Technology Forum
Building Materials

Leaflet no. TF 1123-0-en

Concepts and engineering solutions for production plants for dry mortar products

Examples:

- Nikecell, Hungary
- Celco, Romania
- Hydroment, Germany
- Egid, France
- Hanil Cement, South Korea
- Plaxit, Abu Dhabi
- ParexLanko, France

The Pioneer in Material Processing®

EIRICH

agglomerating · batching · coating · cooling · conveying · deaerating · defibrating · disagglomerating · dispersing · dissolving · drying · emulsifying · evacuating · fine grinding granulating · heating · impregnating · mixing · moistening · pelletizing · plasticizing · reacting · suspending · stripping · slurrying · waterproofing · weighing · measuring · controlling

Summary:

Maschinenfabrik Gustav Eirich GmbH & Co KG from Hardheim in Germany has long been the global leader in mixing technology, among others in the field of processing systems for dry building materials, with over 230 mixers and mixing plants delivered worldwide in the last four decades.

The systems concepts involved vary widely depending on the number of basic materials, the required throughput rates, the operating logistics (single-shift or multiple-shift operation; fully automated or partially manual operation) and the transport logistics (incoming raw materials, outgoing delivery of the finished products), with the principle behind every concept being to offer the best possible, custom-tailored solution for each customer. In this connection, locational aspects and peculiarities also have to be taken into consideration in the planning of each plant as well, particularly for the markets in Asia, the Gulf region, Eastern Europe, and North and South America. The following article provides a general and detailed description of six different plant concepts delivered by Eirich over the last 10 years.

Introduction:

The size and design of a plant for processing dry mortar is largely dependent on the following factors:

- Product range
- Number of raw materials – sand, binders and fillers
- Number of additives
- Possible addition of colorants
- Possible use of additives such as fibers or lightweight materials
- Fully automated or partially automated operation
- Incoming delivery of raw materials
- Outgoing delivery of the end product
- Site-specific aspects (greenfield planning, incorporation in or extension to an existing building)

The number of large silos can vary from 2 to 32 and the material can be delivered either by silo truck, from which the silos are filled pneumatically, or, depending on the region, in Big Bags. For large plants with annual capacities of 50,000 t or more, the sand is often also supplied as an unprocessed material to be stored in bulk containers before it is forwarded to a sand drying and screening system integrated in the plant.

Additives are fed in either manually or on a fully automated basis from what may be as many as several dozen storage containers, or from Big Bags or sacks. The types of additives involved include different types of fibers which are automatically fed into the mixing process by fiber batching units, and lightweight materials which are fed in with the help of specially configured conveying, batching and weighing systems.

The readiness to use a partially manual solution varies depending on the international location. In so-called low-wage countries, for example, the sacks are placed on the bagging stations by hand, and in some cases the sacks are palletized manually even when several hundred sacks are being bagged. Manual filling of the large silos for holding aggregates and binders is by no means unusual either, especially in China, India or even Russia. In Western Europe, too, additives and colorants are still metered into the mixing process on a manual basis. Depending on the specific number of additives and colorants this can tie down one to two workers because of the short mixing times involved.

One requirement of plant planning that should not be underestimated is the packing of the end product in sacks or Big Bags. In the case of bulk materials (plaster) the product may also be fed directly into transportation silos straight from the mixing process, to be then delivered to the building site on a just-in-time basis. One challenge in terms of plant engineering is to separate the loading process from the mixing process by conveying the end product by bucket elevator or pneumatic means to storage silos, with packing machines and/or loading equipment positioned below the silos for loading the silo trucks. Another widespread practice is to fill mini-containers immediately after the mixing process.

The choice of plant concept is largely dependent on the site. Integration in an existing building, often involving the replacement of an obsolete or only partially automated plant, generally allows little scope for freedom of choice. External connection to existing buildings, for example next to an existing mixing tower or storage building, can dictate the positioning of the mixer and, in particular, the alignment of the packing line. However, another frequent requirement is for the plant to have a low overall height, meaning an in-line plant, in order to meet the requirements of the topography or planning regulations. Official regulations, for example, may stipulate a maximum building height of 20 m or less, and this cannot be achieved with a classical tower construction and purely gravimetric material from elevated silos involving overall heights of 32 - 45 m.

The following description looks at six different plant concepts, each of which had to take account of some of the aforementioned aspects and requirements and was therefore specially tailored to the requirements of the customer in each case.

Nikecell, Hungary:

Run in single-shift operation, each year this plant produces about 10,000 t of adhesive mortar for use in thermal insulation panels. The required hourly output is delivered by an Eirich R15 mixer with a volume of 500 l and an output of at least 20 batches per hour. The raw materials are stored in four large silos – two for sand and two for cement. The different formulas, of which there are only a few, are produced with four different additives. Sand and cement are delivered by silo trucks, while the additives arrive in sacks. The entire mixing tower is housed on a ground area of 6 x 6 m. The fact that the storage silos could be located in the open air made it possible to achieve a low-cost plant

Fig. 2.1: External view of the Nikecell plant in Hungary

Fig. 3.1: Eirich R15 intensive mixer with packing unit

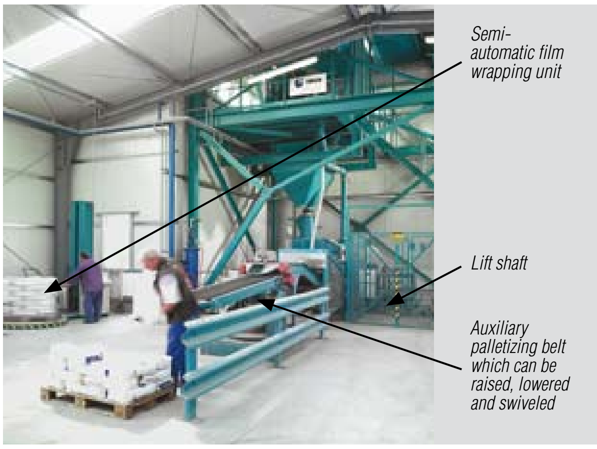

Fig. 3.2: Manual palletizing with auxiliary belt

design. Manual work involves the manual placement of the empty sacks on the single-nozzle packer and the manual palletizing of the 25 kg sacks. To make manual palletizing easier, an auxiliary palletizing belt that can be raised, lowered and swiveled is provided. Thanks to its simple structure the plant can be run with a Siemens S7 300 series control system. The overall height of the plant is 14 m.

Celco, Romania

The production plant installed for Celco in Romania is of a similar design and features an Eirich RV12 mixer with a volume of 400 l. One difference from the Hungarian plant is that the additives are added manually. Furthermore, the plant has two additional raw material silos and the sand silos are filled by bucket elevator and screw conveyor after the sand has been dried in a drum drier and screened into three different fractions. It should also be noted that the mixing system has been installed in an existing building, while the silos for the raw materials are located outside the building.

Fig. 3.3:
Side view of the Celco plant

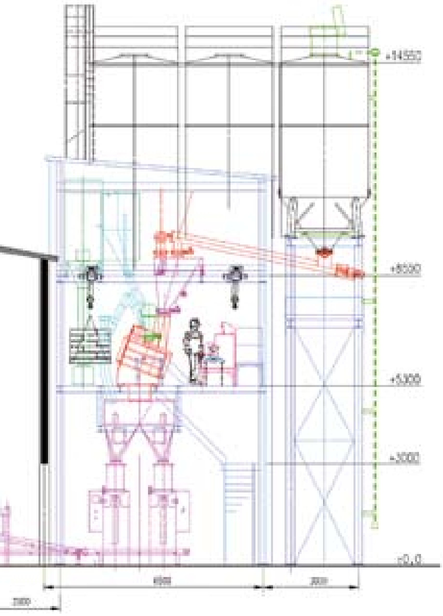

Fig. 3.4: Top view of the Celco plant, Romania

Fig. 3.5: Table scales and operator terminal for manual batching of additives

Hydroment, Germany

This plant produces dehumidifying plaster in an R09 mixer with a volume of 150 l. The basic components, namely cement, quartz powder, cellular glass and sand, are fed from six raw material silos to a scale, from which they are then taken by pneumatic conveyor to the mixer. Located immediately above the mixer are five additive silos which supply the quantities required for the formulas on a fully automated bases. This special product is manufactured in 1-shift operation running for 35 hours a week. The end product is packed in 25 kg sacks on a single-nozzle packer, and this is followed by automatic palletizing and stretch wrapping in film. The plant is operated by two workers who are also responsible for transporting the material with forklift trucks within the plant to intermediate storage areas, for loading the trucks and for administrative tasks. As a consequence of stipulations from the relevant authorities, the maximum height of the structure was restricted to 16 m. Given the relatively low output and an operating time restricted to just a single shift per week, the ideal solution for this in-line plant was a pneumatic conveyor system. The higher operating costs compared to a purely mechanical conveyor system were therefore acceptable in this instance. Another noteworthy feature of the plant is the manually traversable mixer discharge hopper. This enables the end product to be conveyed not just to the bagging station but to the position for filling small containers as well.

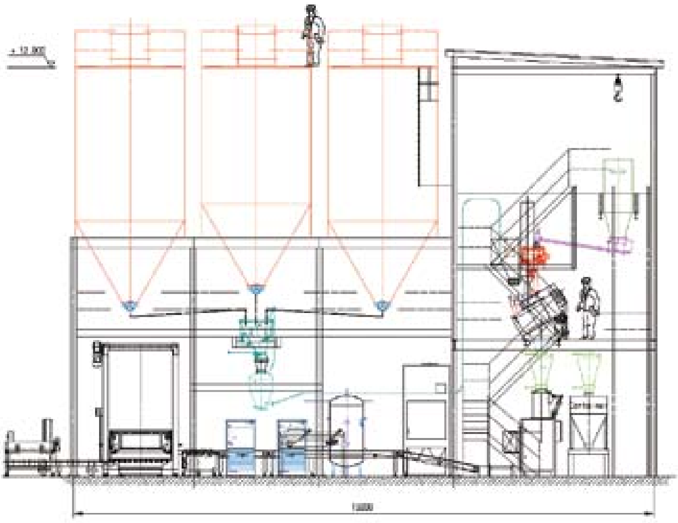

Fig. 4.3: Side view of project Hydroment

Fig. 4.1: External view of the Hydroment plant

Fig. 4.2: Hydroment traversable mixer discharge hopper

Egid, France

The main product made at this plant is colored rendering. The sand is supplied from a sand quarry located just a few hundred metres away, with two sand hoppers being loaded directly from trucks. From the hoppers the sand is taken by conveyor belt to a drum drier where the sand is dried to a final moisture level of 0.5 % After this the sand is transported by bucket elevator and trough screw conveyor for screening and separation into four different fractions.

Binders are delivered by truck and blown in pneumatically. In addition, light-weight material in the form of perlite is also stored, batched, weighed and transported at the plant. The plant was restricted to a maximum height of 24 m to ensure that it blended into the rolling landscape of Brittany. This requirement was met by placing the raw material storage silos alongside the mixing system itself. The material is first weighed and then conveyed by a vertical lift which picks up the pre-weihed material in a suitably sized container, swings it into the lifting position, transfers it for a distance of about 15 m and then swings it into the emptying position over the mixer.

Fig. 4.4: External view of the Egid plant

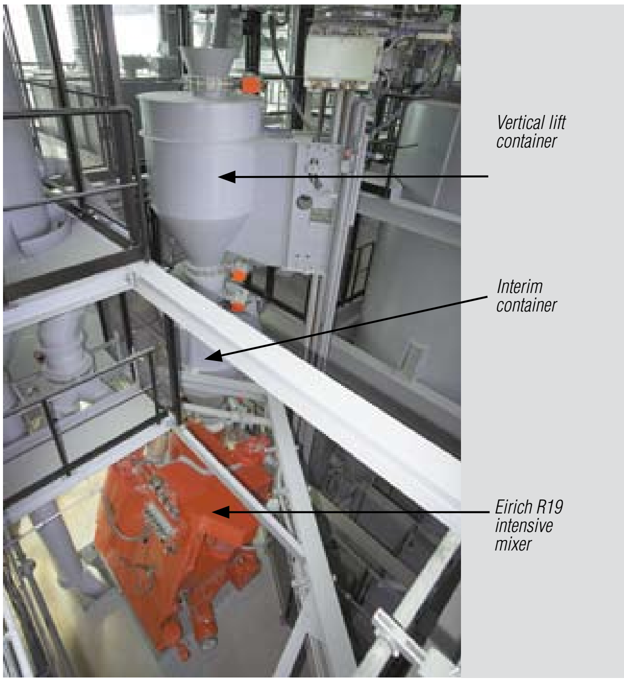

Fig. 5.1: Vertical lift

As in some other plants, the additives are fed in fully automatically from directly above the mixer. Coloring pigments are weighed, batched and added to the mixer on a manual basis, which requires one worker during the single-shift operation of the plant. The manual weighing process is accurate to ± 1 g. The end product is packed fully automatically in 25 kg sacks, with both sack placement and palletizing after bagging also being fully automated. About 10 full pallets are picked up by forklift truck each hour and then wrapped in film by a semi-automatic film wrapping machine to protect them for transport and against the weather. Since the plant has a mechanical vertical conveying system, it is limited to a capacity of 15 - 17 batches per hour.

Hanil Cement, South Korea

This two-shift plant, which went into operation in 2005, produces 100,000 to 150,000 t of bulk products such as plaster, along with special products such as repair mortar, adhesive mortar and screed mortar, plus products for DIY stores as well. In terms of plant engineering, provision was made in the plans to allow for further extension at a later date to incorporate the installation of a second mixer line.

The plant concept includes the following process steps:

- Raw material storage in 12 large silos
- Interim component storage in eight 3m³ silos
- Storage of 20 different additives in swap containers
- Addition of up to 10 different coloring additives or fibers

In addition, lightweight materials are also batched volumetrically.

The Eirich intensive mixer used here, which has a capacity of 1,150 l per batch, can achieve an output of up to 45 t/h depending on the formula and the bulk density. The batching, weighing and mixing systems and the conveying system for taking away the end product are all gravity-based thanks to the classical tower design of the plant.

Fig. 5.2: External view of the Hanil Cement plant

Fig. 5.3: Traversaler weigher in the mixing plant at Haniel Cement

What is particularly noteworthy about this plant concept is the fact that the additive scale used here is mobile, i.e. it picks up the material from up six additive containers at two transfer positions, weighs the material and conveys it to the mixer. After the mixer the end product is forwarded via two-way sorting gates to an eight-nozzle packing unit, a direct bulk material loading unit for loading silo trucks or to a filling station for filling transport vessels or Big Bags.

In addition, a pneumatic conveyor system is also provided for conveying the material to end product silos, from which the packing unit can also be filled.

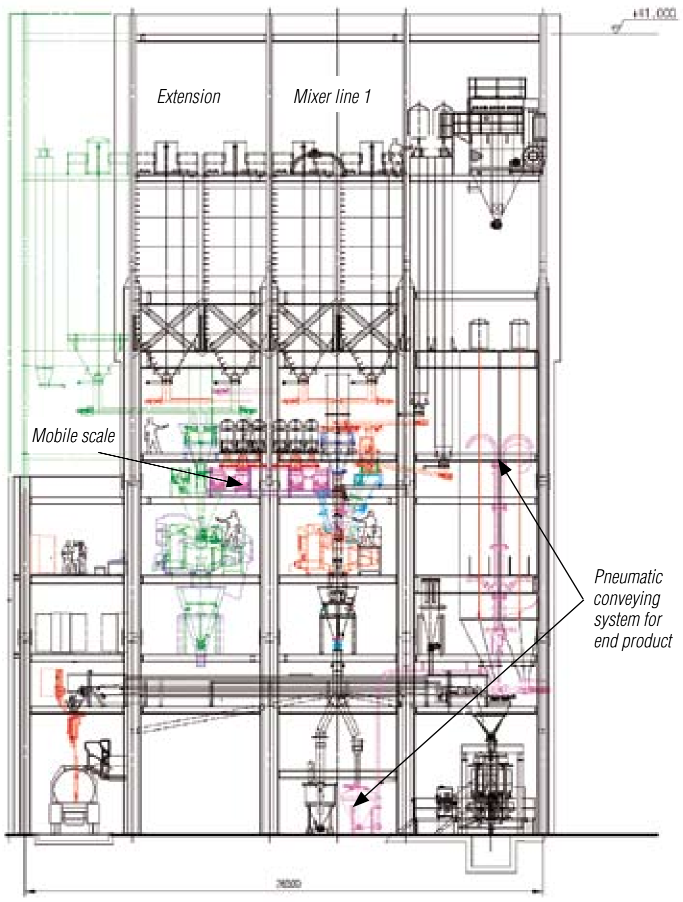

Fig. 6.1: Side view of project Hanil Cement with options for later

The raw material silos were carefully positioned at the outset in the planning stage to leave enough space to allow for an expansion of capacity at a later date with a second mixer line. With its mobile additive scale and the selected batching capacity of the additive screw feeders, the plant is already prepared for the parallel operation of two mixer lines with a batch capacity of up to 2 x 24 batches per hour. All that is required for an expansion of production, therefore, is the addition of interim component silos with scales, a raw material scale and, of course, the mixer.

Eirich was responsible for all of the planning work, which included the design of the compressed air and dust extraction system, installation planning, silo equipment, and the dimensioning and arrangement of the product distribution system following the mixer. The steel structure and silos were produced and delivered by local suppliers, contracted by the customer, on the basis of this design engineering work. The contract for the packing line, which includes a palletizing and stretch hooder unit, was awarded directly to Möllers by the customer.

Plaxit, Abu Dhabi

Planning the conveying system for the raw materials in the mixing system at Plaxit in Abu Dhabi was also an interesting challenge. In this plant the base material from 40 ground-level silos is conveyed by mobile container to a vertical lift. From there it is lifted up and over one of two mixers, then emptied. The batching and weighing equipment is stationary and is assembled in four groups. While one container is being lifted and emptied into one of the mixers, the second carriage moves at ground level to four material transfer points and collects the raw material. The carriage then moves to the lift shaft where it picks up the second, empty container while the full container is lifted to the mixing platform by a lifting device. This parallel system of plant operation with two mixer lines allows 15 batches to be handled in each line per hour.

The advantages of this plant design are that the raw material silos are positioned alongside the mixing tower, which offers cost advantages, and the scope for adding more raw material silos from which the material can supplied to the mobile transport container after batching and weighing. This makes it possible to keep down initial capital investment costs while enabling the plant to be expanded at low cost to meet market requirements at the same time.

Fig. 6.2: External view of the Plaxit plant, Abu Dhabi

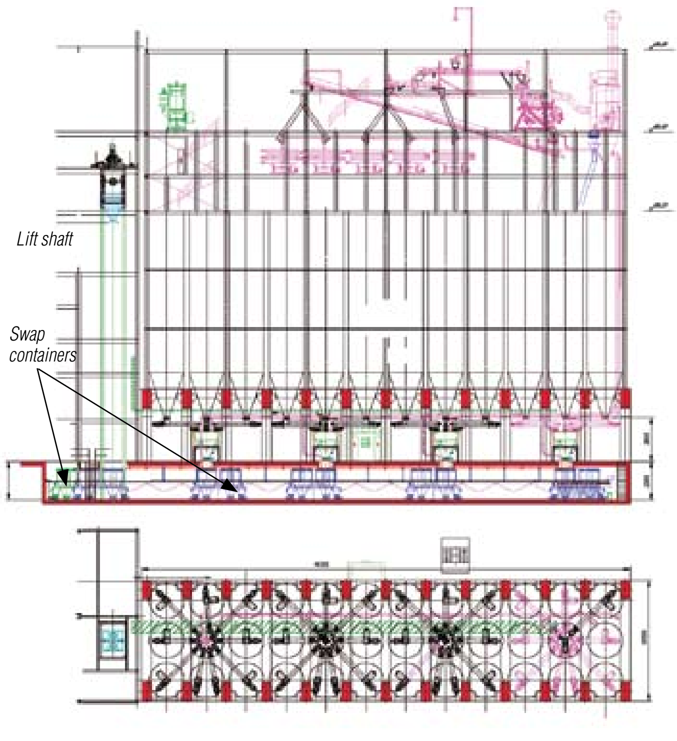

Fig. 6.3: Mixing system project at Plaxit, side and plan views

ParexLanko, France

The ParexLanko plant in France is an example of an in-house installation. In this project, the paddle mixer used in an existing plant was replaced by an Eirich intensive mixer with a batch size of 1,500 l so that the company could meet market demands for improved mixing homogeneity and reproducibility with no loss of high output at the same time.

In addition to the mixing system, the systems for batching and weighing the additives were also renewed. The semi-automatic system for conveying the raw materials after weighing was replaced by an automatic vertical lift which picks up the raw material from below the raw materials scale, swings it into the lifting position and transfers it 14 m in a vertical direction before swiveling it into the emptying position over the mixer where it is emptied. The material conveying system for the raw materials enables the plant to operate at 17 batches per hour.

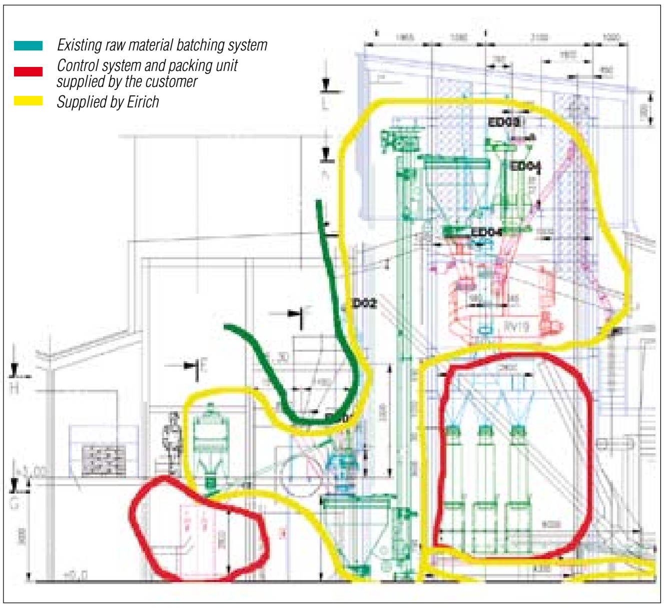

Fig. 7.1: Colour-coded indication of the parts supplied by Eirich

Fig. 7.2: Newly installed RV19 intensive mixer from Eirich

Final comments

To be able to properly account for market requirements such as sales capacity, product range, place of installation and international location, suppliers of plants must be highly flexible and be in a position to develop plant concepts that are tailored to the specific requirements of each customer. By using the best possible mixing system from the outset and ensuring that the plant concept is as flexible as possible, the plant will be capable of being adapted to future changes in market requirements. Eirich offers inexpensive, custom-tailored solutions from the very start and undertakes the planning, delivery, installation and commissioning to hand over turn-key plants to its customers. With over 100 years' of experience as one of the leading firms in the field of mixing technology and 40 years' experience in planning plants for the production of dry mortar, Eirich offers its customers an advantage which is simply priceless.

Author: Dipl.-Ing. Georg Henning,
Maschinenfabrik Gustav Eirich GmbH & Co KG, Hardheim

Industrial Mixing and Fine Grinding Technology

Tradition and innovation since 1863

02/10 Printed in Germany. Subject to changes

Eirich stands worldwide for a comprehensive range of products and services in the field of preparation technology. Its particular focus is on mixing and fine grinding technology, with know-how developed over 145 years of close cooperation with industrial users, universities and research institutions.

Pursuing a corporate philosophy of operating internationally and thereby ensuring close proximity to every customer, the Eirich Group has secured its place in all the key economic regions of the world.

The focus is on innovative technology for machinery and plant engineering designed to offer solutions for high-standard preparation tasks from a single source.

Applications and process technology with own test centers, a high vertical range of production and comprehensive after-sales service provide the ideal basis for the development of modern and economical processes for a multitude of industries.

Building materials – Ceramics – Glass – Carbon bodies – Battery pastes
Friction linings – Metallurgy – Foundries – Environmental protection

Your local consultant:

The Eirich Group worldwide:

Maschinenfabrik Gustav Eirich GmbH & Co KG
Postfach 11 60
74732 Hardheim, Germany
Phone: +49 (0) 6283 51-0
Fax: +49 (0) 6283 51-325
E-mail: eirich@eirich.de
Internet: www.eirich.com

Groupe Eirich France SARL
Villeurbanne, France

OOO Eirich Maschinentechnik
Moscow, Russia

OOO Eirich Maschinentechnik
Dnepropetrovsk, Ukraine

Eirich Machines, Inc.
Gurnee, IL, USA

Eirich Industrial Ltda.
Jandira S.P., Brazil

Nippon Eirich Co. Ltd.
Chiba, Japan

Eirich East Asia/Pacific
Seoul, Republic of Korea

Eirich Group China Ltd.
Shanghai & Beijing, P.R. China
Eirich-FME
Jiangyin, Jiangsu Province, P.R. China

Eirich-Transweigh India Pvt. Ltd.
Mumbai, India

H. Birkenmayer (Pty.) Ltd.
Isando, Republic of South Africa

The Pioneer in Material Processing®

EIRICH