Deerns

Designing Life Science facilities for tomorrow

Efficiency and resilience delivered at high pace

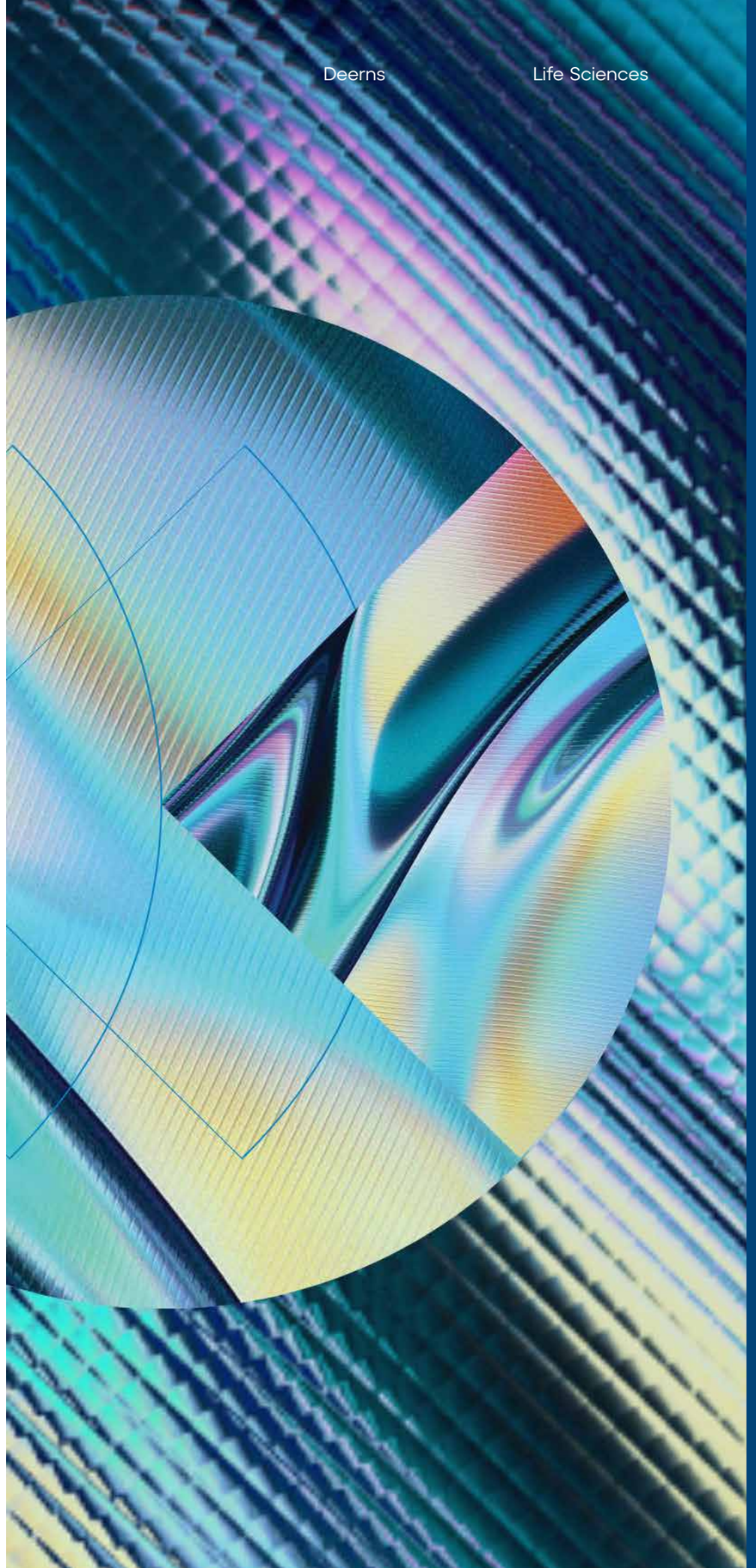
deerns.com

About Deerns

Deerns specialises in the design and optimisation of installations for high performance buildings for people and industries to thrive. Our consultancy and engineering services cover the entire lifecycle of buildings.

We operate in 6 market segments

- Airports
- Real Estate
- Health Care
- Life Sciences
- Electronics
- Data Centres



Designing Life Science facilities for tomorrow

Deerns delivers solutions for Life Sciences facilities where controlled environments are crucial. Our experts provide the full range of expertise in developing, designing, and putting into operation Life Sciences facilities, from research to production and from laboratory rooms to whole campuses. Within Life Sciences we provide services for a wide range of segments, including primary & secondary pharmaceutical facilities for small molecules and biopharmaceuticals, nutraceutical, seed breeding, radiopharmaceutical, medical devices, and vaccine production. Our projects include every type of facility, both new and renovated, providing improved efficiencies, flexibility, and people-centred spaces that meet relevant industry standards.

Key Trends

The landscape in Life Sciences is changing quickly. New technologies provide solutions to manipulate molecules and generate new treatments and medicines. Regenerative medicines repair damaged tissues and organs. The blockbuster business model of big pharma is declining and personalized medicine is rising. Numerous start-up companies are working on break through developments in biotechnology. Many of these startups are gathered on campuses where they share capital intensive equipment and facilities. Life Science companies nowadays have a global focus and need to comply with international regulations for global delivery of products. The increasing use of high potency Active Pharmaceutical Ingredients requires stringent control measures in production and research facilities. Sustainability is now a prerequisite for all our clients and as such is integrated into facility design, processes and procedures. We provide solutions for these trends on a daily basis and understand how to integrate the required solutions into facility design.

Our Services

Comply with stringent levels of control
To meet the requisite stringent levels of control, the design of Life Sciences facilities requires specialized skills and methods. State-of-the-art technology, high quality, reliability, safety, flexibility , sustainability, proven solutions, cost-effectiveness and strict time management form the key starting points in the design and realisation of state-of-the-art Life Sciences facilities. Knowing how to integrate regulatory requirements into the design and realisation to facilitate qualification and validation is crucial in Life Sciences. Our approach delivers the right focus in every phase of a project and keeps track on the overall project goals. At the same time these facilities face numerous evolving challenges: integration of (inter) national compliances like GMP/ FDA or HACCP, new guidelines from the WHO, increased usage of isolators, achieving a balance between prevention of contamination and cross-contamination.

The perfect balance between performance, costs and sustainability
We have developed a design methodology that puts our client's processes at the centre of the design. This approach is crucial in achieving successful solutions that effectively integrate all aspects of operations, processes and equipment within the facility, supporting systems and technical infrastructure. We have the experience to achieve the right balance between a fit for purpose design and a flexible and adjustable facility at a market competitive cost. We use our broad Life Sciences knowledge built on worldwide experience on our controlled environment projects. We form international design teams to deliver the right combination of experience, knowledge and skills. In all our projects we integrate sustainability into every aspect, from initial concept development through to certification.

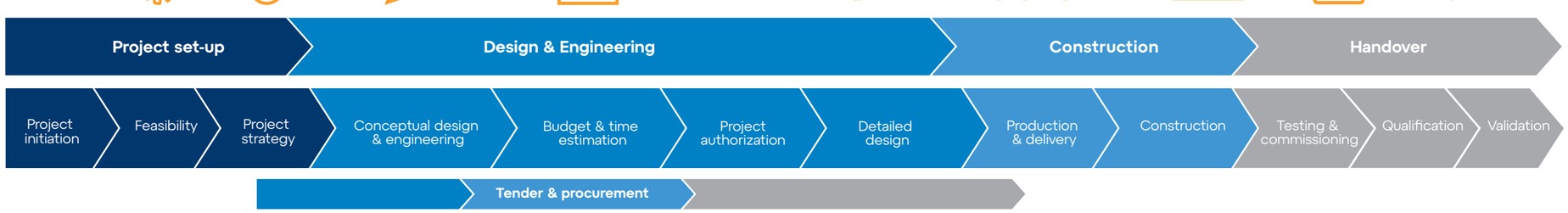
Our Life Sciences Services
- Project Programming
- Process Design
- Laboratory Layout planning
- Project Management
- Design and Engineering
- Construction Supervision
- Qualification & Validation
- Operational Support

Planning & Development
- Master planning
- Technical Programme of Requirements
- User Requirements Specifications
- Conceptual Design/Estimating
- Risk Assessments & Business Continuity
- Strategic Consulting (cGMP)
- Energy Advice/Auditing/Monitoring
- Permitting and H&S
- Commissioning, Qualification and Validation

Design & Engineering
- Engineering Design (Concept, Basic & Detailed)
- Lab design
- Process Critical Systems
- Health and Safety by Design
- Building physics
- Mechanical/ HVAC / Electrical
- Plumbing & Fire Protection
- Civil, Structural & Architectural
- Instrumentation & Controls
- Circular/Waste reduction and recovery
- BIM management
- Commissioning, Qualification and Validation

Construction & Handover
- Health & Safety support
- Construction Management
- Equipment hook-up
- Commissioning, Qualification and Validation

Operating & Redefining
- Health and Safety support
- Monitoring of the equipment start-up activities
- Ad-hoc consultancy for trouble shooting
- OPEX, CAPEX and TCO calculations
- Planning and preparations of upgrades and/or expansions



Here’s where we pioneer new frontiers

Deerns Life Sciences Projects

Kadans Plus Ultra, Leiden

At the Leiden Bio Science Park, Kadans Science Partner is developing the highly sustainable multi-tenant building Plus Ultra Leiden, which houses offices and laboratories.

The entrance and parking facilities are located on the ground floor. A bright atrium with communal facilities will be created on the first floor. The project will be certified as BREEAM Excellent.

Scope

Deerns is the consultant involved for installation technology, building physics, fire safety and BREEAM. Deerns will act as a design team partner from the design phase up to and including delivery.

Why relevant

Plus Ultra Leiden offers a high degree of flexibility for tenants. The building is intended as a meeting point for the business community at the Leiden Bio Science Park and is the first development as part of the Kop van Leeuwenhoek.

The building will be equipped with a WKO installation with heat pumps and will be certified according to BREEAM Excellent. The building is therefore gas-free.

Services

- Installation technology consultant
- Building physics
- Fire safety
- BREEAM

‘High degree of flexibility for tenants’

DSM Biotechnology Centre, Delft

The new DSM Biotechnology Centre is set to become the figurehead of DSM's biotechnology campus in Delft.

The research centre strikes a perfect balance between sustainability, compactness, functionality, ease of use and maintenance, flexibility and design. All DSM's biotechnology research will be conducted in this new state-of-the-art building. The new R&D centre, with laboratories, cleanrooms, offices and conference rooms, replaces the current building, which has become obsolete and no longer meets today's requirements and needs. Deerns was involved in all technical aspects of the project including electrical, IT, security, mechanical, control, transport and process utility systems

To achieve optimal logistics within the Centre, Deerns worked closely with both DSM's research departments and the architect.

Engaging with stakeholders, particularly the research team which will occupy the Centre was key to achieving effective integration of specialised areas for sensitive metrology and analytical work, GMP labs and cleanrooms. Likewise, teaming up with the architect resulted in a well-designed laboratory layout and highly efficient process and people flows, whilst maintaining an open plan. This open plan, together with the glass façade, creates a verypleasant and productive work environment, which stimulates interactions and new collaborations.

Special Features

The complete design of this building was driven by DSM's ambition to classify their new Research Centre with the BREEAM Very Good certification. During the design, no specifi BREEAM requirements for the laboratories existed, so sustainability targets were defined by the design team. To reduce energy consumption and to meet strict temperature requirements, the façade is designed to reduce solar heat gain to significantly reduce the cooling load.

Besides saving energy, it was important that the building infrastructure would allow future modifications. Careful analysis of the current and projected future laboratory requirements enabled the design to be optimised, resulting in lower investment and operational costs.

'Balancing flexibility and optimal use of building infrastructure'

Hubrecht Institute, Utrecht

The Royal Netherlands Academy of Arts and Sciences (KNAW) realised a new building for the Hubrecht Institute. This new building E, comprises several laboratories for the Hubrecht Institute and the University Medical Centre Utrecht (UMC Utrecht) for translational research on regenerative medicine and stem cell biology.

The facility forms a starting position for an intensive collaboration between the institutes and combines the total chain of fundamental and translational research with patient treatment.

Deerns designed the technical infrastructure of the 9.000 m^2 building and laboratories, including their fit-out. The laboratories are designed according to the principles of 'The New Way of Laboratory Working'. The laboratories are large and spacious, to encourage interaction between the researcher's staff as much as possible. The microbiological laboratories at ML-I and ML-II levels are located in the centre of the building.

Special features
To meet future demands all laboratory layouts and the fit-out are designed for maximum flexibility. A separate fume extraction system was integrated into the design to eliminate the risk of cross contamination and corrosion in the general air handling system. Energy for heating and cooling is provided by an underground thermal storage system which is used in combination with heat pumps, resulting in a highly sustainable system.

'State of the art facility for regenerative medicine and stem cell biology research'

New production facility for Bayer, Wuppertal Germany

Bayer is an innovative firm with over 150 years of history and core competences in the fields of health care, pharmaceutics and agriculture.

Deerns was selected to be part of Bayer's construction team, Capacity Expansion Biologics recombinant Factor 8 Active Pharmaceutical Ingredients, to create a new biotechnology facility for the production of medication to treat haemophilia, with an overall investment level of 500 million euro.

International team with local knowledge

Deerns was able to fulfil Bayer's needs by assembling a team of experts from both Germany and the Netherlands. Dutch expertise in designing clean environments was combined with German knowledge of local regulations and familiarity with the client. The on-site team is responsible for coordinating and supervising nine installation contracts, monitoring progress and quality and managing coordination of the utility systems.

Special features

The project will be completed according to the pharmaceutical procedures laid down in the Good Manufacturing Practice (GMP) guidelines whilst adhering to Bayer's construction protocols. A flexible multinational on-site Deerns team covering all technical disciplines provided the necessary supervision to ensure that GMP, quality and safety requirements were met. Specialist knowledge was provided by Deerns' back office experts.

'Combining local German knowledge and international cleanroom expertise'

New building for the Dutch National Institute for Public Health and Environment, Utrecht

The Dutch National Institute for Public Health and Environment (RIVM) is a leading knowledge and research centre. This integrated new building will be realised for the RIVM based on a Public/Private-Partnership (PPP).

This building will also be used by the Dutch Medicine Evaluation Board. The project consists of numerous research laboratories, office workplaces and supporting facilities. The new facilities offer flexibility and comfort for a diverse program of research activities, which are completely integrated in one building. The building has an open character to create an inspiring research facility and to provide meeting places for all occupants promoting interaction and collaboration.

Deerns was responsible for the design of the building service installations during the tender stage. After winning the competition Deerns was part of the engineering team. The total building area of 70.000 m² includes 20.000 m² of laboratories. Research laboratories are divided into generic ML II labs and function-specific labs, including BSL 3 labs, CBRN labs and a measurement field lab.

Special features
In order to meet the sustainability target of BREEAM Outstanding, a large wind turbine will be contracted nearby to provide a sustainable energy source. The heating and cooling energy demand will be using high-effi ammonia heat pumps in combination with Aquifer Thermal Energy Storage (ATES). All air handling systems contain plate heat exchanger energy recuperators and have adiabatic cooling in the return airflow. To reduce domestic water consumption, a grey water system will be supplied for irrigation of the surrounding landscape.

‘One extensive integrated building with a high diversity of labs’

Pivot Park, Oss

Pivot Park is a Life Sciences campus which supports startup companies by providing them with facilities and equipment. The campus is positioned in MSD's former site in Oss.

The main goal of Pivot Park is to stimulate and attract startup companies and thereby create employment in life sciences as well as supporting the development of new products and medicines. Pivot Park has the ambition to be an incubator of new companies and new products in Life Sciences.

Challenges

The Research and Development facilities of MSD were originally occupied by a single user and needed to be converted into a multi-tenant environment for startup companies. Systems and infrastructure within the buildings had to be modified to provide flexibility and adaptability, to accommodate varied tenant types, enable future growth, and new equipment. To reach the sustainability goals set by the stakeholders and to reduce the operational costs, the energy consumption of the buildings has been optimised.

Deerns' role

Deerns defined the requirements of a (standard) laboratory suitable for start-up life sciences companies to work in, incorporating features for analytical, chemical and biological processes. Deerns' design solutions also focused on achieving the flexibility required of an incubator facility. Further Deerns made energy saving plans for several buildings and provided the basic engineering for these adjustments.

'Redevelopment of a single tenant site into a Life Sciences Campus'

New HVAC for MSD facility, Oss

MSD Netherlands discovers, develops, manufactures and markets a wide range of innovative pharmaceutical products to improve human and animal health.

As part of MSD's masterplan for their Oss site, segregation of production areas was planned to avoid potential contamination. The project also included improvements in GMP compliance, updated internal MSD standards and maintainability. Deerns Netherlands was selected by MSD to perform the high level study, concept and detailed design of this site upgrade.

For MSD's production facility in Oss, Deerns performed a comprehensive study to assess and identify the requirements for the new HVAC systems and dust collection system. Deerns carried out a detailed analysis of operational requirements and developed four scenarios for the upgrade of the HVAC. During workshops, involving all stakeholders, options were evaluated for technical and financial performance and the best option was selected for development as the chosen solution. Our risk based approach was implemented during basic and detailed engineering, concluding in constructability reviews of the proposed design solutions.

Special Features

An important starting point of the design was the limited space and restricted height in the technical area, requiring additional site checks to ensure constructability. Other important challenges included prevention of cross-contamination during operations and execution of the project with as little as possible downtime for the ongoing production. These have been leading themes in the design and execution of this project.

'Alignment with stakeholders for design of an extensive refurbishment'

New production line Fresenius Kabi, Italy

Fresenius Kabi is a global health care company that specialises in life saving medicines and technologies for infusion, transfusion and clinical nutrition.

Fresenius decided to integrate a new production line for medical devices in their existing warehouse facilities.

Deerns was selected to produce the URS and concept design for the new production line, located in an existing cleanroom facility, to meet GMP and FDA regulations. The work consisted of the upgrade of existing systems and the development of new systems including HVAC, cleanroom, mechanical, electrical and controls. Deerns developed the design in close cooperation with the client, contractor and the structural engineer. Moreover Deerns developed the process flows for materials, products and people, around which the concept design was based. A number of options were developed and evaluated on benefi and costs. The design was developed to accommodate flexibility and future growth. The design approach was risk based, focused on validation to guarantee a smooth startup of operations.

Deerns was responsible for the design and overseeing the construction of a vertical clean lift class ISO7 which connects separated production cleanrooms operating with different HVAC systems. The clean vertical transportation system designed can satisfy both products and personnel logistic at once maintaining the desired degree of air cleanliness. The peculiarity of the cabin lift, airlocks, and shaft's ventilation system coupled with the environmental monitoring control and interlocking systems installed assures a unique, robust and redundant safety ventilation approach for the contamination control of the clean environments. This solution envisages a lean manufacturing concept which will help clean production processes in connecting different cleanroom floors saving time, increasing productivity, reducing man or AGV work and reducing foot-print for packaging used for internal handling while guaranteeing a high degree of safety for personnel and for product quality.

'Optimisation of costs and flexibility for future growth'

Erasmus Medical Centre Research Institute, Rotterdam

The Erasmus Medical Centre conducts research for infectious diseases (e.g. SARS, bird flu, tuberculosis and others). Globalisation, the migration of humans and animals, international trade and international (eco) tourism bring an increasing risk of these diseases spreading.

To assist in protecting the population by containing outbreaks and curing individual patients there is an urgent need for increased availability of diagnostic tests. Erasmus MC decided to develop a facility for both preventive (vaccines) and curative (therapy) purposes. The laboratory was constructed on the top floor of an operational academic hospital in Rotterdam, the Netherlands.

The facility provides full containment for pathogens using a triple barrier. Additionally, stringent security measures have been implemented to prevent unauthorised access to the laboratories. The design also incorporates fail-safe features to mitigate risks due to technical failure or external influences.

The facility is designed to biosafety level 3. Deerns undertook the complete design of this project from feasibility study to URS (User Requirements Specification), detailed design and tendering to installation supervision and validation.

Special features

The design complies with the strictest, international safety standards, including those of the WHO. All operational, maintenance and control activities are defined in protocols. The design and operation of the facility was reviewed by independent, external risk-experts.

‘Creating a high containment lab at 100 metres height in an operational hospital’

Danone Nutricia Research Centre, Utrecht

Danone Nutricia's research and development centre in Utrecht, the Netherlands, is the global hub for their Early Life Nutrition and Advanced Medical Nutrition operations.

The building is a state-of-the-art facility with a high degree of sustainability. It includes 4,000 m^2 science and technology laboratories (ML-I and ML-II), a 1,700 m^2 pilot plant (HACCP regulations) for small scale production and a sensory & consumers lab where consumer testing takes place. Additionally, the building incorporates an information and meeting centre, a restaurant and office space.

Building representative for guests

The building is not only used for the research and development of new products, but also for testing. When a new product is developed, the production process can be tested on a small scale in the pilot plant. Subsequently the food is tested on the target audience (e.g. elderly people or pregnant women). Therefore, the building not only meets the strict requirements for research but also provides a welcoming environment for guests. The Danone Nutricia Research Centre is part of a growing life sciences community in the Utrecht Science Park which includes hospitals, a university, a higher technical school and life sciences companies.

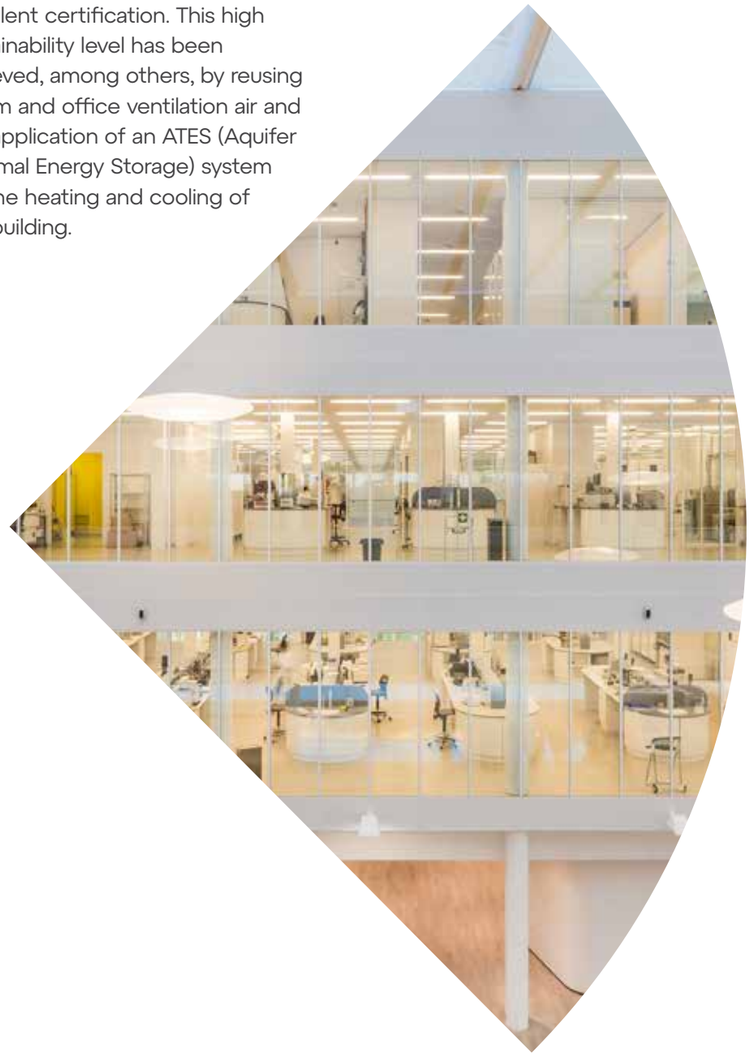
Flexible and adaptable

Deerns' design included all the MEP systems and infrastructure for this facility. Designing the floor plan and logistics of the laboratories and pilot plant and the layout of all the MEP systems was done in close collaboration with the other project partners. This has resulted in a highly flexible and adaptable facility that suits the variety of users and visitors.

Special features

The building received a BREEAM Excellent certification. This high sustainability level has been achieved, among others, by reusing atrium and office ventilation air and the application of an ATES (Aquifer Thermal Energy Storage) system for the heating and cooling of the building.

'State of the art building for labs, offices and pilot production'



Science Park Bilthoven, Utrecht

The Utrecht Science Park Bilthoven has a long standing history in the Netherlands. From its inception the National Public Health Agency has been located on this site and has a strong reputation in life sciences, health and the environment.

Several institutes and companies are now present on this Science Park, which is owned by vaccines producer Bilthoven Biologicals. The park consists of 40 buildings and has a total area of 22 ha.

Challenges

Over the past 20 years Deerns has carried out numerous projects on the Utrecht Science Park including; vaccine production facilities (under GMP regulations), biotechnology laboratories at ML 1 and 2, High Containment Laboratories (BSL 3 and 4), cleanrooms, animal research facilities, sterilisation facilities and offices. Additionally, Deerns produced designs for the site's energy systems infrastructure and the extensive security systems which protect the park and its buildings.

Special Features

Due to the nature of the activities at the Science Park, special attention is given to the protection of employees and the environment against infections by the implementation of high containment, isolation technology, disinfection and biosecurity measures which are incorporated in the facilities.

'20 years of continuous involvement in a Life Sciences Campus'

Patheon (Thermofisher Scientific), Tilburg

Patheon (Thermofisher Scientific), Tilburg produce soft gel caps for pharmaceutical or nutraceutical purposes.

Patheon (Thermofisher Scientific) decided to upgrade their HVAC system to be in full compliance with the GMP regulations

Challenges

Deerns was selected to undertake the design for the HVAC systems which serve the medicines area cubicles, to comply with GMP regulations. Deerns optimised the design of the HVAC to improve the protection of the product as well as the operators. A pressure cascade between the ISO 7 conditions in the cubicles and ISO 8 in the corridor was integrated into the design. With a risk-based design approach we were able to shorten the validation period and achieve a smooth startup of the operations.

'Upgrade of HVAC systems to meet GMP regulations '

New frontiers for the Life Sciences industry

Here’s where lives are improved

Cutting-edge technological developments in genomics, nano technology and data science are new frontiers for the Life Sciences industry. Deerns enables this experience by ensuring that clean technology environments are optimized and compliant to stringent regulations and local design codes for research and manufacturing facilities. We design for safety, quality, efficiency and speed of the processes in pharmaceuticals, biotechnology, medtech and nutraceuticals.

Building design & innovation

A controlled and regulated environment is essential for enabling R&D and production processes in Life Sciences. Future-proof production methods for personalized medicine or high-volume manufacturing requires flexible, efficient and sustainable clean tech design.

Energy use & sustainability

Installation design requirements within sustainability boundaries also need to meet the high demands for Life Science buildings. Deerns is a frontrunner in designing, planning and commissioning carbon-neutral or energy-positive design.

Smart technology

We leverage smart building technology to ensure pleasant, healthy and safe working environments for Life Science specialists. We design Life Science buildings so that they provide comfortable indoor climate control, adaptable lighting or office space booking.

Colophon

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