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Factory planning

Procedure according to VDI 5200

Factory planning according to VDI 5200

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Planning procedure for factory planning according to guideline VDI 5200

Cases

- New planning
- Replanning
- Extension
- Dismantling
- Revitalization

Goals

- More flexibility
- Higher product quality
- Better economic efficiency
- Attractive workplaces

Reference

VDI-Gesellschaft Produktion und Logistik 5200: Blatt 1 Fabrikplanung Planungsvorgehen. Berlin: VDI 2011

Causes

- Internal company causes such as a new production strategy
- Causes external to the company such as changing markets or new laws

Scope

- Workplace
- Segment
- Building
- Site
- Network

Factory planning according to VDI 5200 > Overview

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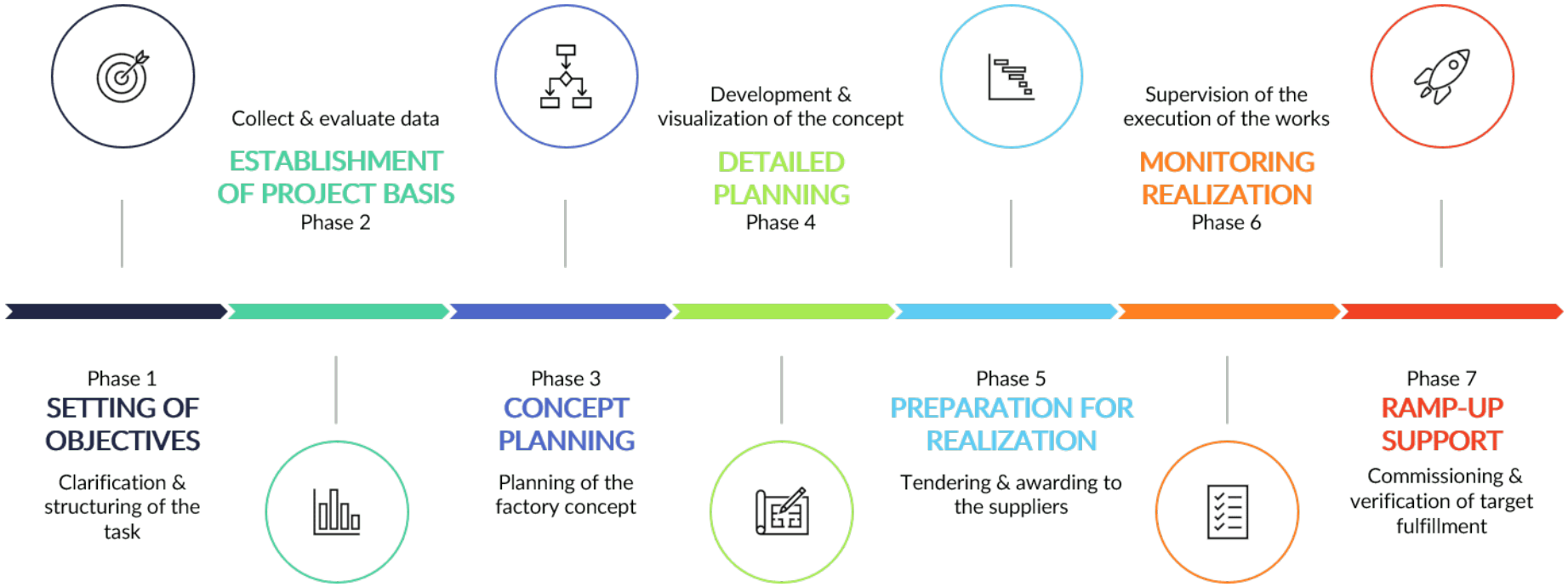

VDI 5200: Sheet 1 Factory Planning Planning Procedure. Berlin: VDI 2011.

Factory planning according to VDI 5200 > Phase 1

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SETTING OF OBJECTIVES

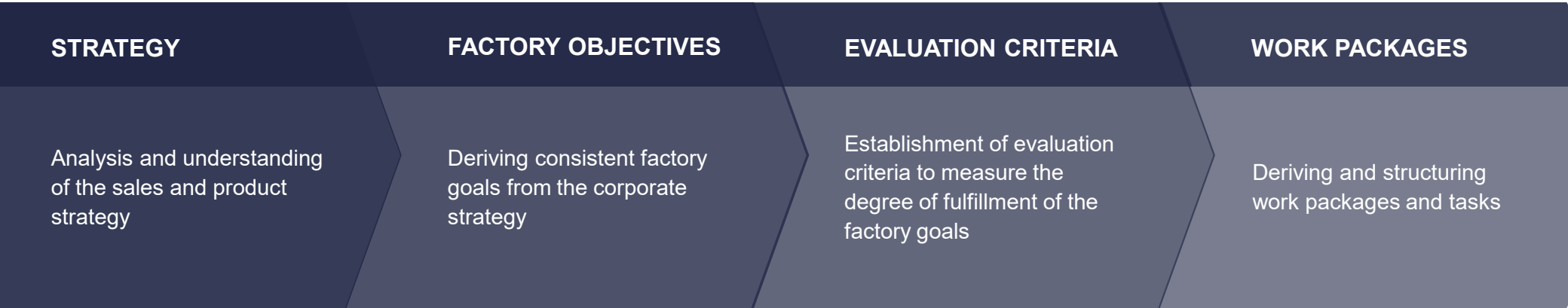
The target-setting phase is divided into four sub-steps. Firstly, the corporate strategy must be defined. Consisting of a product and sales strategy, this defines the

- strategic orientation,
- planned products,
- possible locations,
- Budget and time frame

is defined. In the second step, factory targets for the new plant are derived from this overarching company strategy. These include, for example

- the production quantity per product
- the depth of added value and
- possible regions/ properties.

The objectives also define the timetable and the costs as the framework for the project.
Depending on the formulated factory objectives, evaluation criteria are defined in the third step in order to be able to assess the degree to which the developed concepts meet the objectives. For example, if the production quantity and products are only vaguely defined in the objectives, the criteria of flexibility and adaptability should be used for evaluation. The more concretely the objectives can be formulated, the more the criteria of profitability and efficiency come to the fore. Further criteria would be the innovative character and implementation risks. Due to the long-term time horizon of factory planning, it is advisable to formulate the tasks as specifically as possible or as necessary as possible. On the one hand, concretely formulated work packages help all project participants in the process. On the other hand, the solution space should not be too strict in order to be able to react flexibly to any changes. Planning in different scenarios within two extreme scenarios helps here.



Factory planning according to VDI 5200 > Phase 2

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ESTABLISHMENT OF PROJECT BASIS

As part of this phase, all relevant planning data and processes required for further planning and the overall implementation of the project are recorded on site together with the project team. Data is collected in consultation with Bross and using a checklist.
Bross Consulting then prepares the collected data (e.g. quantities, areas, orders, etc.) accordingly and creates a valid and consistent planning database. The planning database forms the basis for all subsequent analyses, evaluations and calculations in relation to the further project procedure.
The next step is to record the actual processes using the value stream method. For this purpose, the main processes and workflows in relation to the project scope are recorded and documented with additional information (e.g. frequency of activities, special customer requirements, etc.) on site through inspections, observations and interviews. The individual areas from incoming goods to dispatch are inspected intensively with the relevant specialist managers. The aim is to understand the current processes and workflows and to become familiar with the product range and systems. Knowledge of the processes serves as the basis for identifying weak points and improvement measures. The focus here is on space utilization, material flow relationships, transport costs, capacity expansions and technology solutions. Together with the customer, the data and processes, premises, project assumptions, etc. are validated and adopted as the basis for the rest of the project. Current weaknesses are identified through process mapping and data analysis. By defining future target processes, an attempt is made to compensate for the weaknesses. The target processes form the basis of the concepts.

DATA ACQUISITION	ACTUAL PROCESSES	WEAKNESSES	TARGET PROCESSES
Collecting master and transaction data and creating a planning basis	Recording of material flow relationships and information processes	Analysis of weak points in the recorded processes and evaluation of the data analyses created	Documentation and evaluation of the potential for conceptual design

Factory planning according to VDI 5200 > Phase 3

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CONCEPT PLANNING

Phase 3 focuses on the conceptual development of multiple scenarios. To this end, the factory is first structured. This structural planning or segmentation is used, for example, to separate exotics from fast movers so as not to interrupt processes. The factory can also be subdivided according to products or technologies. In the subsequent dimensioning phase, the individual machine and logistics areas are dimensioned on the basis of the data and area analyses from the previous phase. The target processes from phase 2 are taken into account, as are future unit volume forecasts from phase 1 and the associated space requirements. The ideal layout is developed in the ideal planning phase. This shows the ideal arrangement of the production and logistics areas in relation to each other. The starting point is the calculated areas of the dimensioning. It is important to move away from the current layout in order to identify the optimum. Further plant structure variants can be developed from this optimum. In this project phase, we are still working with "verified blocks". This means that the ideal layout is shown in the form of a block layout, but the blocks must then be verified again in terms of area in the detailed planning in AutoCAD, so that it is ensured that not only the size of the blocks, but also the correct geometry (e.g. elongated production areas or square arrangement) of the blocks is shown. Further plant structure variants are developed in the real planning on the basis of the ideal layout. When developing the variants, it makes sense to consider the evaluation criteria and the factory objectives in order to reduce reactive power for the generation of poor variants.

STRUCTURAL PLANNING	DIMENSIONING	IDEAL PLANNING	REAL PLANNING
Structuring the factory according to segments such as processes, products and technologies	Dimensioning of the segments and indirect areas	Creation of an ideal layout without restrictions to form the optimum for the evaluation	Derivation of real layouts by incorporating restrictions and evaluation

Factory planning according to VDI 5200 > Phase 4

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DETAIL PLANNING

In detailed planning, the best-rated real layout is converted into an overall CAD layout (2D or 3D). The individual functional areas are merged into a comprehensive and detailed layout plan at workstation level. This involves creating a layout of all production areas, including operating resources, staging zones, handling areas, rail yards, traffic routes, buffer zones, expansion areas, etc. Structural restrictions such as the hall dimensions and requirements for column grids, floor loads, fire protection zones, expansion joints etc. are taken into account and entered in the layout. Next, a logistics concept is developed. This describes the processes and equipment required for transportation, provision and storage for all production lines, machines, workstations and storage locations from incoming to outgoing goods. The aim is to develop an efficient and transparent material flow that simultaneously optimizes space requirements and connects all plants in a suitable manner. To this end, the transport and storage services to be provided are first determined on the basis of the production program and the material flow relationships. The detailed material flows are then integrated into the 2D or 3D model created. Based on the resulting material flow intensities, suitable means of transportation are selected and the necessary delivery, buffer, transfer and disposal areas are dimensioned. Various transportation concepts (e.g. transportation by tugger train) are planned and compared with each other based on investment, costs, flexibility, security of supply, space consumption, etc. Plots of the layouts and other documents must be submitted to the authorities for approval. Tenders and specifications must be drawn up for the equipment and trades to be procured.

FINE PLANNING	LOGISTICS CONCEPT	APPROVAL	Requirement Specification
Detailing of the best real layout in 2D or 3D and verification of space requirements	Definition of material supply and disposal, including specification of equipment	Submission of the building application incl. construction drawings, building description etc. to the responsible building authority	Preparation of specifications and tender documents for larger capital goods

Factory planning according to VDI 5200 > Phase 5

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PREPARATION FOR REALIZATION

The first step in preparing for implementation is to research and contact potential suppliers to obtain quotations on the basis of the specifications and the invitation to tender. Incoming offers are checked for compliance with the points mentioned in the specifications and any corrections are discussed with the suppliers. In addition to completeness, attention must also be paid to the comparability of the offers in order to subsequently award the contract based on the best price-performance ratio. Once the bids have been submitted, the profitability of the plant structure variants created, including logistics solutions, is determined in the business case. logistics solutions. Cost-effectiveness can also be used as a criterion for a rough estimate during the evaluation in phase 3, but can only be reliably determined at this stage. A variety of methods are available for this, such as GUV or ROI calculations. The contract is awarded to the suppliers on the basis of the most cost-effective offers. In the implementation planning phase, an implementation roadmap is drawn up for the plant structure variant. Depending on the implementation stage, the implementation plan shows the procedure from investment approval, tendering and procurement through to commissioning for relocations and the installation of workstations. The necessary activities and the associated resources are classified on a schedule and verified with the client's experts. Dependencies between the implementation steps are identified and presented. For example, lead times for building up a buffer stock are also taken into account in order to ensure delivery capability during the relocation. Once the relocation plan has been approved and the delivery times agreed with the suppliers, constant monitoring is carried out to avoid any loss of time.

REQUEST FOR QUOTATION	BUSINESS CASE & VERGABE	IMPLEMENTATION PLANNING	MONITORING
Researching suitable suppliers and obtaining quotations	Calculation of the economic efficiency of various solutions and allocation of equipment	Preparation of a time and implementation plan including delivery times for the equipment	Monitoring of project progress and creation of measures in the event of delays

Factory planning according to VDI 5200 > Phase 6

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REALIZATION MONITORING

During the realization monitoring phase, the execution plans drawn up by the supplier are continuously checked. In addition, the installation of equipment and trades as well as the construction of the building are monitored. Compliance with the approval and the performance specifications must be checked on an ongoing basis. This also includes updating and monitoring the schedule and documenting the construction process of the executing company. Invoices are also checked and compared with the order totals, including cost control. At the same time, the documentation is systematically compiled. This includes, on the one hand, the drawings and, on the other, the mathematical results of the project. This also includes listing the claims for defects and monitoring the rectification of these defects. All planning data and documentation is transferred electronically to the project team. Finally, the acceptance of the construction work and equipment is organized. The acceptance of equipment and machines, which is the main focus of factory planning, includes setting up, aligning and anchoring at the installation site, instructing the operating personnel and creating geometry protocols to verify machine accuracy. Acceptance is divided into preliminary and final acceptance. The preliminary acceptance at the supplier's plant and the final acceptance at the customer's plant. Acceptance takes place under production conditions on components defined in advance. The acceptance must provide proof of process capability and machine capability as well as the technical availability of the entire system.

MONITORING	COST CONTROL	DOCUMENTATION	ACCEPTANCE
Monitoring compliance with the schedule and the scope described in the service description	Checking the invoices and comparing them with the order totals	Documentation of the implementation for proof of defects and for subsequent changes or extensions	Recording the acceptance and checking compliance with agreed parameters

Factory planning according to VDI 5200 > Phase 7

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RAMP-UP SUPPORT

The start of production (SOP) is the initial phase of commercial production. It begins with the SOP and ends when the targets set for e.g. product and process quality, production quantity, capacity utilization and production costs have been achieved. The SOP or ramp-up is followed by the production start-up, a steady and controlled increase in production parameters. Starting with selected reference products (standard products with high quantities) through to exotic products (slow-moving items). The production start-up is of great importance for companies because the time to market of a new product directly influences the financial success of the product. In particular, the time to market has a significant impact on the ROI of the factory planning project. If the time to market is delayed compared to the schedule, revenues are postponed; therefore, a shorter ramp-up period shortens the payback period and improves the return on investment. In addition, market share and sales may be lost if delivery to the customer is delayed due to an ineffective production ramp-up. The basis for a successful production start-up is the sustainable safeguarding of ongoing operations. In addition to the process stability of production, this includes all indirect areas such as logistics, quality and maintenance. Once the targeted production parameters have been achieved, the project is reassessed with regard to the achievement of the factory goals defined in phase 1 and the formulation of lessons learned. The project is ceremoniously concluded by recognizing the achievements of all project participants and handing over all documents and documentation from the project partners to the client.

START OF PRODUCTION	PRODUCTION START-UP	RATING	PROJECT COMPLETION
Start of commercial production	Controlled increase in production parameters until target parameters are reached	Evaluation of the factory planning project for the achievement of the factory goals	Appreciation of performance and handover of all documents

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