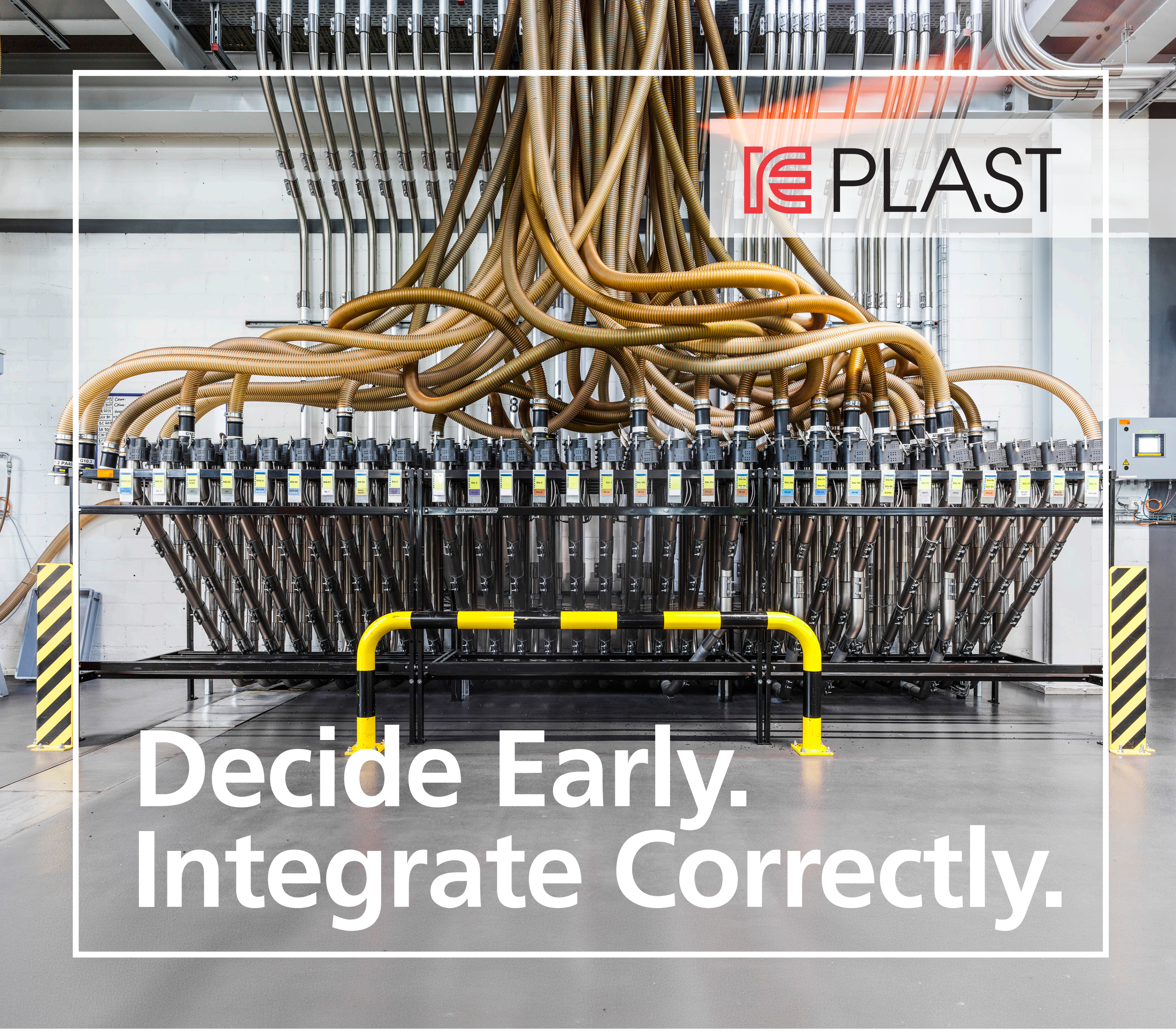

Decide Early. Integrate Correctly.

When Material Supply Becomes a Planning Discipline

Companies in the plastics and technology industries are regularly confronted with the same fundamental question when planning new builds, conversions, or expansion projects: How can a production facility be designed to meet today's requirements while at the same time offering sufficient flexibility for future developments? Production capacities are growing, sites are being consolidated, existing buildings are reaching their functional limits or simply the end of their lifecycle. At the same time, requirements regarding flexibility, traceability, energy efficiency, and process stability continue to increase.

In this environment, it is becoming increasingly clear that successful projects depend less on individual decisions than on the quality of the overarching planning approach. In particular, material supply is often underestimated, despite its direct impact on production processes, building infrastructure, and organizational workflows. This white paper highlights the role of central raw material conveying systems in plastics processing and demonstrates why their early consideration, in close coordination with factory and building planning, is critical to project success.

Factory Planning Between Production, Technology, and Building Design.

The planning of modern industrial buildings can no longer be reduced to the mere provision of space. Production layout, material flows, utilities supply, hygiene zones, and technical infrastructure form a tightly interconnected system. Changes in one area inevitably affect others. If these interdependencies are not taken into account during early planning phases, conflicting objectives arise that can only be resolved later with considerable effort.

Especially in plastics processing operations, technical systems such as material conveying, drying, or dedusting cannot be treated as downstream equipment. They shape the building structure, influence machine arrangement, define utility routes, and affect structural design, maintenance concepts, and future expandability. An integrated planning approach, in which production processes, plant technology, and building structure are developed in parallel, creates the necessary transparency and planning reliability.

Energy Supply in Focus – Material Supply as an Equal Factor.

In almost every refurbishment and construction project in the plastics processing industry, early attention is focused on energy supply. Demand-oriented electrical grids, cooling of process heat, heat recovery systems, energy storage, combined heat and power plants, or the integration of external energy sources such as variable electricity tariffs or participation in energy parks are now well-established topics. Modern control and automation concepts allow for the efficient combination of various internal and external energy sources. As important as these aspects are, it must not be overlooked that without a functioning material supply, no manufacturing process can take place. While energy supply is often centrally planned, material supply in many companies has evolved historically and remains decentralized. Particularly in thermoplastics processing, increasing numbers of machines and material variants lead to growing complexity, inefficiency, and lack of transparency.

Material Supply in Plastics Processing – From Individual Workstations to a Structural Issue.

In traditional plant concepts, processing machines are often supplied with material individually. Vacuum conveying systems from different manufacturers feed individual machines, each configured for a specific application. While this approach remains manageable in small-scale operations, it rapidly loses efficiency as production size increases.

As the number of machines grows, manual interventions, transport distances, and organizational effort increase. Valuable production space becomes increasingly occupied. At the same time, the risk of material mix-ups, unclear material preparation states, hygiene weaknesses, and inefficient space utilization rises. Material supply thus evolves from a supporting process into a limiting factor of production.

"I have seen many new production facilities where material supply was integrated retrospectively - with all the resulting consequences for efficiency and expandability.
A truly functional solution can only be achieved if material feeding, drying, conveying, and recyclate integration are considered together with the building from the very beginning."

Benedikt Sticht,
Managing Director IE Plast

Central Raw Material Conveying Systems as a Technical Solution.

Central raw material conveying systems address this challenge by structurally bundling material supply. Material receipt, preparation, and distribution are consolidated into a higher-level system and centrally controlled. Supervisory control architectures allow modern production control and traceability requirements to be implemented. A key advantage lies in the systematic acquisition and linkage of material data. Granulate type, batch, feeding station, and time can be clearly assigned. In addition, material preparation parameters such as drying, dehumidification, or dedusting can be documented and allocated to the respective processing machine. Via standardized data interfaces - commonly OPC UA in practice - this information can be extended to product level and integrated into existing audit trail or quality assurance systems.

Traceability and Regulatory Requirements.

For manufacturers in medical technology, aerospace, automotive, and other quality-critical industries, this level of transparency is an essential part of day-to-day operations. Customers increasingly demand complete batch traceability, reproducible processes, and robust documentation of all relevant production parameters.

Modern central material conveying systems provide the technical foundation to implement these requirements in an automated and validated manner. In this context, the conveying system becomes not only a logistical solution, but also a data-driven system that is actively integrated into production control.

Material Supply and Production Scheduling.

Another advantage of central systems is the ability to link material supply with warehouse management or ERP systems. Material inventories currently undergoing preparation can be displayed transparently. The current status of material conditioning allows conclusions to be drawn regarding production readiness.

If the required drying time has been met, the specified residual moisture content achieved, and the maximum residual dust level not exceeded, the material can be automatically released and fed into processing. In this way, the system does not merely convey material but is actively integrated into production scheduling.

"The parallel planning approach of material conveying technology and building design enables the early definition and optimization of all relevant interfaces. This allows the building infrastructure to be specifically aligned with operational requirements and a demand-oriented plant technology concept to be engineered."

Jan Hammer
Factory Planning | Project Lead

Hygienic Advantages of Centralized Material Supply.

The spatial separation of material supply and production offers significant advantages, particularly in hygienic environments. Granulate transport is automated via vacuum conveying rather than manual handling of bags on foot or via intralogistics systems. Manual feeding steps are eliminated, open materials are removed from production areas, and the risk of manipulation, pellet loss, or cross-contamination is significantly reduced.

At the same time, the separation of processes enables clear organizational allocation. Material supply can be handled by logistics or production supply personnel, while skilled operators in production can focus on processing tasks. This allows different qualification, shift, and remuneration models to be implemented without compromising process reliability.

Integration of the Conveying System into Building Planning.

If a company intends to centralize material conveying, this should be examined intensively in the context of a building refurbishment or new construction project and ideally planned in parallel. Like heating, cooling, or ventilation technology, material conveying is an integral component of the production building. System components generate relevant point loads, pipeline routes must be supported by the structural framework, ceilings, or columns, and penetrations, fire barriers, and recesses must be planned in a targeted manner.

Additional considerations include installation areas, accessibility for forklifts or pallet trucks, the design of feeding stations with sufficient space for pipeline routing, and provisions for future growth or additional material variants. Lifting aids for bagged material, automated transfer systems, and octabin emptying or tipping stations must also be considered early to realize safe, ergonomic, and future-proof solutions.

Material Conveying in Cleanroom and Controlled Environments.

In hygienic production environments, particularly cleanrooms and controlled areas, the integration of material conveying becomes a central planning task. Conveying lines for granulate, vacuum, and control systems must be routed in a way that does not compromise the hygiene concept of the room. Individual penetrations through ceilings or wall panels are technically feasible but significantly increase fixing and sealing effort when used in large numbers.

Alternative concepts, in which lines are routed via rear media corridors or walls, are tied to fixed machine positions and offer limited flexibility. In dynamic production environments, such solutions quickly reach their limits.

Media Columns as a Structured Interface.

Suspended media columns offer a structured and flexible solution. They route the required lines from the ceiling to a defined transfer point at the machine and can be repositioned within ceiling grids if designed accordingly. Standardized column concepts enable use across different machine types and dimensions. At the same time, structural boundary conditions must be considered. Crane-served areas must not be obstructed by vertical columns, the design must be sufficiently slender to avoid occupying valuable cleanroom space, and yet robust enough to withstand mechanical loads.

Special attention is also required for sealing in pressurized rooms. Defined interfaces within the columns allow machine connections via flexible hoses, quick-release or safety couplings, and suitable electrical plug-in systems.

Closed-Loop Systems and Technical Safeguards.

In particularly hygiene-sensitive applications, the use of closed conveying systems is recommended, in which vacuum circuits are operated in a closed loop. This prevents the granulate from absorbing moisture from ambient air and ensures that the dehumidified state is maintained until processing. At the same time, cross-contamination of the material or the cleanroom can be avoided.

In addition, filters of appropriate class and particle size must be provided at all points where false air may be drawn in. By strategically positioning pneumatic valves or separators outside hygiene boundaries, additional risks can be reduced and technical complexity within the cleanroom minimized.

Structure of Central Material Conveying Systems.

Central raw material conveying systems can generally be divided into several functional areas. These include components for material feeding, filling, and storage such as bag dump stations, octabin suction stations, granulate containers, or silo systems. In the preparation stage, metal separators, dedusting and drying units, as well as mixing and homogenization systems are used to produce shot- or batch-specific material compositions. Following preparation, the material is distributed to the processing machines. At an early stage, it must be clarified whether pipelines are to be routed based on material or color, or based on individual machines. Depending on material types, fill levels, and contamination requirements, different project-specific solutions emerge, for which there is no universally correct or incorrect approach.

Importance of Feeding Stations for Traceability.

Even seemingly simple system components such as feeding stations play a central role in traceability. In addition to classic hygienic design requirements such as complete emptying, surface quality, and seamless transitions, additional aspects are gaining importance. These include employee identification, barcode or RFID validation, operator guidance systems, lockable containers, and safety measures that prevent non-released material from entering the conveying process.

In this way, it can be clearly determined at the very beginning of the conveying chain who filled which material and when, and whether that material has the required release status. The conveying system thus becomes an active control instrument within quality management.

Distribution Concepts and Coupling Stations.

Where variable material assignment to processing machines is required, coupling stations are used that - similar to a patch panel - connect different material sources with various consumers. Mechanical coding or electronic safeguards using barcode or RFID ensure that only released and correctly prepared material is conveyed to the respective machine.

Automatic coupling stations are becoming increasingly important, particularly in hygienic environments and multi-shift operations. While these systems are currently associated with higher investment costs and limited scalability, they offer advantages in terms of availability, staffing efficiency, and process reliability.

Conclusion:

Central material supply systems are far more than logistical aids. They are structural elements of modern plastics factories and influence production processes, building infrastructure, and organizational workflows alike. However, their benefits can only be fully realized if they are integrated early and holistically into factory and building planning.

Where these interdependencies are consistently taken into account, technically robust, hygiene-compliant, and long-term flexible production sites are created - facilities that sustainably meet increasing requirements for quality, transparency, and economic efficiency.

The IE Group plans, designs, and delivers industrial buildings for the Plastics, Food, Life Science, and Technology sectors. Its primary objective is to ensure maximum production efficiency by developing industrial facilities that are precisely tailored to the customer's individual processes. Accordingly, at the outset of a project, the IE Group does not focus on the building itself, but rather on factors such as optimized, space-efficient production and intralogistics workflows, as well as hygiene and cleanroom requirements including GxP compliance. IE industry experts develop innovative and intelligent solutions for sensitive production and storage areas and design integrated factory, laboratory, and logistics concepts. IE customers receive operational planning, building design, construction execution, and qualification of quality-relevant components for complex and demanding industrial construction projects from a single source. The result is turnkey, sustainable industrial buildings that are efficient, flexibly usable, low-emission, and fully compliant with applicable building, operational, and hygiene regulations.

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