: EasyMile

EAU PURE INTERNATIONAL

Advanced water purification technologies

►►► Overall mission

Eau Pure International provides water purification solutions in desert and rural areas around the world to industries such as mining and agri-food.

Through its subsidiaries on five continents and its wide network of partners the company manages a broad range of projects.

It has developed innovative solutions to harness renewable energy systems (biogas, solar PV, wind) with water purification technologies to produce drinking water on a large scale.

►►► Main products & services

- Equipment and turnkey solutions for:
 - Drinking water filtration units
 - Urban waste water treatment
 - Pumping systems for water and fire protection
 - Renewable energy systems (solar panels)
- Plant operation and maintenance
- Remote monitoring

►►► Airport references

France : Airforce base in Colmar (drinking water)

World : Airforce camp in Benslimane (Morocco),
Nouakchott (Mauritania),
Santiago (Chile)

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ECODAS

Eco-friendly sterilization of infectious waste

►►► Overall mission

ECODAS designs, manufactures, and markets systems for the treatment and processing of infectious and regulated medical waste (RMW).

With extensive experience industrial manufacturing and production of pressurized equipment for the textile and food processing industry, our team perfectly masters modern metalworking and the engineering of thermal processes.

Through its partnerships and sophisticated distribution network, **ECODAS** exports its product-line to the five continents realizing 80% of its turnover from export sales.

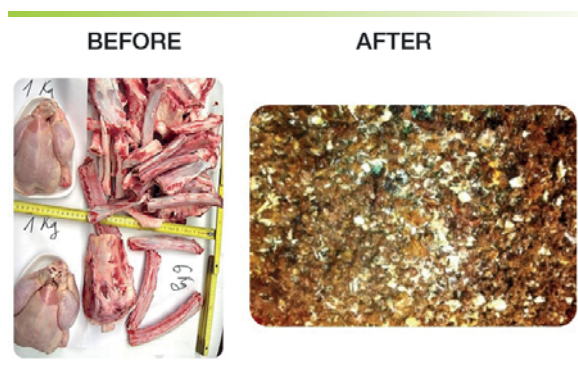
ECODAS became a major global player in the medical waste industry simply due to its process and systems that are well known worldwide for superior performance in safety, reliability, flexibility, ease of use, and sustainability while remaining cost-effective.

►►► Main products & services

Infectious Waste Treatment Equipment (consulting, installation, and maintenance)

►►► Airport references

World : Hospitals are currently customers



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Egis

Renewable energy technologies and sustainable engineering

►►► Overall mission

A global engineering group, Egis is a key player in developing renewable energy technologies with particular application to the airport sector through its “smart cities” vision. As shareholder and partner in the operation of 17 airports Egis has proven expertise in providing innovative, sustainable solutions to airports.

►►► Key projects

“Wind-it” Renewable Energy

(<http://www.egis.fr/content/wind-it>)

This new Egis subsidiary designs telecommunication towers integrating wind turbines and solar panels to meet the infrastructure needs of developing economies. A pilot site is currently in operation in Madagascar with plans underway for new sites in Tanzania and the Philippines.

Pyro-gasification

This technology produces syngas that can be used in gas engines to produce electricity and heat. Egis is developing small-scale, modular pyro-gasification units which can use a variety of local wastes as feedstock (plastics, tyres). The process can produce energy either directly to a local grid or in the form of biofuel.

“Captive land” solar energy

Developed originally for motorways, this concept incorporates photovoltaic technology into the roadway infrastructure (retaining structures, road surfaces, etc.) to generate energy and revenue from large tracts of lands having no agricultural or commercial use. Trials underway at Larnaka and Pafos airports in Cyprus indicate potential savings of up to 30% of electricity use.

►►► Main products & services

- Design engineering
- Project and construction management
- Operation & management
- Turnkey operations
- Consultancy in energy, water and waste treatment

►►► Airport references

Egis has been developing sustainable solutions and technology for its customers at different airports across the globe, and mostly through its 17 airports network in France, Belgium, Cyprus, Côte d’Ivoire, Brazil, Congo and Gabon.

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Sustainable and recyclable manhole covers and drainage gratings

►►► Overall mission

EJ take great pride in the fact that each day we recycle hundreds of tons of post and pre-consumer material into new useful products. Our European facilities operate environmental and safety management systems that are certified to the standards set down in ISO14001 and OHSAS18001 along with an ISO50001 certification on energy management for our main foundry based in France.

Our products have an enduring service life, and typically require little to no maintenance once they are installed on the runway, taxiway, apron, parking, pump station or access road. manhole covers and drainage gratings by EJ are made from recycled materials, with ferrous scrap metals as the primary component. When no longer useful, many of our products are 100% recyclable.

►►► Main products & services

- Hinged, assisted and fod compliant F900 manhole covers for airport underground networks :
 - Airfield ground lighting
 - Refueling
 - Domestic and waste water
 - Telecom and electricity
- Drainage linear F900 gratings

►►► Airport references

Europe : London H, Frankfurt, Paris, Madrid, Munich, Fiumicino

World : **America :** New York, Atlanta, Chicago, Los Angeles, Mexico - **Africa :** Algiers, Johannesburg, Cairo, Dakar, Banjul, Nouakchott - **Middle East and South East Asia :** Changi, Dubai, Jeddah, Doha, Jakarta, Phuket

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ENGIE AIRPORTS

Energy management and sustainable operations

►►► Overall mission

Engie Airports (formerly Cofely Airport Services) develops long-term multi-service partnerships with airport authorities, including services relating to critical equipment (boarding bridges, GPU, PCA, Baggage Handling, etc.), energy, environmental and facility management.

ENGIE Airports has become the benchmark for the integrated management of facility services. The company increasingly provides energy performance contracts (EPC) directly linked to reductions in energy consumption.

►►► Main products & services

- Energy efficiency auditing
- Smart metering
- Design, installation, and operation of renewable energy centres
- Performance-based facility management

►►► Airport references

France : Paris CDG, Lyon, Marseilles, Metz-Nancy, Bastia, La Reunion

Europe : Brussels, Charleroi (Belgium); Dublin, Edinburgh

World : Montreal, Quebec (Canada); Boston, Louisville (USA)

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ENVISA

Aviation environmental solutions

►►► Overall mission

Created in 2004, ENVISA is an environmental consulting service specialized in the aviation industry.

Working with Eurocontrol, ICAO and European airports, ENVISA has refined a methodology for measuring and analyzing GHG emissions generated within the airport environment. Their audits form a basis for airports to develop practical and durable programmes to reduce emissions and improve air quality through operational procedures, energy-saving, and waste management. They also have in-depth expertise in measuring aircraft noise impacts. As a World Partner of ACI Europe, ENVISA has been closely involved in the Airport Carbon Accreditation programme and has carried out certifications in numerous airports.

►►► Main products & services

- Consulting services.
- On-line and classroom training courses in sustainable airport operations.

►►► Airport references

France : Brest, La Rochelle, Vinci Airports (various), Lyon

Europe : Bucharest, Geneva, Newquay (UK)

World : Osaka, Kansai (Japan); Libreville (Gabon), Bahrain (MEA), Madagascar, Seychelles, Amman (Jordan)

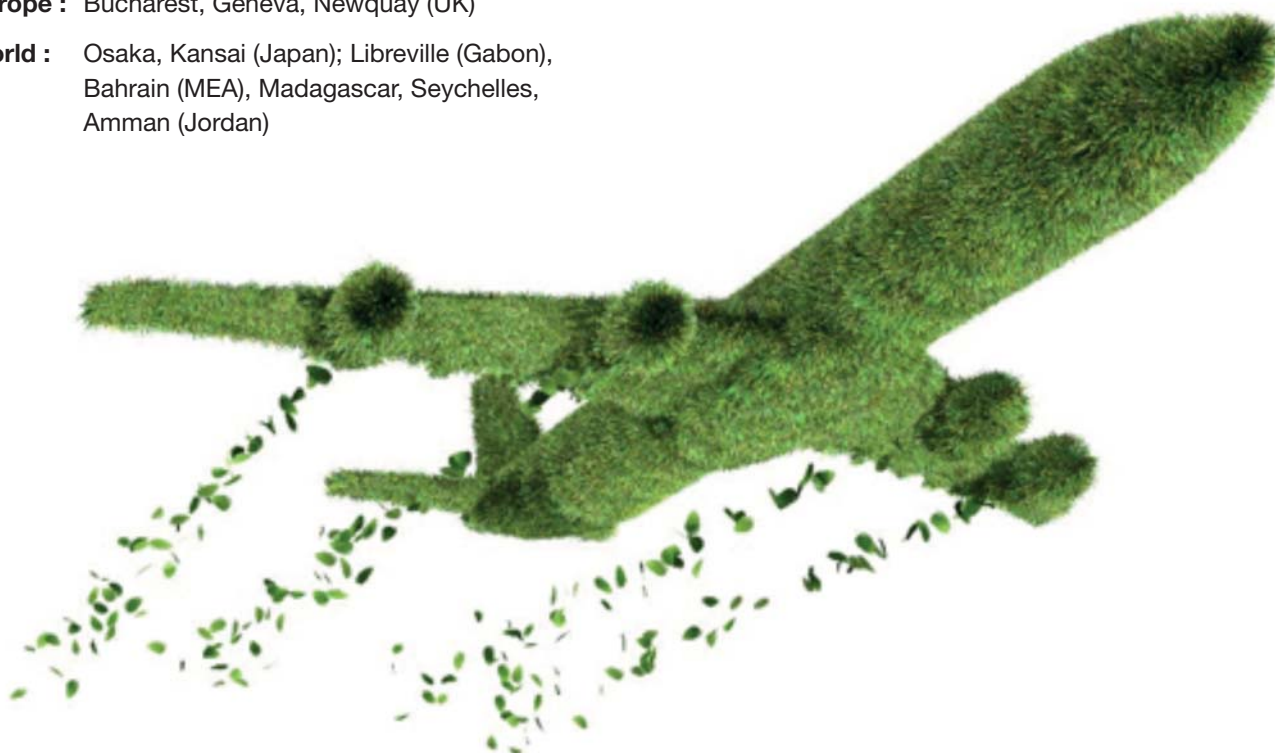
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GORGY TIMING

High precision synchronization systems for streamlined operations

►►► Overall mission

Gorgy Timing produces high-precision synchronization systems (clocks and displays) which allow airport ground handling staff and ATC to better coordinate aircraft movements.

The resulting reduction in aircraft wait time and unnecessary taxiing has a direct impact on the greenhouse gas emissions from less fuel being burned.

In addition to the operational impacts on air quality from its products, Gorgy Timing puts sustainability at the core of its business and is one of the few small-sized businesses in France to attain the latest ISO 14001: 2015 certification for its business operations. Its display units all feature LED lighting for low electrical consumption.

►►► Main products & services

- LED Timer
- Time servers and network management software

►►► Airport references

France : Paris CDG, Paris Orly

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GREEN CREATIVE

Innovative solutions for waste sorting and recovery

►►► Overall mission



Green CREATIVE is a young French company specializing in the design, production, and marketing of innovative solutions for the collection and sorting of waste.

Waste recycling is only possible if products are sorted by types of materials. Green CREATIVE delivers smart technologies to make it possible. For beverage waste, their solution is a fun and connected waste bin, which automatically recognizes, sorts and compacts cans, disposable cups and plastic bottles.

Thanks to this connectivity, the bin alerts when it is full and generates reporting. Another system deals with biowaste. It is able to cleanly separate food waste from packaging and to recover a high-quality organic feedstock for producing biogas and fertilizer.

►►► Main products & services

- **R3D3** - a smart and connected waste-bin which automatically sorts and compacts cans, disposable cups and plastic bottles.
- **FLEXDRY** - a biowaste depackaging technology which separates packaging materials from organic waste.

►►► Airport references

France : Looking for opportunities



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GUINAULT LEBRUN

The alternative to APU on the ground

►►► Overall mission

Auxiliary Power Units (APU) are critical to airport apron operations; unfortunately, they are also noisy, generate a significant share of carbon emissions, and are costly to run.

GUINAULT-LEBRUN offers a range of ground power equipment which replace conventional APU's and air conditioning units and contribute to improving air and noise quality.

- Limit emissions of direct pollutants to the ground
- Greatly reduce the ambient noise level on the ground
- Generate new revenue for the airport
- Significant savings in kerosene consumption for airlines
- Improve air quality

►►► Main products & services

- Electric APU (440 Hz)
- Air conditioners

►►► Airport references

France : Aéroport de Paris CDG, Aéroport de Paris Orly, Nice

Europe : Aéroport de Munich, Frankfurt, British Airways, Swissport

World : Aéroport d'Abu Dhabi, United Airlines, Emirates, Etihad, Singapour Airlines

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IER (Bolloré Group)

Electromobility

►►► Overall mission

IER and its sister companies within the Bolloré Group are playing a leading role in the development of self-service electric cars offering a wide range of services.

Blue Solutions manufactures LMP® batteries specifically designed for the requirements of electric vehicles. Their batteries feature in the cars (Bluecar) used in the pioneering Autolib' car-sharing service operating in Paris and other carsharing services all over the world, as well as in shuttle buses provided through the Bluebus subsidiary.

Bluecity now operates a similar service to Autolib' in central London and will shortly be serving airport travelers with an electric car-sharing service at London Gatwick airport.

►►► Main products & services

- Manufacture of high-capacity LMP batteries
- Manufacture of electric vehicles (passenger cars and buses)
- Service delivery and project management
- Service and maintenance operations
- Support and monitoring of charging networks

►►► Airport references

Europe : London Gatwick

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BUREAU VERITAS • CADDIE - LES ATELIERS REUNIS SAS • CC-CONSULTING • CODRA • COHOR • CONDUENT • CS France •
DAIFUKU LOGAN • DEF • DEGREANE HORIZON • DIRICKX GROUPE • DSNA SERVICES • ECTAR • EDGE AIRPORT Franc • EGIS
AVIA • EJ • EKUM • ENGIE COFELY • ENGIE INEO • ENVISA • FAYAT ENERGIES SERVICES INTERNATIONAL • GORGY TIMING SA •
GUINAULT • HUB ONE • HUB PERFORMANCE • IER • INNOV ATM • JB BONNEFOND ENVIRONNEMENT • LOGYX • MATREX •
NEXANS France • REEL • RESA AIRPORT DATA SYSTEMS • SAGUEZ • SAFRAN I & S • SETEC INTERNATIONAL • SIDES •
TELERAD • THALES • VINCI AIRPORTS • VISIOM • ZODIAC - INTERTECHNIQUE

ENGIE Ineo

EPC Contractor for green airports projects

►►► Overall mission

ENGIE Ineo, it's more than 1500 talents serving a changing world. With a network of 300 branches in France and abroad, our teams innovate to guide you through your energy and digital transition.

They are by your side to realize your green airport projects. From design to implementation and from maintenance to operation, our experts imagine and anticipate the uses of tomorrow by developing solutions that combine technical and economical performance.

At ENGIE Ineo, we encourage spirit of initiative of our teams and provide a work environment that fosters creativity.

►►► Main products & services

- Design, engineering and deployment of turnkey renewable energy airports
 - Green Production based on solar (and storage if necessary) from 50kW to 30MW
 - Energy efficiency studies and implementation for runway, apron and terminal
- Project management
- Products
- Energy storage system (50kW to 3MW)
- Be-safe Products and particularly AirTouch

►►► Airport references

France : Montpellier, French Polynesia

Europe : Brussels

World : Senegal, Mauritania, Gabon, Chad, Congo



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Reducing aircraft emissions through optimised operations

Thanks to its optimization algorithm based on artificial intelligence, Innov'ATM brings significant benefits for airport stakeholders making a direct reduction in greenhouse gas emissions. These reduced emissions can be calculated directly by the software.

- **SkyKeeper Suite software**
(ATC and A-CDM versions)
- Customised ATM software development

France : Nice Cote d'Azur
Paris Charles de Gaulle

Europe : Geneva

World : Jakarta

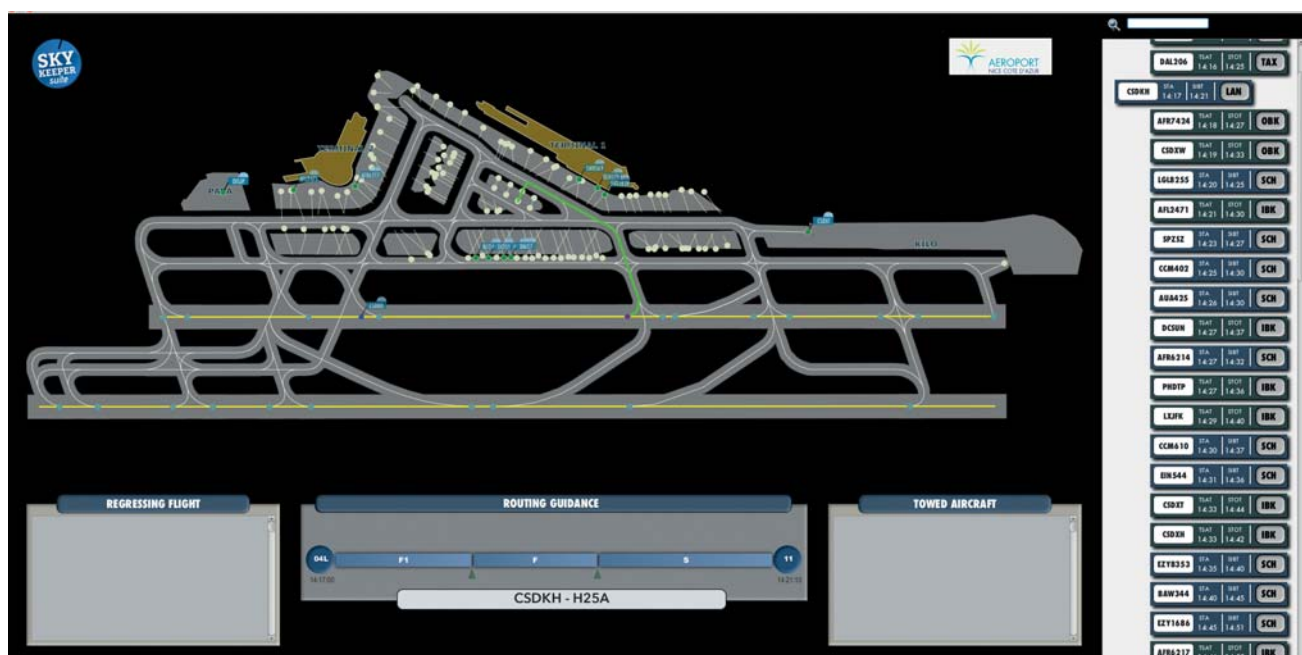
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JB BONNEFOND ENVIRONNEMENT

Eco-friendly runway cleaning

►►► Overall mission

JB Bonnefond is a pioneer in the field of industrial cleaning and waste treatment using sustainable methods and materials. The company has developed innovative products for hydraulic cleaning, including a technique for removing rubber deposits from airport runways. Their process also recovers and reuses the waste water from the cleaning process.

►►► Main products & services

- Runway surface friction measurement
- Rubber removal
- Removal of contaminants (oil, grease, and kerosene)
- Pavement marking removal
- Airfield pavement evaluation

►►► Airport references

France : Lyon Saint-Exupéry Airport, Paris Orly Airport, Nice Côte d'Azur Airport, Montpellier Airport & many others

Europe : Portugal (10 airports under long-term contracts); Brussels Airport, Geneva Airport & many others

World : Morocco (24 airports under long-term contracts), Douala Airport, Abidjan Airport & many others

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NAVYA

Autonomous electric vehicles

►►► Overall mission

Experts agree that one of the first markets for driverless cars will be on restricted non-public roadways such as the airside of airports. NAVYA launched its ARMA 100% autonomous, electric shuttle in October 2015 to address this market and today is actively involved in testing technical performance and user perception in the airport environments.

Demonstration trials are underway at London Heathrow and Christchurch, New Zealand to quickly and comfortably transport passengers and their luggage, along with airport crews, without adding greenhouse gas emissions to the air.

►►► Main products & services

- Mobility as a Service
- Service delivery and project management
- On-site maintenance
- Service operations

►►► Airport references

Europe : London Heathrow

World : Christchurch (New Zealand)



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PATRICK BLANC

Vertical gardens

►►► Overall mission

Pioneer in the field, Patrick Blanc has been building «vertical gardens» around the world for nearly 30 years.

Working closely with architects, his green wall designs are structurally integrated into the overall building to ensure optimal environmental performance as well as the highest aesthetic quality.

The result is a haven of peace in airport departure lounges, calming the nerves of stressed passengers as well as providing for clean indoor air quality.

His work is on display at the SkyTeam Lounge at London Heathrow Terminal 4 as well as Qantas Lounges in Melbourne and Sydney Airports.

►►► Main products & services

Vertical gardens creation (indoor and outdoor)

►►► Airport references

Europe : London Heathrow

World : Sydney, Melbourne (Australia)

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POWIDIAN

Intelligent green energy stations

►►► Overall mission

PowiDian develops, installs and maintains intelligent, autonomous energy stations that provide electricity at all times at the best possible cost.

Their solutions combine specialised software with an advanced energy storage system, creating highly reliable, modular systems.

Their systems are typically used in isolated, off-grid areas. Airports in developing countries in particular could benefit from PowiDian's products and services to ensure continuous operations in harsh environments.

►►► Main products & services

- Smart Autonomous Green Energy System (SAGE)

►►► Airport references

Looking for opportunities

Off-grid electrical generating plant with hydrogen storage units



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RINCENT LABORATORIES

Air quality measurement / soil depollution / stormwater management

►►► Overall mission

Environmental entities of the Rincent group consist of two companies with complementary expertise and international level consultancy experience.

From 1994, Rincent Water and Environnement (EGEH llc; <http://www.egeh.fr>) has been involved in environmental areas where it applies the expertise of its team of geologists and hydrogeologists :

- Expert reports on polluted sites and soils, and advice on site remediation
- Stormwater management and groundwater resources

Rincent Air (www.rincent-air.fr) specializes in improving internal and external air quality through rigorous, scientific measurement and analysis. For nearly 20 years, the company has studied the impact on health and well-being of air pollution specific to many industrial sectors, including aviation.

►►► Main products & services

- Due diligence and health risk studies of polluted sites
- Executive Direction Assistance APM (Assistance with Project Management) for demolition and site remediation
- Stormwater management and rainwater collection strategies
- Air quality monitoring (noxious emissions and odors)
- Environmental impact studies
- Consulting services

►►► Airport references

France : «Air quality measurement & Volatile Organic compound» Aéroport Roissy Charles de Gaulle - Aéroport de Paris / ONERA

«Carbon Footprint» Military airport 123 - Orleans

«Measurement of chromium VI exposure»
Le Bourget - Merignac - Dassault Falcone
Services - Aeroport Roissy Charles de Gaulle - Sodexi

Europe : «Rainwater collection strategy» - Military airports

World : «Stormwater management and groundwater resources» - Nosi-be - Madagascar - African military airports



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SAFRAN

Electric taxiing

►►► Overall mission

Safran is a world leader in aircraft engines, systems and equipment. A global expert in aircraft electrical systems, Safran has been working for many years on the enabling technologies to make aircraft engines more economical to operate and less polluting.

One of the innovations the company has been developing is Electric Taxiing by Safran. Using the Auxiliary Power Unit (APU) generator to power motors on the main wheels chosen for maximized performance and and agility, the Electric Taxiing solution allows aircraft to push back without support from tug and then taxi without requiring use of the main aircraft engines. The technology will benefit the environment by reducing carbon, noise, and other emissions produced during taxiing operations.

►►► Main products & services

- Electric Taxiing by Safran

►►► Airport references

France : The technology is awaiting commercial launch .

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SAINT DIZIER ENVIRONMENT

Waste water and rainwater treatment

►►► Overall mission

Saint Dizier Environment is one of the pioneers in France in designing, manufacturing, and selling sustainable water treatment and control products.

In the airport sector they have acquired expertise over many years in the particular issues of managing rainwater runoff from airfields, taxiways, and aprons.

As climate change increases the intensity of storms at airports, the need to manage water will increase.

►►► Main products & services

- Water pre-treatment products (oil, rainwater)

►►► Airport references

France : Paris CDG and Paris Orly, Avignon, Chambéry

Europe : Brussels, Madrid, Barcelona, Geneva

World : Kuala Lumpur

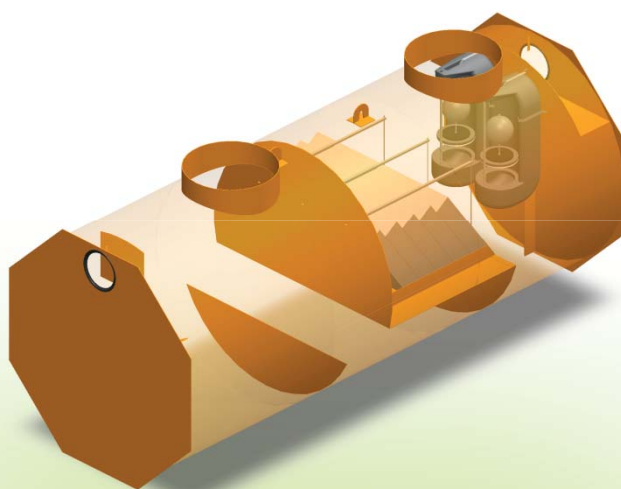
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SETEC

Design and construction of sustainable airports

►►► Overall mission

Setec's position as one of the global leaders in engineering is based on more than 50 years of proven technical excellence.

Its 2,400 employees worldwide have been involved in some of the world's leading projects in transportation, water, buildings, energy efficiency, digital infrastructure and industrial facilities. Its engineers continuously enrich their expertise to design, model and implement sustainable and renewable solutions.

In France and worldwide, SETEC provides a wide range of consultancy, design and construction supervision services to the air transportation industry including airport authorities, airlines, handling companies, investment funds, transport authorities, suppliers and aircraft manufacturers.

►►► Main products & services

- Environmental impact studies (acoustic, air quality, water pollution,...)
- Feasibility Studies, Planning and design
- Project management and Construction Management
- Water treatment, Waste Management
- Energy Efficiency for Buildings and Equipments, Smart Energy Management
- Renewable Energies for airports (thermal sea power, solar energy, ...)

►►► Airport references

- France :** Paris CDG Airport (Rain Water treatment Master plan)
Marseille Airport (Sea thermal power supply)
Nice Airport (Carbon Footprint)
- World :** Maldives (sea/air Passenger Terminal)
Egyptian Airports (Photovoltaic Farms)
La Réunion Airport (Environmental Impact)

Contact

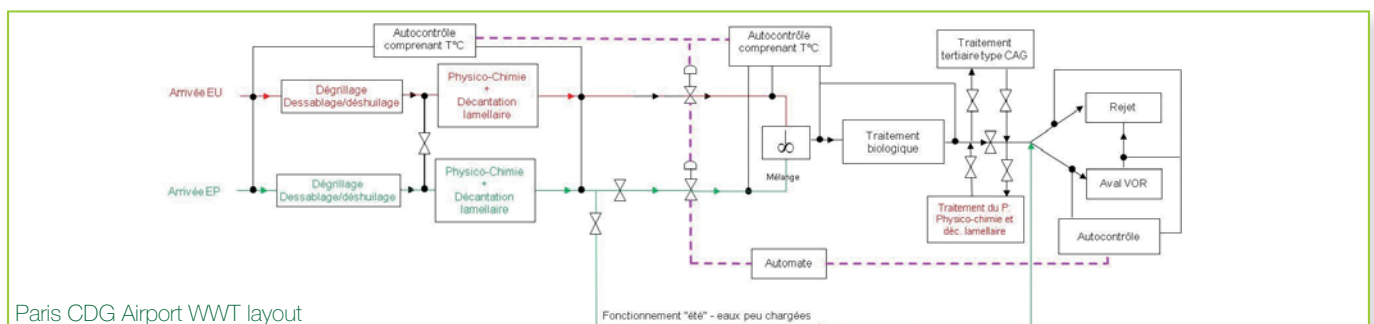
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Marseille Airport thermal pond bathymetry



SUEZ

Water resource management, recycling and waste recovery

►►► Overall mission

The SUEZ group of companies is a world leader in managing water resources and recycling and waste recovery. Like all companies, airports face challenges in optimizing their water and energy consumption.

SUEZ helps airports worldwide on non-core activities to face their challenges in terms of attractiveness, cost optimization and acceptability:

- improving quality of services continuously as expected by travelers and airlines
- Reducing energy and water bills
- Complying with tightening regulations to reduce their environmental footprint and improve airports' environmental image

SUEZ has formed partnerships with the leading French airports to help manage a range of activities including water production and treatment, smart metering, and energy recovery.

►►► Main products & services

Planning, design, and operational services for the following main activities:

- Drinking water production and distribution
- Sewage and waste water collection, valorization / treatment
- Environmental Smart Solutions
- Waste collection, sorting and valorization / treatment
- Runway rubber removal
- Efficiency improvement of non-aeronautical facilities
- Infrastructure development

►►► Airport references

France : Paris CDG, Paris Orly, Toulouse, Bordeaux, Strasbourg

Europe : Bruxelles, Genève, Lisbonne

World : Hong Kong, Santiago, Phnom Penh, Casablanca, Tunis, Mayotte

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