DREES & SOMMER

THINKING AHEAD

THE REGENERATIVE FACTORY AS A VISION OF THE FUTURE

THINKING AHEAD

THE REGENERATIVE FACTORY AS A VISION OF THE FUTURE

Drees & Sommer promotes sustainability strategies that are both systematic and holistic. We believe that economy, ecology and social issues must all be considered together. Our aim is not only to make progress within our own company in the areas of climate protection and social engagement, but also to systematically integrate sustainability into our consulting and planning projects and to support our customers on their way to becoming sustainable organizations.

In the light of the far-reaching changes that are currently taking place, Drees & Sommer's Integrated Factory Planning experts have developed the vision of a regenerative factory. This brochure describes exactly what our vision entails, how you can identify initial areas requiring action, and what specific measures you can take.

VISION

A vision with clear objectives will give you a clear competitive edge. But what role does the regenerative approach play?

FIELDS OF ACTION

Concrete measures and concepts show how the fields of action are addressed. What form can these measures take?

DIGITAL AND SUSTAINABLE

As a technological process, digitization can lead the way and promote sustainable transformation. What reciprocal effects result from this?

VISION

OUR VISION FOR THE REGENERATIVE FACTORY

TODAY, MORE THAN EVER, COMPANIES ARE FACED WITH THE CHALLENGE OF REDUCING THEIR ENVIRONMENTAL IMPACT AND ECOLOGICAL FOOTPRINT AS EFFICIENTLY AS POSSIBLE. HOWEVER, THE AIM SHOULD NOT SOLELY BE TO MINIMIZE ENVIRONMENTAL HARM, BUT RATHER TO MAKE A POSITIVE CONTRIBUTION.

The manufacturing industry is under growing pressure to optimize its factory and production infrastructure, and to improve plant and processes with regard to diverse aspects of sustainability. In view of this, Drees & Sommer's Integrated Factory Planning experts have developed the model of the regenerative factory of the future.

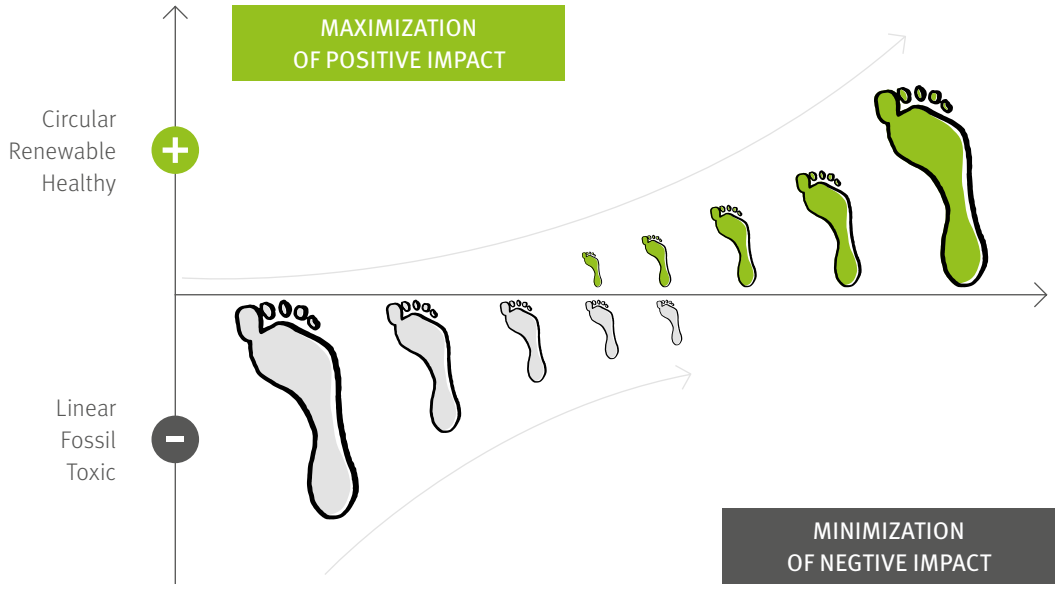
Sustainable factories aim to preserve the environment and minimize damage to it. Regenerative factories go further and follow the principle of giving back more than they take. Alongside economic success, they also aim to achieve the greatest possible benefit for society and the environment. The focus is on identifying the key influencing factors in systems and bringing about transformative change at all levels.

VISION

CRADLE TO CRADLE® IS A DESIGN CONCEPT THAT SEES SUSTAINABILITY AS AN OPPORTUNITY FOR INNOVATION. IT AIMS TO LEAVE A POSITIVE FOOTPRINT AND RESULTS IN PRODUCTS, PROCESSES AND BUILDINGS THAT ARE SAFE FOR PEOPLE, ENVIRONMENTALLY COMPATIBLE, AND PROMOTE THE SUCCESS OF THE BUSINESS MODEL.

Developed by the German chemist Professor Michael Braungart and the American architect William McDonough, the Cradle to Cradle concept describes the principle of two continuous cycles. Instead of taking the conventional approach to waste, Cradle to Cradle sees materials as nutrients that can be repeatedly re-used.

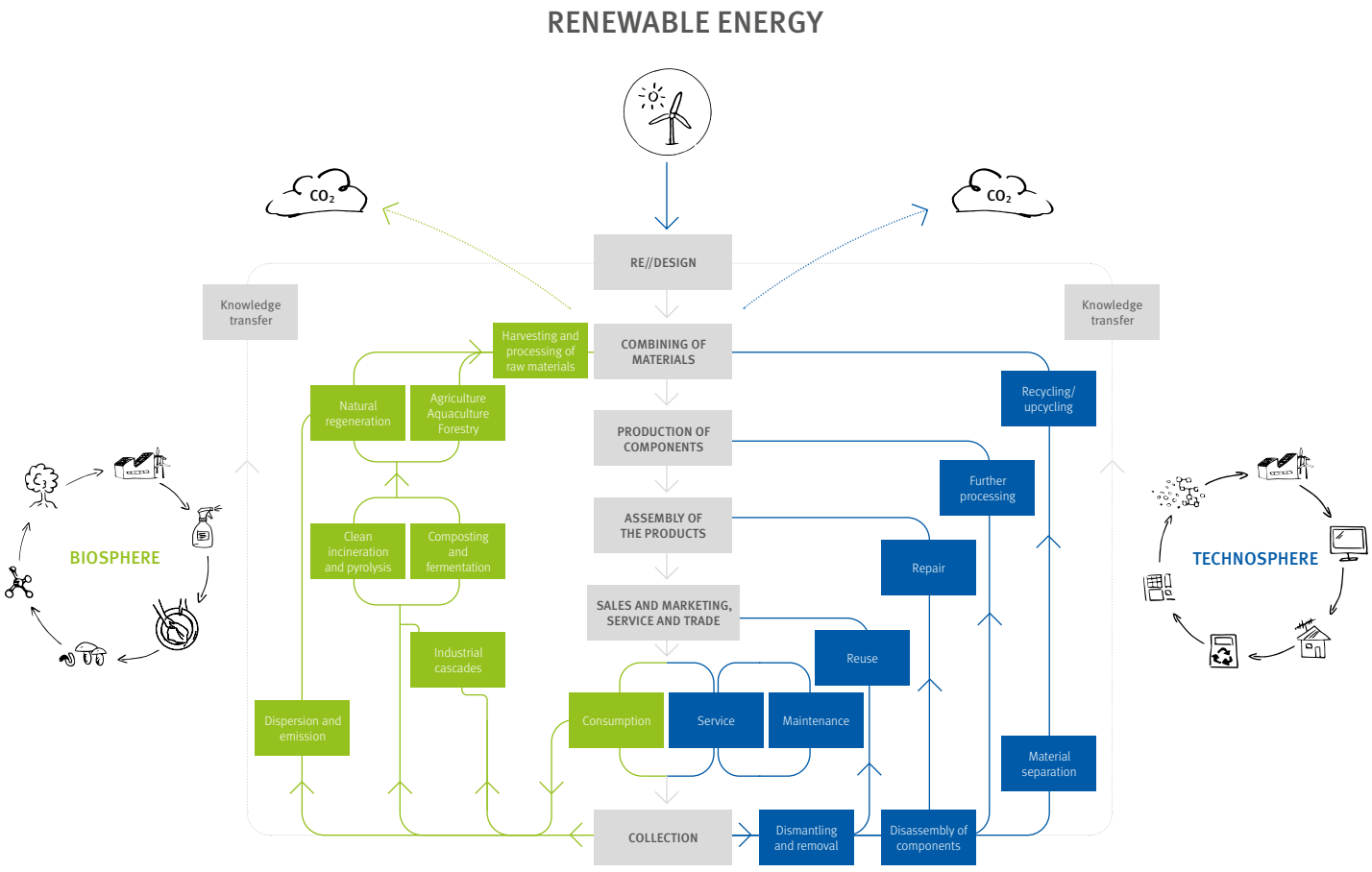
To ensure that a product does not become waste at the end of its final use, it must be designed for the biosphere or the technosphere from the very beginning. This is the only way we can create a positive footprint with optimized nutrient cycles in the long term.



VISION

› Biological nutrient cycle: Consumables such as natural fibers, cleaning agents and biodegradable packaging are safely returned to the nutrient cycle after use. They then form the basis for new products by being turned into compost or other nutrients.

› Technical nutrient cycle: During the design and manufacturing process, consumer products such as electronic goods, floor coverings and vehicles are optimized to be used as resources in the next phase of the cycle. At the end of the product's service life, the materials can be separated by type and returned to the technical cycle without any loss of material quality.



THE FIELDS OF ACTION IDENTIFIED

THE EXPERTS STARTED BY IDENTIFYING TEN FIELDS OF ACTION RELATED TO REGENERATIVE TRANSFORMATION THAT ARE IMPORTANT FOR THE CONCEPT DEVELOPMENT AND PLANNING OF HIGHLY EFFICIENT, RESOURCE-FRIENDLY FACTORIES. THESE FIELDS OF ACTION ARE INTENDED TO PROVIDE GUIDANCE AND HIGHLIGHT THE KEY ISSUES THAT WILL CONTRIBUTE MOST EFFECTIVELY TO A SUCCESSFUL TRANSFORMATION PROCESS.

Experience from numerous factory planning projects confirms that the complex interactions at the interface between the plant and the building often leave potential for a seamless sustainability strategy untapped. The decisive success factors here are the bundling of competencies in the areas of production, process and industrial construction planning, and exploiting the resulting synergies.

HOW WE CAN ASSIST YOU:

The services provided by Drees & Sommer's Integrated Factory Planning range from the analysis of individual key issues to the design, planning and realization of your factory project. We always keep the focus on your product and your value creation process, and apply the latest technologies and future-oriented approaches. This results in a complete customized package from a single source.

FIELDS OF ACTION

REGENERATIVE FACTORY FIELDS OF ACTION
– JOIN US ON THE PATH TO YOUR REGENERATIVE FACTORY OF THE FUTURE. THE FIELDS OF ACTION DESCRIBED BELOW ARE THE LEVERS WE USE TO ENSURE THE SUCCESS OF YOUR TRANSFORMATION PROCESS:

- Carbon-neutral energy management
- Sustainable water management
- Smart charging
- Sustainable design of surfaces, biodiversity
- Optimized global production footprint
- Efficient and sustainable design of the production process
- Efficient machines, plant and equipment
- Social responsibility
- Data consistency, transparency and virtual plant commissioning
- Sustainable products

1ST FIELD OF ACTION

CARBON-NEUTRAL ENERGY MANAGEMENT

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› EFFICIENT USE OF WASTE HEAT:

Heat exchangers or organic Rankine cycle (ORC) systems are used to convert excess process and plant heat into electrical energy.

› USE OF RENEWABLE ENERGIES:

Photovoltaic systems, such as solar carports, convert sunlight directly into electrical energy, thus contributing to in-house electricity generation.

› WIND TURBINES:

Wind turbines can supply additional electricity in windy regions. This sustainable energy source can be used to meet immediate demand, while excess electricity can be stored in various media.

› DEEP GEOTHERMAL ENERGY:

Deep geothermal (in combination with a steam turbine) offers another sustainable source of energy.

› BUFFERING AND ENERGY STORAGE:

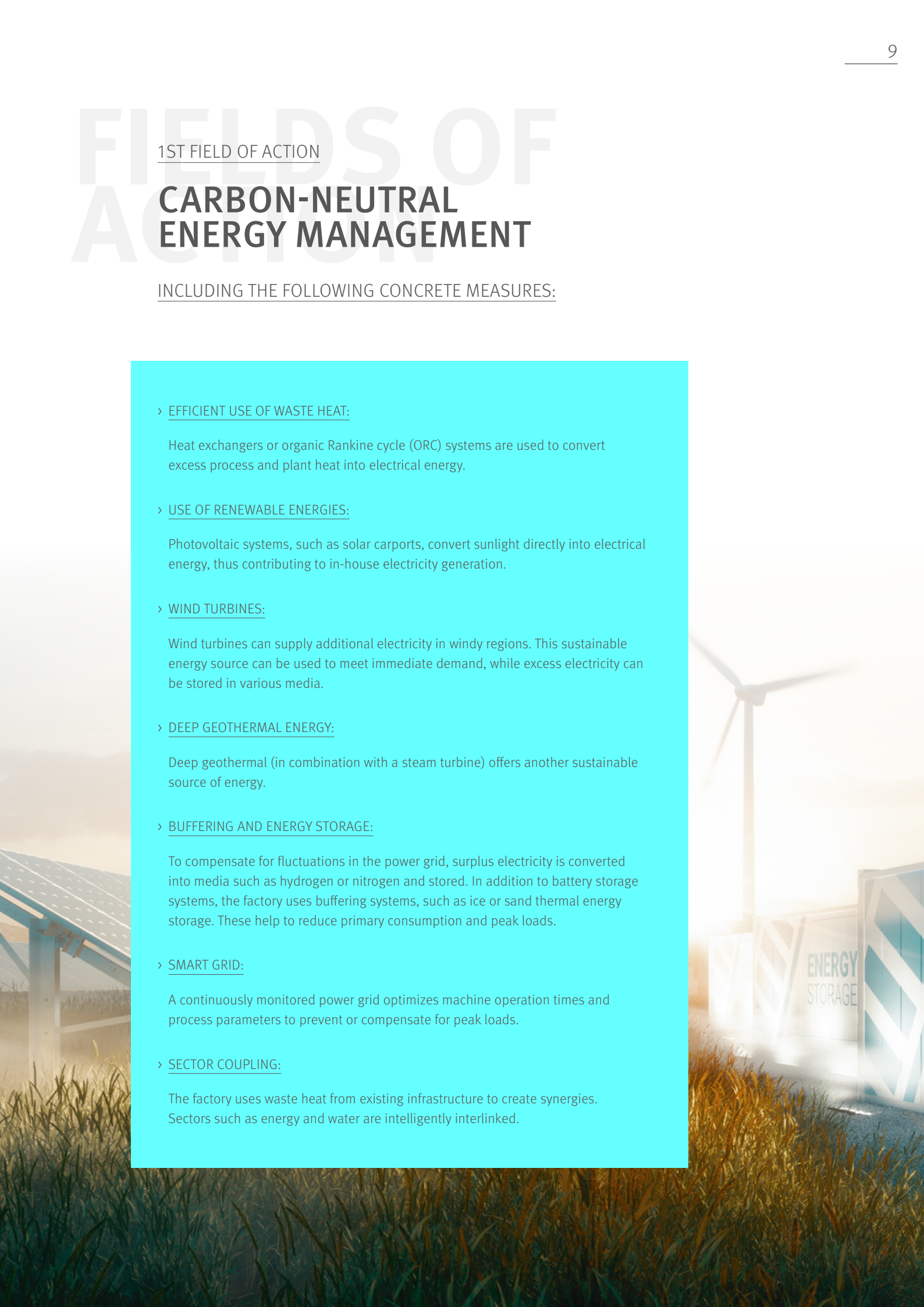
To compensate for fluctuations in the power grid, surplus electricity is converted into media such as hydrogen or nitrogen and stored. In addition to battery storage systems, the factory uses buffering systems, such as ice or sand thermal energy storage. These help to reduce primary consumption and peak loads.

› SMART GRID:

A continuously monitored power grid optimizes machine operation times and process parameters to prevent or compensate for peak loads.

› SECTOR COUPLING:

The factory uses waste heat from existing infrastructure to create synergies. Sectors such as energy and water are intelligently interlinked.



FIELDS OF ACTION

2ND FIELD OF ACTION

SUSTAINABLE WATER MANAGEMENT

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› REGENWASSERBEWIRTSCHAFTUNG:

Rainwater, separated by quality, is used for a range of applications such as cooling and irrigation.

› WATER USE POTENTIAL AND COOLING WATER REQUIREMENTS:

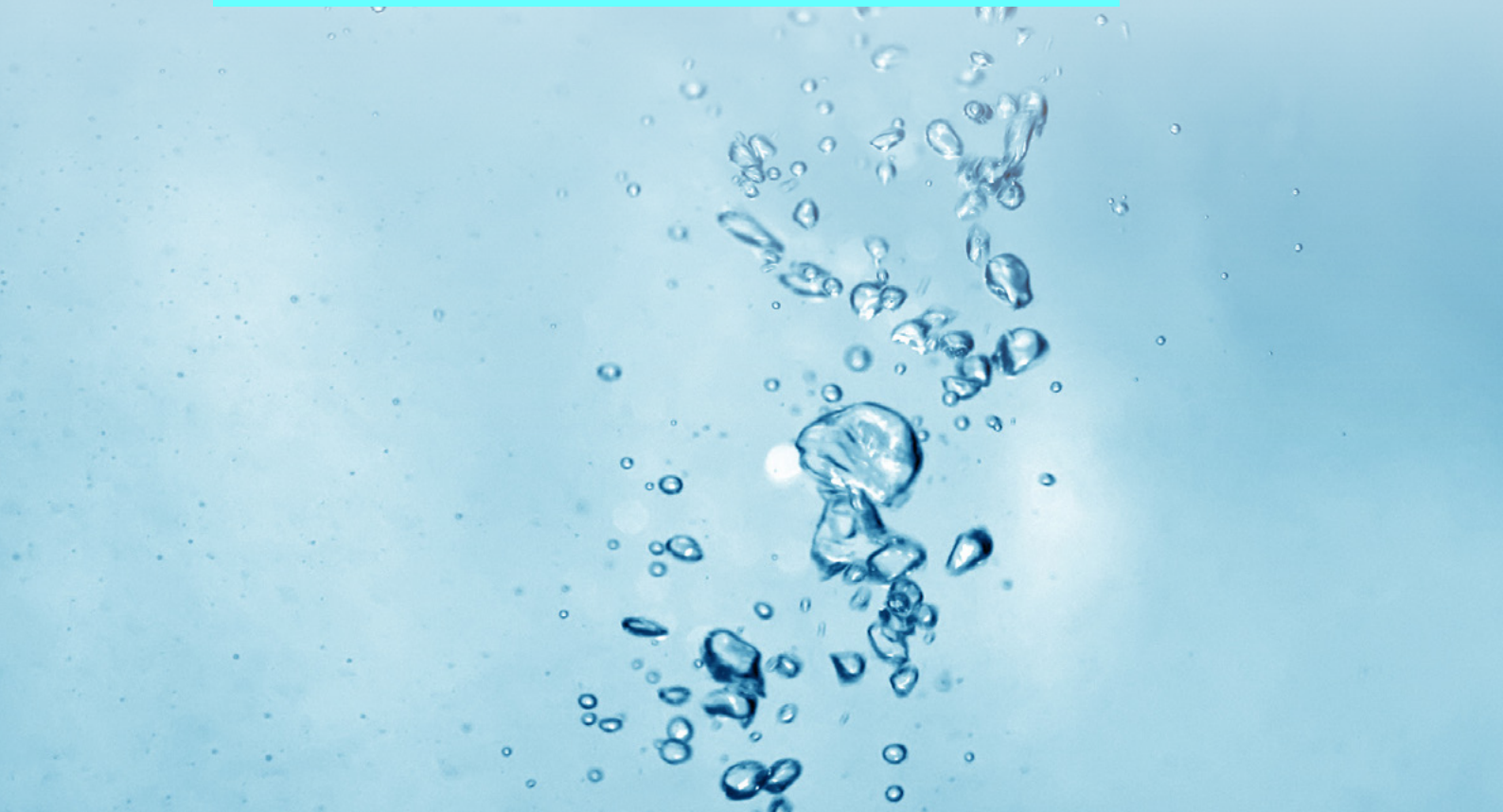
Water use potential is analyzed and cooling water requirements are optimized. Efficient technologies and closed cycles are used.

› WASTEWATER TREATMENT FOR REFRIGERATION:

Wastewater is used to generate cooling. Here, efficient heat exchangers and recycling systems play a key role.

› NATURAL TREATMENT USING VEGETATION:

A wetland roof filters and purifies the water in a natural way. The plants contribute to sustainability by absorbing contaminants.



FIELDS OF ACTION

3RD FIELD OF ACTION

SMART CHARGING

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› PROVISION OF CHARGING INFRASTRUCTURE:

The factory provides a smart charging infrastructure for various user groups:
1. Logistics (trucks and vans)
2. Employees (cars and bicycles)
3. Externals/guests (trucks, cars and bicycles)

› EFFICIENT NETWORK OPERATION:

Intelligent charging smooths electricity demand. This reduces peak loads in the grid, improves the efficiency of grid operation and ensures grid stability, for example by controlling charging processes.

FIELDS OF ACTION

4TH FIELD OF ACTION

SUSTAINABLE DESIGN OF SURFACES AND BIODIVERSITY

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› MINIMIZATION OF SURFACE SEALING:

Reducing surface sealing preserves natural habitats. This protects soil, plants and animals, and ensures necessary seepage areas.

› GREEN CORRIDORS

Green corridors connect biotopes to promote biodiversity and provide safe havens for animals.

› FACADE AND ROOF GREENING:

Roof and facade greening creates habitats for plants, insects and birds. Green walls and roofs also improve air quality and reduce energy consumption.

Drees & Sommer Innovation Building OWP12

FIELDS OF ACTION

5TH FIELD OF ACTION

OPTIMIZED GLOBAL PRODUCTION FOOTPRINT

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› SITE STRATEGY AND SELECTION:

The siting of the production facility is crucial. It must take relevant markets into account, but also ensure optimal exploitation of company and supplier capacities.

› ENERGY MIX AND ENERGY AVAILABILITY:

Efficient use of renewable energies and the availability of electricity are key factors. The locally available energy mix is taken into account.

› SITE SUPPLY AND DISPOSAL CONCEPT:

A holistic supply and disposal concept is essential.

6TH FIELD OF ACTION

EFFICIENT AND SUSTAINABLE DESIGN OF THE PRODUCTION PROCESS

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› MORE EFFICIENT TECHNOLOGIES:

The use of modern technologies can cut process times, thus reducing energy costs. Automation, digitization and intelligent control all have a role to play here.

› INVENTORY/WAREHOUSE AND LOGISTICS OPTIMIZATION:

Optimization of intralogistics and of inbound and outbound logistics aims to reduce inventories and enable efficient control of material flows.

› ZERO-WASTE APPROACH AND SEPARATION BY TYPE:

The pursuit of the zero-waste approach is supported by the separation of production waste by type. This minimizes waste and conserves resources.

› STANDARDIZED RECYCLING CONTAINERS:

Standardized containers enable optimized use and recycling.

› RECYCLABLE PACKAGING:

In keeping with changing customer requirements, the factory uses environmentally friendly, compostable packaging solutions – including during the manufacturing process.

› OPERATIONAL EXCELLENCE:

There is a continuous drive to improve the effectiveness and efficiency of production and logistics processes. Each step in the production process is examined with regard to sustainability and added value.

FIELDS OF ACTION

7TH FIELD OF ACTION

EFFICIENT MACHINES, PLANT AND EQUIPMENT

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› RETROFIT AND MODERNIZATION MEASURES:

The factory invests in retrofitting and modernizing existing machines and plant. This reduces energy consumption and increases efficiency.

› ELECTRIFICATION:

Electric drives replace energy-intensive pneumatic systems. Decentralized energy generation and use help to increase efficiency.

› MOTION OPTIMIZATION:

Intelligent motion control reduces energy loss due to starting and stopping. Regenerative braking recovers energy.

› ENERGY INTERACTION BETWEEN MACHINE AND PROCESS:

Energy efficiency is improved through intelligent control of machines and systems. Machines adapt flexibly to the production process.

FIELDS OF ACTION

8TH FIELD OF ACTION

SOCIAL RESPONSIBILITY

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› HUMAN-CENTRIC ADAPTATION:

The factory offers flexible working hours, allowing employees to adapt their working hours to their personal needs.

› EMPLOYEE ROLE:

Assistance systems and automated process control provide employees with optimal support in their work environment. In future, the employee role will continue to shift towards control and decision-making.

› WORKING CONDITIONS:

The factory invests in ergonomic workplaces that help reduce health problems caused by sitting or standing for extended periods.

FIELDS OF ACTION

9TH FIELD OF ACTION

DATA CONSISTENCY, TRANSPARENCY AND VIRTUAL PLANT COMMISSIONING

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› COMPREHENSIVE DIGITAL TWIN:

The factory uses a comprehensive digital twin to control and optimize processes. This creates transparency and enables efficient production planning.

› LEARNING FROM THE DIGITAL TWIN:

Analysis of the digital twin allows systematic improvement of subsequent product generations. Data from production flows directly into product development and the design of new production processes.

› OPTIMIZATION OF SUSTAINABILITY:

The digital twin helps to identify levers that impact the design of the product, process or the entire production system. This allows sustainability indicators to be simulated and forecast as early as the development and planning phases.

› VIRTUAL PLANT COMMISSIONING:

The factory ensures timely SOP (Start of Production) through virtual tests. This shortens the commissioning phase and increases the quality of planning.

FIELDS OF ACTION

10TH FIELD OF ACTION

SUSTAINABLE PRODUCTS

INCLUDING THE FOLLOWING CONCRETE MEASURES:

› PRODUCT SCENARIO MAPPING:

Product scenario mapping allows the visualization of product recyclability.
Three important aspects are taken into account:
› Recycling (showing the use cycle)
› Product design (Design for Assembly = Design for Disassembly)
› Material selection (Design for Recycling and Disposal)

› MOLECULAR DIGITAL TWIN:

The behavior and properties of a product are mapped at atomic level, allowing analysis of the overall impact of the source materials over the product lifecycle all the way from raw material extraction to disposal.

› OPTIMIZED GEOMETRY AND TYPES OF JOIN:

Products should be designed to facilitate repair, disassembly and reuse.
This promotes circular economy strategies.

› PRODUCT CERTIFICATION:

Cradle to Cradle Certified® is a globally recognized standard for safe, circular and responsible products to achieve measurable progress towards meeting the Sustainable Development Goals.

FIELDS OF ACTION

ESG-REPORTING – AN OBJECTIVE ASSESSMENT SYSTEM WITH STANDARDIZED SUSTAINABILITY CRITERIA IS A KEY ELEMENT ON THE WAY TO BECOMING A REGENERATIVE FACTORY. IT CREATES TRANSPARENCY ABOUT THE CURRENT STATE OF PROCESSES AND STRUCTURES IN AN INDUSTRIAL COMPANY, AND THUS ALLOWS THE MEASURES TAKEN TO BE ASSESSED AND QUANTIFIED.

The significant proportion of environmental pollution caused by manufacturing companies, combined with their high social profile, means that their activities have direct and indirect social and environmental impact. Not every aspect of sustainability can be quantified, but many dimensions of sustainability can be measured, allowing progress to be made visible and communicated. In particular, increasing requirements with regard to environmental and social compatibility require a concrete structure for systematic and holistic sustainability management. Company-specific KPIs designed to control activities and measure progress are also possible. Nevertheless, many companies have difficulty introducing and implementing a holistic sustainability management system.

HOW WE CAN ASSIST YOU:

The new sustainability reporting guidelines specify the concrete measures and measurable results required. In addition, stakeholders expect data and metrics that are verifiable, credible and comparable, allowing them to make informed decisions.

Reporting requirements are constantly changing, and disclosure regulations vary greatly by sector and company size. In addition to the mandatory CSRD criteria, various institutions have developed and published voluntary frameworks for identifying and defining specific performance indicators.

Companies can gain a decisive competitive edge by approaching the sustainable transformation process from the outset using a reliable and transparent KPI system with integrated reporting. Drees & Sommer helps companies of all sizes and stages of development to implement the requirements of the CSRD Directive in their organization, while at the same time initiating transformation towards sustainable and eco-efficient value creation.

Übersetzung: Drees & Sommer follows ESG regulations and supports customers in implementing and complying with them.

THE INTERACTION BETWEEN DIGITIZATION AND SUSTAINABILITY

The manufacturing industry is facing radical change that affects not only the value creation process at the core of each organization, but all other areas as well.

Digitization provides a range of technologies for innovation and can thus lead and promote sustainable transformation. Applications in the factory environment are diverse, ranging from strategy and planning to operation. But they are most prevalent at the heart of value creation – in production. Equipping the shop floor with intelligent sensors and actuators, in combination with more extensive networking, results in the fusion of real and virtual production spaces using the digital twin. The same benefits apply to facility management of industrial buildings and monitoring of the logistics fleet. Systematic continuation of this convergence of the real and digital environments, starting with the planning process, will bring about a transition to the industrial metaverse.

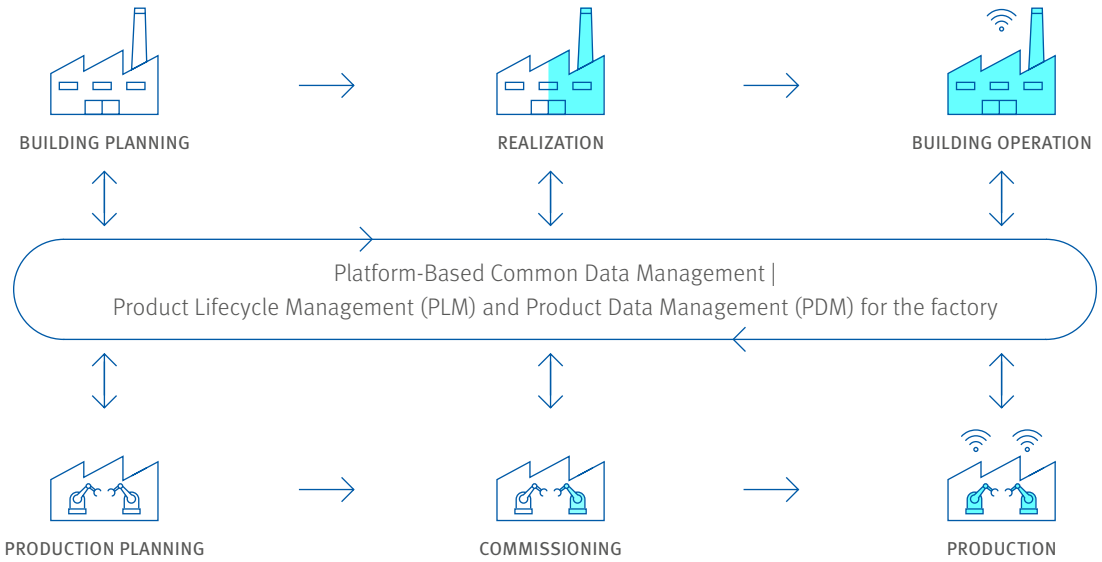
DIGITAL AND SUSTAINABLE

The industrial metaverse has the potential to change all phases of industrial value creation, while at the same time having a huge impact on the way companies operate. It offers the possibility of linking all the required and existing native systems and enables uniform, end-to-end data flow from product development through production and building planning and on to ongoing factory operations.

HOW WE CAN ASSIST YOU:

For the sustainability management of a factory, it makes sense to get involved in the strategy development and planning of intended new construction and modernization measures at an early stage. In order to design and integrate digitization aspects in a sustainable and responsible manner, ecological, economic and social aspects should be fully considered from the outset and set down in a digitization strategy. Revolutionary technologies such as the industrial metaverse are creating the basis for agile planning, simulation and control of production and logistics processes in a holistic virtual factory twin by linking all production-relevant areas. Here, too, as an innovative partner, Drees & Sommer helps industrial companies with their digital transformation by undertaking feasibility studies and designing processes along the entire value chain.

INDUSTRIAL METAVERSE



CONCLUSION

The regenerative factory of the future pursues a holistic sustainability strategy. It minimizes the factory's ecological footprint and takes social aspects into account, while at the same time ensuring the company's competitiveness. Our experts will be happy to support you on your way to the factory of the future by defining customized fields of action with concrete measures and providing you with an initial overview of implementation options.

Please contact us at **industry@dreso.com** for an initial no-obligation discussion.

Drees & Sommer: Uniting opposites to create a world we want to live in.

Drees & Sommer is a partner-managed, global consulting company providing a single source of consultation and implementation services for the real estate, industrial, energy and infrastructure sectors. The company delivers sustainable, innovative, and economically viable solutions that meet each client's unique needs. Founded in 1970 and long recognized as a pioneer in driving sustainability and digitization in the real estate industry, today Drees & Sommer employs more than 6,000 people at 63 offices. The company's interdisciplinary teams are involved in around 6,500 projects worldwide, working to create a livable future and unite concepts which can at face value appear to be opposites: tradition and future, analog and digital, efficiency and well-being. As 'intrapreneurs', the Drees & Sommer Partners are personally responsible for managing the company.