

# FROM THE GROUND UP



**Thomas Lansdorf, EIRICH, Germany,** explains the importance of proper planning for the commercial success of a new fertilizer plant.

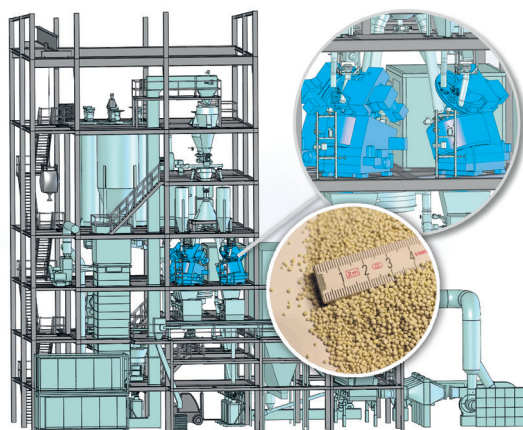
**A** young family designing and building their own house is full of optimism. They dream of owning their perfect home. Everyone has their own individual wishes, and these all need to be considered. This is the same when it comes to designing and constructing a new fertilizer plant. Maybe a new product is to be developed, or increasing demand for an already successful fertilizer is to be met. Once the investment decision has been taken, the plant needs to be planned and constructed quickly. After on-time completion and commissioning, production should start immediately – and the planned throughput rate needs to be met.

## **Expect the unexpected**

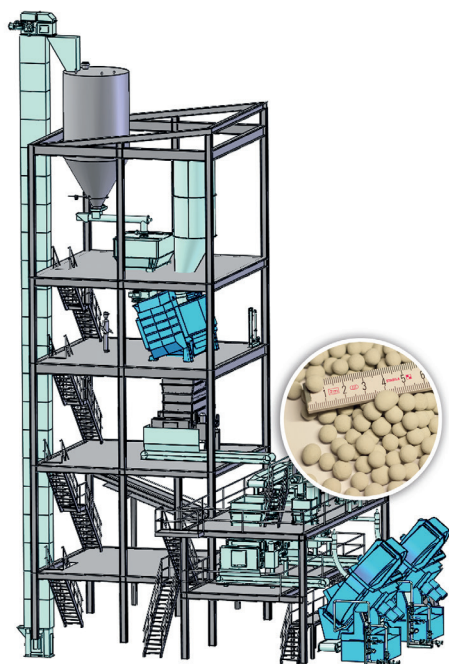
Once production has started, there must not be any unexpected difficulties. However, there are plenty of potential pitfalls, such as planning errors, wear, corrosion, low yield, high maintenance, and cleaning requirements, to name just a few. The initial sense of euphoria can soon disappear. This often requires reworking, which is usually expensive. It also often leads to costly production downtimes and delivery bottlenecks. It can be very awkward to find the responsible party who



**Figure 1.** Typical test centre of a plant manufacturer for upscaling a method to production level.



**Figure 2.** NPK production plant with the EIRICH SmartMixer – fully automated mixing and granulation in a single system.



**Figure 3.** Production of uniform pellets for soil improver. Moistening and pre-granulation in the SmartMixer combined with disk pelletisers.

should pay for the costs. The root cause is often very difficult to identify, and if many suppliers are involved in the project, troubleshooting and fault remedying tends to be an expensive and long-winded process.

### The secret to success

Fortunately, there are also positive examples. If the plant is completed on-time, all suppliers can deliver punctually. The

plant then runs and produces as planned. The product quality is then right, and the production quantities meet all expectations. Experienced plant builders are able to identify typical sources of risk at early stages during planning. Every process step and every interface needs to be critically checked. Experienced plant builders also have the necessary knowhow to avoid potential pitfalls. The first step is to consider the checklist of many important details.

### Turning idea into reality

Perhaps a new source of raw materials has been discovered, or a way has been developed to market a previously worthless byproduct or waste product as a profitable fertilizer. Maybe researchers and engineers have developed a new long-term fertilizer. Or, perhaps, demand has risen for a successful product and manufacturing levels need to be increased. There are many reasons for a new fertilizer plant, but there is always one clear objective: the system must pay for itself quickly. The plant needs to be producing profitably from day one, which should continue for many years or decades.

### 'Upscaling' is the magic word

What seems so easy in a laboratory now needs to be transferred to a production plant. Once a developer has designed the perfect fertilizer, it is time to develop a suitable production method. After clarification of the task, initial trials normally take place in a test centre (Figure 1). Many machine manufacturers have modern research and development centres. This requires a motivated team of process engineers and a suitable, well-equipped test centre with state-of-the-art machinery. The specialists are in a position to assess which approach is best suited for a particular production method. For example, there are many different ways to produce fertilizer granulates, and the particular choice of method has a major impact on the cost effectiveness of the subsequent plant.

### Three methods for an infinite variety of products:

#### Mixing and granulating in a SmartMixer

Task definition: multi-component fertilizers need to be manufactured from many individual components. The desired grain size is usually between 0.2 – 2 mm.

Figure 2 shows a production plant with several SmartMixers. The raw ingredients are initially dosed, weighed, and metered into the mixer fully automatically. After a few minutes, a granulate is produced with the required grain distribution. If required, this can also be coated with powders or a liquid. The mixer is emptied after around 6 min. The granulates are then dried, sieved, and packaged.

#### Combination of SmartMixer and disk pelletiser

Task definition: soil improver (e.g. dolomite, limestone powder) is normally manufactured in a grain size between 5 – 10 mm. Figure 3 shows a production plant of this type. Raw ingredients are dosed, mixed in the SmartMixer, and pre-granulated. The pre-granulate is transferred to a transfer system (e.g. table feeder). Afterwards the granulates are produced in a disk pelletiser. Here again, coating is possible if required. The product is then dried and sieved.

## Production unit comprising SmartMixer and tumbling drum

Task definition: a soil improver made of recycled materials is to be produced. Residual materials, such as fly ash and wood ash, are usually processed in large quantities. The grain distribution of the pellets is often slightly wider, but on cheaper fertilizers this is often acceptable. The combination of a SmartMixer and a tumbling drum would be the perfect solution here. Figure 4 shows an example of this for fly ash. In many cases it is not necessary to dry the pellets.

## The devil is in the detail

During commissioning, it soon becomes clear if all the processing steps have been properly thought through. The storage, weighing, and transport of bulk materials are often underestimated. Fine powders and hygroscopic salts often cause caking on conveyor belts or dosing devices, which in turn causes quality fluctuations and increased cleaning effort. Caking can set and become as hard as concrete, with machine damage often the unavoidable result. If continuous maintenance is neglected, this can lead to a complete production standstill. This will quickly reveal how carefully (or not) the planning was performed.

## Is the sky the limit?

The 'tower construction' approach is often preferred for production plants, and for good reason. It is clearly laid out, uncluttered, and elegant. During preparation, raw materials are transported from the bottom to the top. In reverse, the production process is assisted by gravity. The handling process is clear and easy to understand. Thanks to its advantages, this is often the preferred approach, but it requires a certain degree of freedom, both financially and in terms of construction.

## Plant installation – as easy as playing with building blocks

Time is money. Once the decision to invest has been taken, the plant needs to be up and running as quickly as possible. Any delay in commissioning costs hard cash. In many cases, installations are erected far away from the manufacturer, so experienced construction and assembly personnel will need to be flown in. If the commissioning process takes weeks, this can soon get very expensive. These are all reasons that support the supply of fully pre-assembled plant segments, which are pre-wired and tested by the manufacturer. Transport is possible using standardised construction segments via trucks (Figure 5). In an ideal scenario, this will reduce the length of commissioning to just a few days.

## The plant is up and running

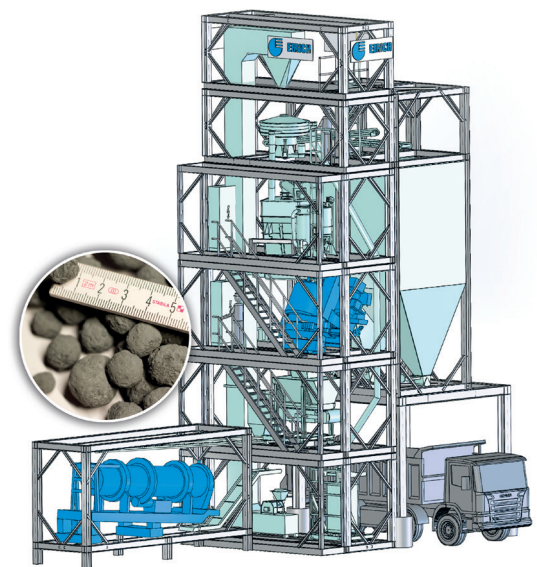
The plant control system does more than just ensure a trouble-free flow of processes. Formulae are often integrated in Enterprise Resource Planning (ERP) systems. Industry 4.0 is not just a version number, it has already become reality. With the aid of data communication systems, current process parameters can be called up from anywhere in the world. Processes can be controlled and revised. Modern plants are more or less remote-controlled, meaning labour costs can be reduced to a minimum.

## Plant reliability

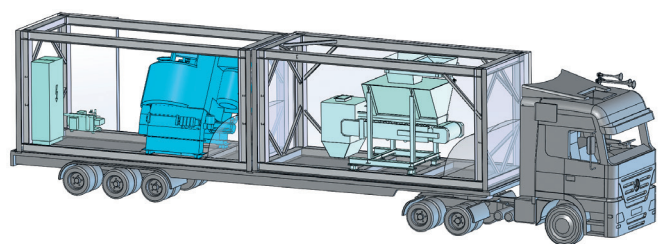
A major concern is often whether or not the plant is still running reliably. Machines are like people – wear is unavoidable. While wear in the human body can be sensed intuitively, gearbox damage has been previously difficult to predict. But the installation of vibration sensors makes it possible. Being able to locate problems early on means that plant downtime is avoided, while parts can be analysed online to determine if replacement is necessary. Many machine manufacturers have developed this type of system and have a wide range of systems in active use, saving maintenance costs and providing operators with planning security.

## Intelligent plants for today and tomorrow

Fertilizer factories are complex production plants. High-grade fertilizers are manufactured from a large number of raw ingredients. To ensure that this works from day one, the relevant specialists need to consider all the criteria in accordance with the state of the art technologies. Every raw ingredient is unique, and every plant needs to be individually configured. In the process, high demands are placed on the yield, product quality, and flexibility of a plant. Environmental requirements are becoming ever stricter, and the costs of raw ingredients, energy, and labour are steadily increasing. Only when considering all the details will sustainable, long-lasting, and cost-efficient production be guaranteed for many decades to come. **WF**



**Figure 4.** A high throughput rate is possible in the SmartMixer combined with a tumbling drum – often designed for cheaper fertilizers.



**Figure 5.** Pre-assembled plant segments can be easily transported via trucks, reducing installation to just a few days.