
**BEST COMPONENTS
BETTER SYSTEMS**

THE RECIPE FOR PERFECT FOOD



Innovative food and pet food processing solutions.
From single components to complete systems.

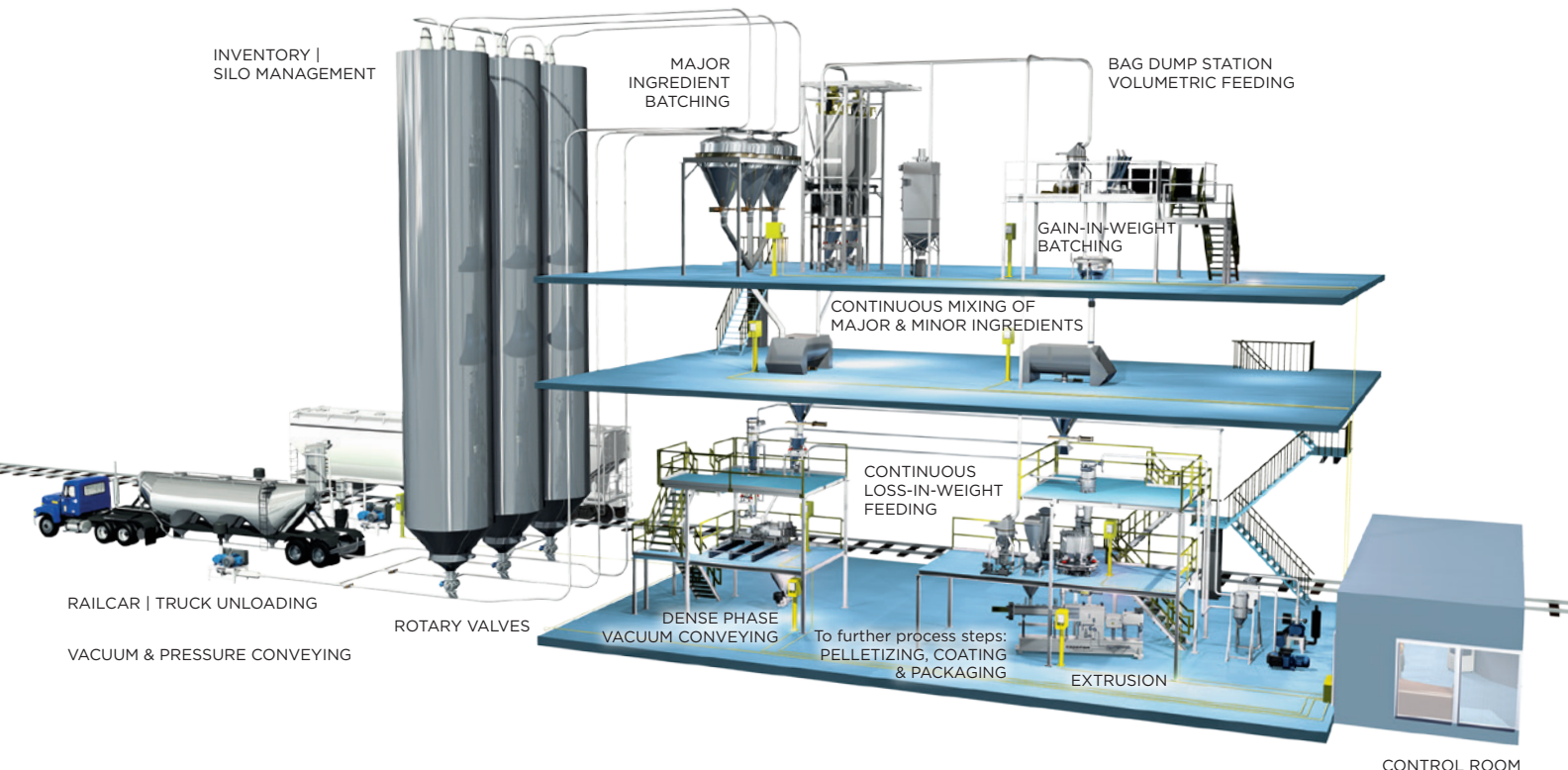
»» A supplier of food and pet food solutions must deliver more than reliable machines and systems. Experience and know-how are also absolutely essential. Our innovative food and pet food process technologies, as well as our extensive knowledge in process efficiency and food safety make us the ideal partner for process system supply.

KEY FACTORS IN FOOD SYSTEM DESIGN

Today's global food manufacturers are searching for partners in system and equipment supply who understand the importance of process efficiency and food safety. For this reason, global food and pet food manufacturers of all sizes rely on the extensive application experience and design expertise offered by Coperion and Coperion K-Tron. A variety of equipment designs are available, depending on the specific needs and sanitary requirements of the application. The systems and equipment provided by Coperion and Coperion K-Tron ensure optimal product and process safety, including compliance with EHEDG, FDA, FSMA and/or GFSI initiatives, standards and regulations.

COMPLETE PROCESS INTEGRATION

With more than 40 locations, 2,500 employees and numerous representatives worldwide, we can respond quickly and offer local support where it is needed. From transferring the raw ingredients from the truck, railcar, bulk bag or silo, batch weighing, feeding and scaling of macro and minor ingredients, all the way to the mixing, twin screw extrusion process steps and packaging, Coperion's and Coperion K-Tron's experienced technical engineers are available to discuss your applications in detail.

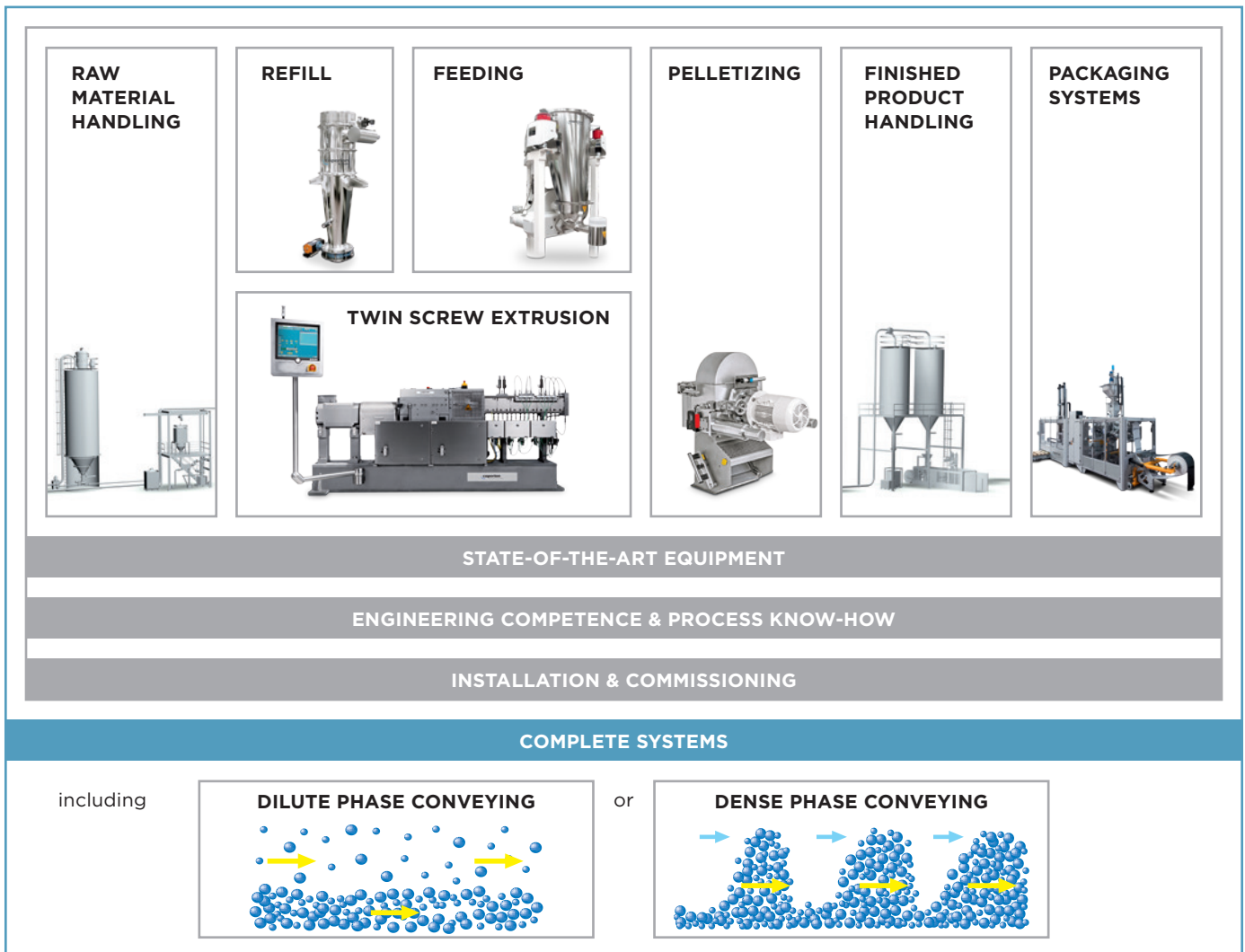


OUR PRODUCT LINES

Our ZSK twin screw extruders are ideal due to a combination of large free volume and excellent wear resistance. For the handling of ingredients, highly accurate volumetric and gravimetric feeders are provided for both batch and continuous applications. Our bulk material components, such as rotary, diverter and gate valves, as well as bin vents and receivers are used the world over for transfer of a wide variety of materials, including the most difficult to handle ingredients. Furthermore, our pressure

and vacuum conveying systems are designed for a wide variety of material transfer tasks, focusing on the most efficient and cost effective method for the specific application. Finally, our innovative and modular designs for bagging and palletizing are ideal for end of the line material weighing and packaging. We offer total systems as well as single components, engineering, application expertise, commissioning, and professional services from a single supplier.

SCOPE OF SUPPLY



Some people think it's our research department. Actually, it's yours. We focus on the specific requirements of your food and pet food applications and have found an ideal way of showing tomorrow to our customers today – the Coperion and Coperion K-Tron test labs.

Coperion and Coperion K-Tron provide test labs for feeding and extrusion applications, food components and conveying systems. These test labs are the ideal platform for advanced testing of any challenge in a production plant, such as product

behavior, new formulations, throughput rates or food safety standards. Next to our test labs are our laboratories, in which our engineers have access to numerous analysis options to evaluate product quality.

Feeding & extrusion

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| Test labs in Stuttgart (D), Niederlenz (CH), Ramsey (USA), Pitman (USA), Nanjing (CN), Wuxi (CN) |
| Test lab specially equipped for food and pet food requirements in Stuttgart (D) |
| All feeding equipment available, from volumetric feeders, loss-in-weight feeders, weigh belt feeders and low-rate micro-ingredient feeders to food pelletizing systems |
| A total of 30 extrusion systems permanently available for testing - from laboratory extruder ZSK 18 MEGALab to ZSK 92 |
| Throughputs ranging from 1 kg/h to 2 t/h |
| Laboratories for real-time analyses of product quality |



Food components & conveying

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|---|
| Test labs in Weingarten (D), Niederlenz (CH), Salina (USA) and Wuxi (CN) |
| Several conveying systems for dilute phase and dense phase conveying |
| More than 50 conveying, blending and separating systems for testing bulk solid properties, such as flow functions, conveying factors, filtration data, wall friction, time and moisture affects, particle shape, size and critical dimensions |
| Archive with more than 10,000 product samples |
| Laboratories for fast analysis of product characteristics and behavior |



Kansas State University Bulk Solids Innovation Center

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| Adjacent to Coperion K-Tron Salina |
| Partnership consisting of Kansas State University, several government agencies and private companies including Coperion K-Tron |
| Full scale testing and development of bulk solids behavior |
| Full scale bulk solids test bay - full scale systems to include: vacuum and pressure dilute phase, vacuum sequencing, vacuum and pressure vessel dense phase, rotary valve dense phase, batch weighing, silo zone blender, gravity flow, air filtration, feeding, mixing and silo storage |
| Material properties test lab - bulk solid and particle properties will be evaluated and modeled in a test bench environment |
| Research areas - five laboratories for university and industry sponsored research |
| Training/education center conference and lecture rooms |





COMPREHENSIVE APPLICATION KNOW-HOW

Processed food

- › Pet food/treats
- › Breakfast cereals and snacks
- › Candy masses
- › Crumb chocolate/
chocolate masses
- › Chewing gum/gum base
- › Meat analogues,
texturized proteins
- › Maillard flavors
(toasting, roasting,
baking, caramel)

- › Encapsulated flavors
- › Modified starches
- › Popcorn
- › Ice cream
- › Soft drink concentrates
- › Bread crumbs

Ingredients/raw materials

- › Herbs/spices/spice blends
- › Functional ingredients
- › Biodegradable materials
- › Starches

- › Pharmaceuticals
- › Bakery ingredients
- › Flour, sugar
- › Coffee beans and powder
- › Malt
- › Cocoa beans and powder
- › Salt
- › Rice
- › Tea
- › Tobacco
- › Soy beans
- › Nuts

- › Pectin, gelatin
- › Potato powder
- › Instant powder

Dairy products

- › Milk powder
- › Whey powder
- › Lactose
- › Casein
- › Cheese powder
- › Infant formula/baby food

OPERATOR SAFETY + PRODUCT SAFETY = COPERION PROCESS DESIGN

Our global network of process and system engineers can provide in depth solutions in accordance with a wide variety of regulations and standards. Options in materials of construction, surface finishes, recommended cleaning designs including CIP, COP and

WIP are available. In addition automation options for HAACP analysis, as well as complete mechanical and operational FAT, SAT protocols are all available, depending on the customer and process requirements.



COPERION AND COPERION K-TRON - A PARTNERSHIP OFFERING MANY ADVANTAGES

- › High precision material handling, feeders, components, twin screw extruders and packaging equipment which can be provided to the highest hygienic design standards for easy cleaning and maintenance
- › Single components and entire systems which encompass all the steps in the process, from one single supplier

- › Comprehensive service provision with a global service network and 24/7 hotline
- › Extensive global test facilities for handling even the most difficult flowing ingredients or challenging twin screw extrusion applications
- › World-renowned technology for all phases of the food and pet food manufacturing process as a result of research and development teams worldwide

➤➤ Feeders – the highest accuracy addition of food ingredients for both batch and continuous applications. Coperion K-Tron offers a wide range of liquid and solids feeding designs for even the most difficult to handle products.

Whether for volumetric or high accuracy gravimetric feeding applications, thousands of Coperion K-Tron feeders have been sold for the food and pet food industry. Our world-renowned weighing technology and innovative custom designs can be integrated into a variety of food and pet food processes including dispensing, mixing, extrusion, milling, coating and packaging.

Typical food type materials include cereals and breakfast foods, snack foods, pet/fish food and feed, confectionery/chocolate products, coffee, flour/dough/bakery products, probiotics, trace elements, vitamin fortifiers and liquid flavors and aromatics. Food grade designs include stainless steel construction and FDA approved materials. Specialized designs are available for hazardous environments in accordance with ATEX and NEC guidelines.



SINGLE AND TWIN SCREW FEEDERS | MICRO-INGREDIENT FEEDERS | VOLUMETRIC AND GRAVIMETRIC DESIGNS

- Single screw feeders are ideal for handling free flowing granular materials
 - MS12, MS16, KS60, S60, S100, S500 models
 - Feed rates 0.007 to 45,300 dm³/hr (0.0002 to 1,600 ft³/hr)
- Twin screw feeders are ideal for handling difficult materials such as powders
 - MT12, MT16, KT20, KT35, T60, T80
 - Feed rates 0.0016 to 30,600 dm³/hr (0.0006 to 1,080 ft³/hr)

SMART WEIGH BELT FEEDERS

- Ideal for handling free flowing or friable materials
- Ideal for large quantities
- Used to meter or totalize prior to packaging
- Available with and without housing, 300 mm and 600 mm belt width
- Feed rates 10 to 80,000 dm³/hr (0.4 to 2,800 ft³/hr)

VIBRATORY LOSS-IN-WEIGHT FEEDERS

- Ideal for fragile or fibrous materials
- Weighing module isolates vibration amplitude for high accuracy loss-in-weight feeding
- Feed rates 0.2 to 8,500 dm³/hr (0.007 to 300 ft³/hr)

LIQUID LOSS-IN-WEIGHT FEEDERS

- Provide accurate continuous volumetric or gravimetric flow control of liquids
- Feed rates are dependent upon configuration



INNOVATIVE COPERION AND COPERION K-TRON FEEDERS – YOUR BENEFITS

- Unsurpassed weighing technology
- Custom controls integration
- Versatile options for even the hardest to handle powders
- Easy cleaning
- Reliable performance

➤➤ Pneumatic conveying and material transfer solutions – from continuous pressure and vacuum systems, both dilute and dense phase, to batch weighing and scaling. **Coperion K-Tron can transfer a wide variety of bulk materials and final products.**

TYPICAL CONVEYING APPLICATIONS

- › Bulk bag, railcar, and silo unloading of major ingredients such as flour, salts, corn meal, sugar, gluten, etc.
- › Dense phase conveying of preblend materials to extruder or other processes
- › Dilute phase conveying via pressure or vacuum of micro, minor and major ingredients
- › Refill of loss-in-weight and volumetric feeders for continuous processes
- › Gentle conveying for fragile materials such as popcorn, pasta, candies
- › Multi-material conveying and batch weighing
- › Combined volumetric feeding and pneumatic conveying where space is limited

SCOPE OF SUPPLY

- › Continuous pressure
- › Continuous vacuum
- › Dilute and dense phase
- › Line sizes of 38 mm (1.5 in) up to 406 mm (16 in) and conveying capacities up to 100,000 kg/hr (220,000 lb/hr)



SPECIALTY CONVEYING RECEIVERS

- › For dense phase and dilute phase
- › Continuous and vacuum sequencing applications
- › Sanitary Filter Receiver (SFR): innovative design for easy-clean quick turnaround applications, horizontal filter media, top entry, tool-less design for access and maintenance
- › P Series: for sanitary applications, with steep cone angles, easy-clean design, options for wash-in-place retractable spray balls and swing out filter heads
- › Series 2400 line: filtered vacuum loaders and receivers, models available in painted carbon steel, stainless steel and aluminum, quick disconnect clamps for easy cleaning and filter maintenance

SCALE HOPPERS AND BATCH WEIGH RECEIVERS

- › Variety of systems offered for batch weighing of pneumatically conveyed food ingredients
- › Ideal for either a single ingredient to be delivered to multiple destinations or multiple ingredients delivered to a single destination
- › All systems feature hoppers suspended on load cells with extremely high resultant batch accuracies
- › Integrated system controls can include recipe, formula and inventory capabilities

SPECIALTY SYSTEM COMPONENTS

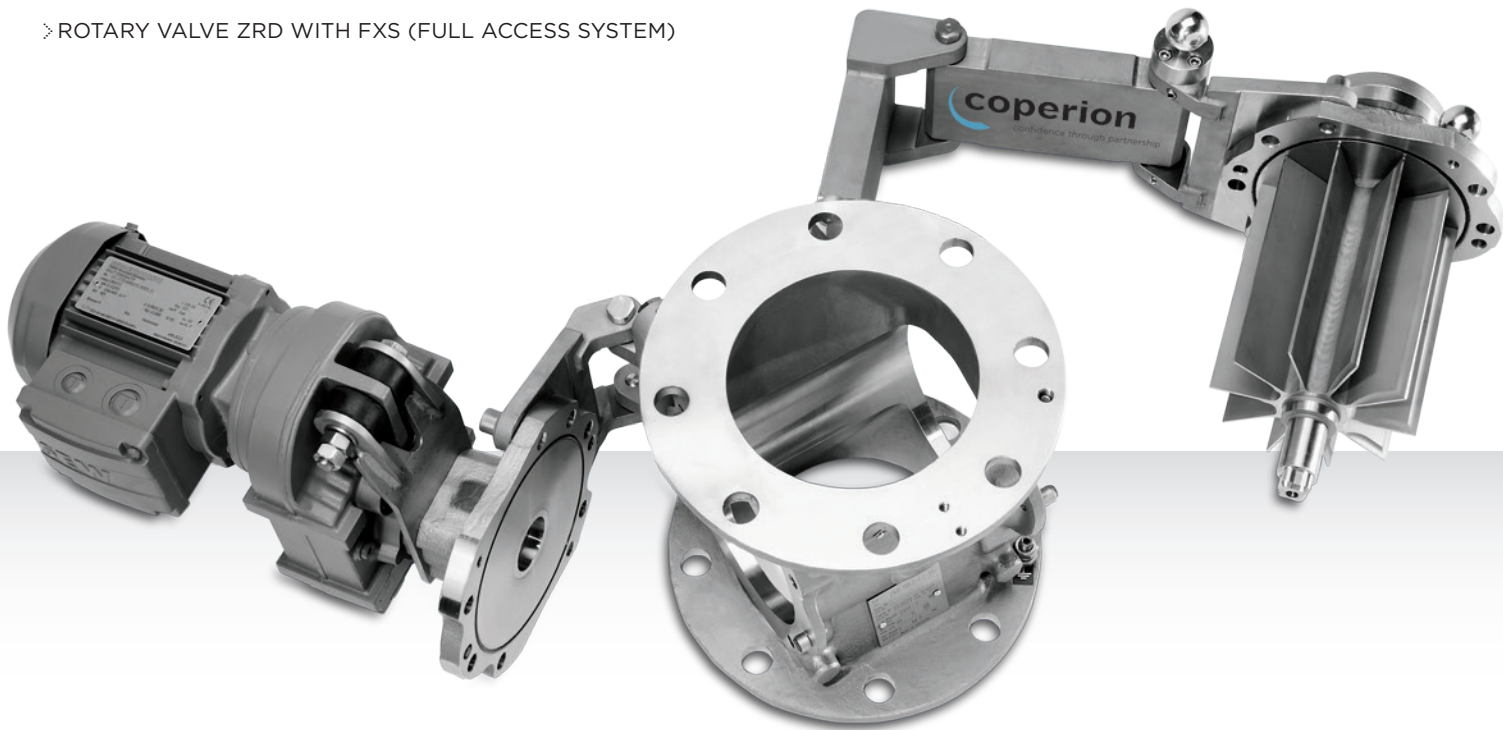
- › Variety of product pickup devices available, including executions in carbon steel to polished stainless steel designs with capability of being washed or cleaned-in-place
- › Specialized fluidizing cones utilize FDA approved perforated liner which allows for the fluidization of the product via air to enhance product flow
- › Sanitary quick-release cartridge bin vents for easy access and cleanout
- › Variety of flow aid devices to ensure easy flow of materials out of feeder hopper, bins and silos

➤ An eye for detail with the big picture in mind. Rotary and diverter valves for conveying and discharging foodstuffs must satisfy very high demands with regard to hygiene and reliability. Coperion is the right partner for these applications.

Parameters such as particle size, cohesion and adhesion influence the flow properties of bulk materials and therefore the correct design and layout of bulk material handling components. Our intensive research and the development of new technologies has resulted in innovative and easy-to-clean

rotary and diverter valves produced on our own premises which consistently set standards in the industry. This means that your products are handled as hygienically and gently as possible in keeping with the very latest technical standards.

➤ ROTARY VALVE ZRD WITH FXS (FULL ACCESS SYSTEM)

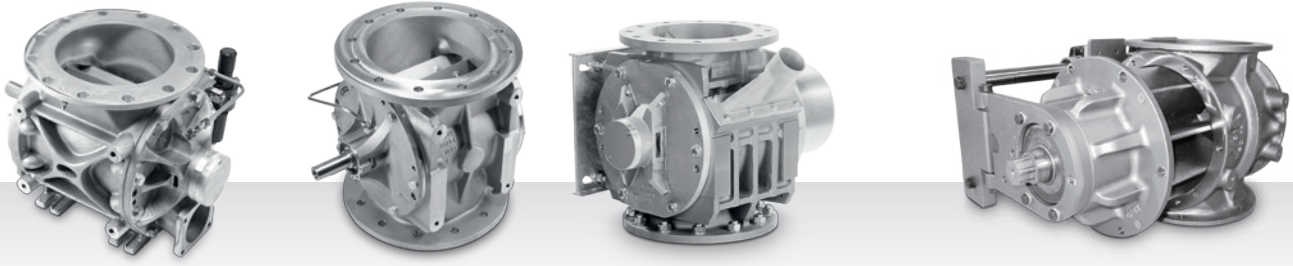


EHEDG AND USDA COMPLIANT AND CERTIFIED VERSIONS AVAILABLE

Coperion is an active member of the European Hygienic Engineering & Design Group. The latest developments and directives are therefore directly incorporated into the development of all components. The USDA (United States Department of Agriculture) Dairy Grading Branch certifies components on the basis of stringent regulations regarding sanitary and easy-clean design.



› ROTARY VALVES



BLOW-THROUGH VALVE ZXD | DISCHARGE AND CONVEYING VALVES ZRD, ZVD, HD, MD

- › Extra-large inlet for high throughputs
- › Suitable for pneumatic conveying at up to 1.5 bar (g)/21 psi
- › Materials available: stainless steel, chrome-plated grey cast iron, nickel-plated grey cast iron, grey cast iron
- › Sizes (inlet) DN 150 to 700 (6 to 28 in)
- › Hygienic series: smooth polished surfaces ($R_a \leq 0,8 \mu\text{m}$)
- › Surfaces available with wear protection or Teflon coating
- › ZXD with optimal chamber emptying with specially designed blow-through channel, ideal for products with poor flow properties

QUICK-CLEAN AEROLOCK™ MD-Q

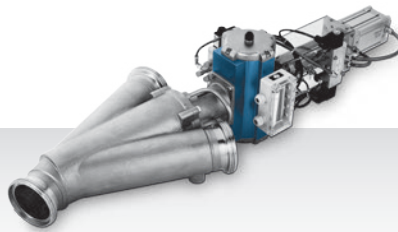
- › Easy to disassemble, clean and reassemble
- › Optional support carriage is ideal for use in high places to facilitate rotor removal. The carriage fully supports the rotor as it is removed for cleaning.
- › Pressure differential up to 0.8 bar (g)/12 psi
- › Ten-blade rotor that maintains a minimum three-blade labyrinth seal to minimize air leakage

› DIVERTER VALVES



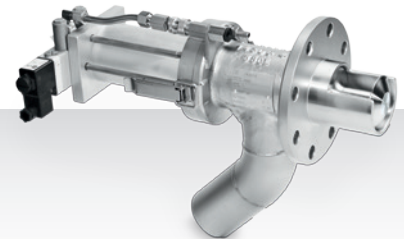
TWO-WAY DIVERTER VALVE WZK

- › Parts in contact with product made of stainless steel, aluminium housing
- › For pneumatic conveying systems at up to +5 bar
- › Smooth, easy-to-clean surfaces
- › Sizes DN 50 to 250 (2 to 10 in)



TWO-WAY DIVERTER VALVE WYK

- › Entirely made of stainless steel
- › For pneumatic conveying systems at up to +5 bar
- › EHEDG certified design for fully automatic wet cleaning (CIP)



SAMPLER PN80

- › For regular extraction of product samples from a silo cone or gravity pipe
- › Material: aluminium or stainless steel
- › Option: quick cleaning



INNOVATIVE COPERION COMPONENTS - YOUR BENEFITS

- › Sanitary product design
- › Operational reliability and durability
- › Easy to clean: fast, efficient cleaning and inspection due to optimal accessibility ›› save time and money
- › Certified CIP versions (cleaning-in-place)

➤ The ZSK Mv PLUS: the heart of your system. This twin screw extruder is setting standards with leading-edge technology for food and pet food extrusion.

Coperion's twin screw extruder ZSK Mv PLUS provides ideal conditions for the extrusion of many types of food and pet food products. The process section of the twin screw extruder consists of several barrels in which the co-rotating screws operate. The closely intermeshing screws with their tight self-wiping profile eliminate stagnant zones over the whole length of the process section. The effect of this is a constantly high conveying efficiency and perfect self-cleaning.

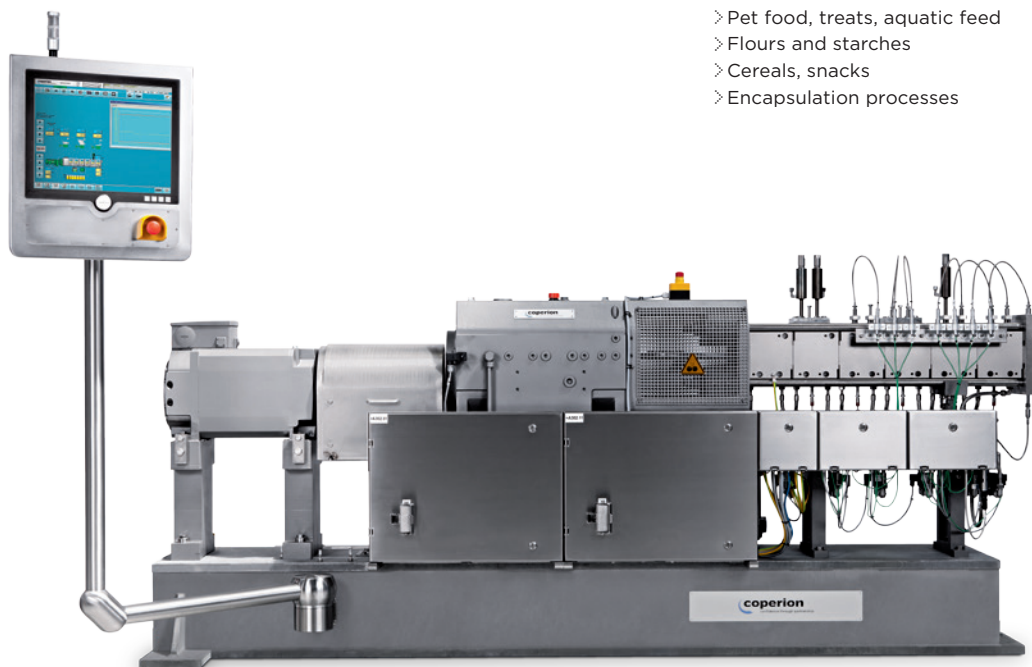
The modular design of the ZSK Mv PLUS and its unusual combination of free screw volume, screw speed and torque enable this twin screw extruder series to be individually configured for every application. The complete portfolio includes a wide range of sizes, allowing customers to process any required throughput range from laboratory to production scale.

SPECIAL FEATURES OF THE ZSK Mv PLUS

| | |
|--|---|
| <p>Screw volume The deeply cut screw flights with a diameter ratio D_o/D_i of 1.8 result in a very large free screw volume</p> | <p>The advantages</p> <ul style="list-style-type: none"> ➤ Improved feed intake of additives with a low bulk density such as flours, starches, pigments, fillers, additives ➤ Lower shearing ➤ Reduced thermal stress on the raw materials ➤ Longer residence time for reaction processes ➤ Safe devolatilization |
| <p>Screw speed The ZSK Mv PLUS series is designed for speeds up to 1,800 rpm</p> | <p>The advantages</p> <ul style="list-style-type: none"> ➤ Increase in the throughput by up to 3 or 4 times in comparison to the preceding ZSK Mv model ➤ Lower investment and operating costs due to smaller machine sizes at the given throughput rate ➤ Favorable price-performance ratio |
| <p>Torque The specific torque of the ZSK Mv PLUS is 11.3 Nm/cm³. It has been increased by 30 % in comparison to the preceding ZSK Mv model</p> | <p>The advantages</p> <ul style="list-style-type: none"> ➤ Another increase in throughput of up to 40 % in comparison to the preceding series ➤ Extended operating window ➤ Greater recipe flexibility |

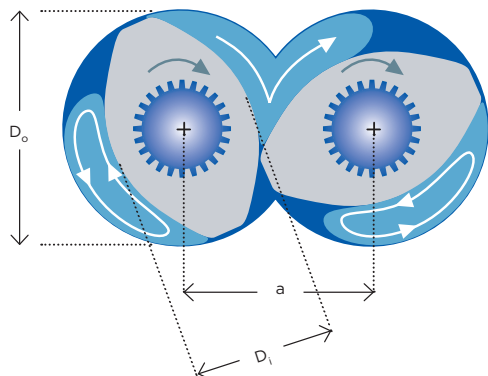
TYPICAL AREAS OF APPLICATION OF THE ZSK Mv PLUS

- Pet food, treats, aquatic feed
- Confectionery
- Flours and starches
- Meat analogues, texturized protein
- Cereals, snacks
- Biodegradable products
- Encapsulation processes
- Pharmaceuticals



➤ TWIN SCREW EXTRUDER
ZSK 43 Mv PLUS

CROSS-SECTION THROUGH THE TWO CO-ROTATING SCREWS



D_o = outer diameter | D_i = inner diameter | a = center line distance | D_o/D_i = outer/inner diameter ratio, determines shear and free volume | Md/a^3 = specific torque, determines output density and degree of fill | n = screw speed, determines shearing and mixing

TECHNICAL DATA

| ZSK | Max. torque per shaft Md [Nm] | Max. screw speed [rpm] | Max. drive power N [kW] | Screw diameter [mm] |
|-------------|---------------------------------|------------------------|---------------------------|---------------------|
| 18 MEGAlab* | 38 | 1,200 | 10 | 18 |
| 27 Mv PLUS | 100 | 1,800 | 40 | 27 |
| 34 Mv PLUS | 205 | 1,800 | 81 | 34 |
| 43 Mv PLUS | 420 | 1,800 | 168 | 43 |
| 54 Mv PLUS | 815 | 1,800 | 321 | 54 |
| 62 Mv PLUS | 1,250 | 1,800 | 494 | 62 |
| 76 Mv PLUS | 2,275 | 1,800 | 901 | 76 |
| 98 Mv PLUS | 5,000 | 1,500 | 1,651 | 98 |
| 125 Mv PLUS | 10,300 | 1,500 | 3,431 | 125 |
| 248 Mv | 35,000 | 500 | 3,665 | 248 |

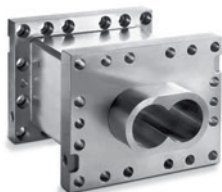
* Laboratory extruder with D_o/D_i 1,55.
ZSK 34-ZSK 76 available in compact version.

INDIVIDUAL WEAR AND CORROSION RESISTANT MATERIAL SOLUTIONS

ZSK twin screw extruders can be highly productive even in difficult food and pet food applications with aggressive products. Considering your individual requirements, our experts help you to determine the exact combination out of more than 150 materials to ensure highest durability and reliability of the wear parts especially with economical considerations. To ensure maximum food safety, all parts in contact with the product are in line with the corresponding food regulations, such as EU 1935/2004, or the relevant recommendations from the FDA. They can be traced back to their origin thanks to Coperion's quality control system.



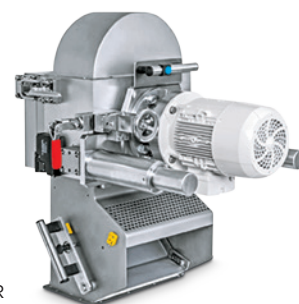
> WEAR AND CORROSION RESISTANT SCREW ELEMENTS



> BARREL WITH OVAL LINER

ZGF CENTRIC PELLETIZER

Coperion's ZGF centric pelletizer has been used successfully for many years in extrusion plants for the production of directly expanded food stuffs such as cereals, aquatic feed or pet food. The knife rotor of the ZGF centric pelletizer is arranged centrally to the die plate. The product which emerges from the die plate in endless strands is cut off by the knife directly at the end of the extruder (hot die face pelletizer). The length of the pellets produced can be influenced easily by the number of knives and by the speed of the knife rotor.



> ZGF CENTRIC PELLETIZER

➤ The entire range of food and pet food processing.

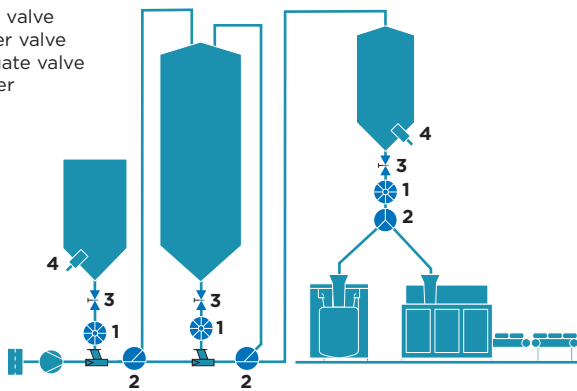
The global systems engineering services provided by Coperion and Coperion K-Tron ensure the most efficient integrated processes with an emphasis on cleanability, food safety and efficient, automated design. Application experience and design

expertise ensure that food processing systems are ideally configured for every application. The complete portfolio allows customers to process any required throughput from laboratory to production scale.

APPLICATION EXPERTISE IN ROTARY AND DIVERTER VALVES

➤ LOGISTICS SYSTEM

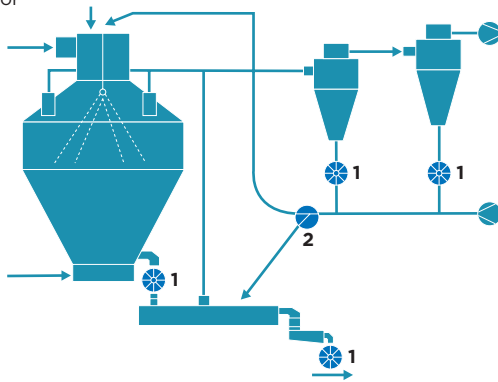
- 1 Rotary valve
- 2 Diverter valve
- 3 Slide gate valve
- 4 Sampler



Coperion's reliable rotary valves are the right choice for the discharge of powder and granules out of silos and hoppers into dilute phase or dense phase pneumatic conveying systems. They ensure highest conveying capacities. Coperion's rigid diverter valves enable safe routing of products to several directions.

➤ SPRAY-DRYING SYSTEM

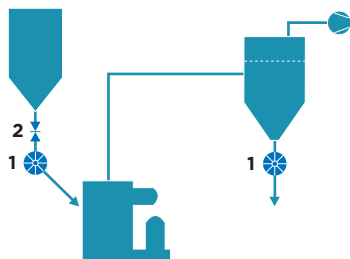
- 1 Rotary valve for CIP application
- 2 Diverter valve for CIP application



Coperion's hygienic design rotary valves and diverter valves are ideal for integration in sanitary conveying applications, such as spray drying of milk powders and infant formulas. Valve designs are available for discharge from spray towers, cyclones, sanitary receivers and for product line diversion to cooling operations, including complete CIP operation.

➤ MILL WITH EXPLOSION PROTECTION

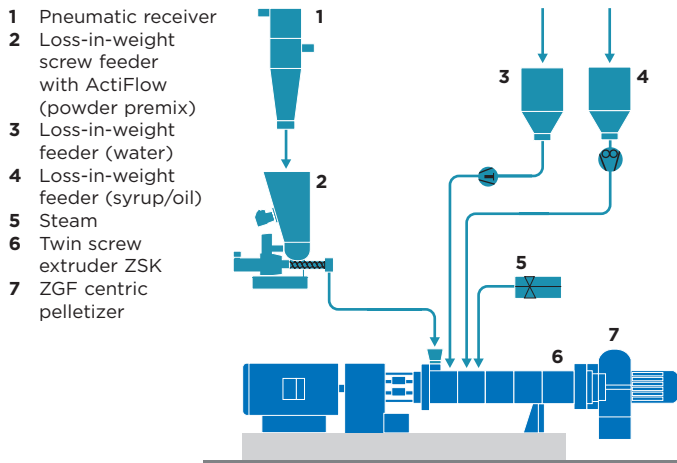
- 1 Rotary valve used as pressure isolation/protection system (ATEX)
- 2 Slide gate valve



Coperion's PSR and ATEX rated rotary valves are ideal for integration into high pressure explosion protection milling systems for pressure isolation between the feeding mechanism and the product collector discharge point. They can also be used in conjunction with Coperion K-Tron screw feeders at the entrance of the milling system to ensure optimal and safe performance of the milling operation.

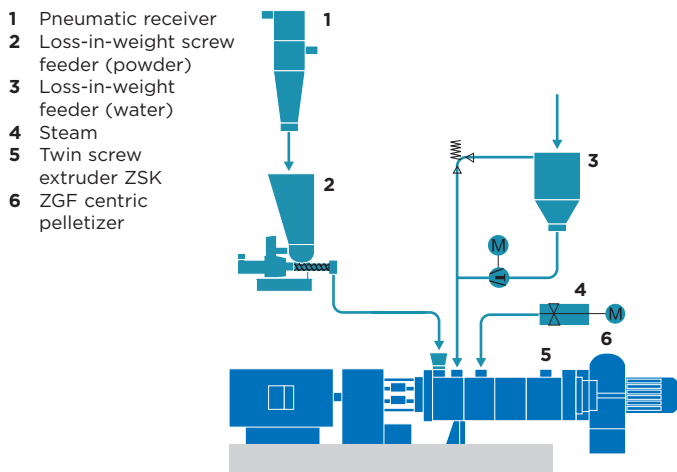
APPLICATION EXPERTISE IN EXTRUSION

> CEREALS



The ZSK Mv PLUS continually provides consistent high product quality in extruding the full range of raw materials for cereals, from fine flours to whole grains – even for cereals with a high fat content. Its excellent feeding characteristics allow high throughput rates to be achieved. Raw material preparation such as precooking, addition of moisture etc. are not required and can be replaced by direct steam injection. The process steps downstream are covered in cooperation with our longstanding partners: directly-expanded cereals can be dried, fortified with flavors and vitamins, powdered or coated in oil/seasonings or chocolate/sugar. Cooked, non-expanded, “cold-formed” pellets are rolled and roasted to make flaked and shredded products.

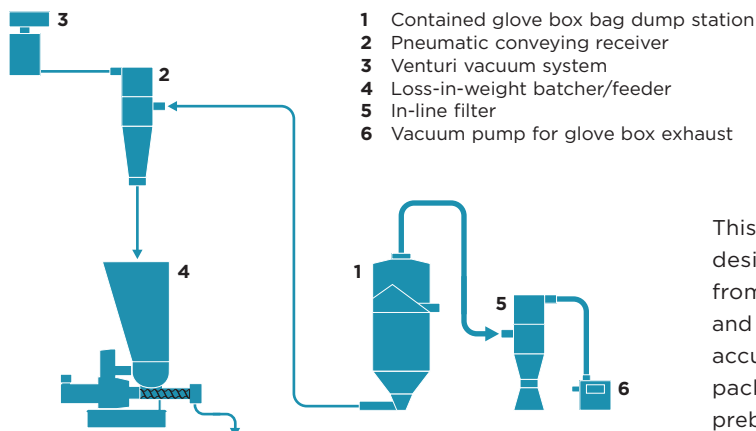
> FLOURS AND STARCHES



In comparison to conventional production methods of using a stirred kettle and roller dryer, production of flours and starches with a twin screw extruder has significant cost benefits. Excellent product feed characteristics allow the ZSK Mv PLUS to achieve very high throughputs even with small machine sizes. Investment and operating costs drop significantly compared to conventional production methods or to processes using older extruder series.

APPLICATION EXPERTISE IN FEEDING AND CONVEYING

> CONVEYING AND LOSS-IN-WEIGHT BATCHING OF MICRO-INGREDIENTS TO MIXERS, PACKAGING LINES OR TANKS

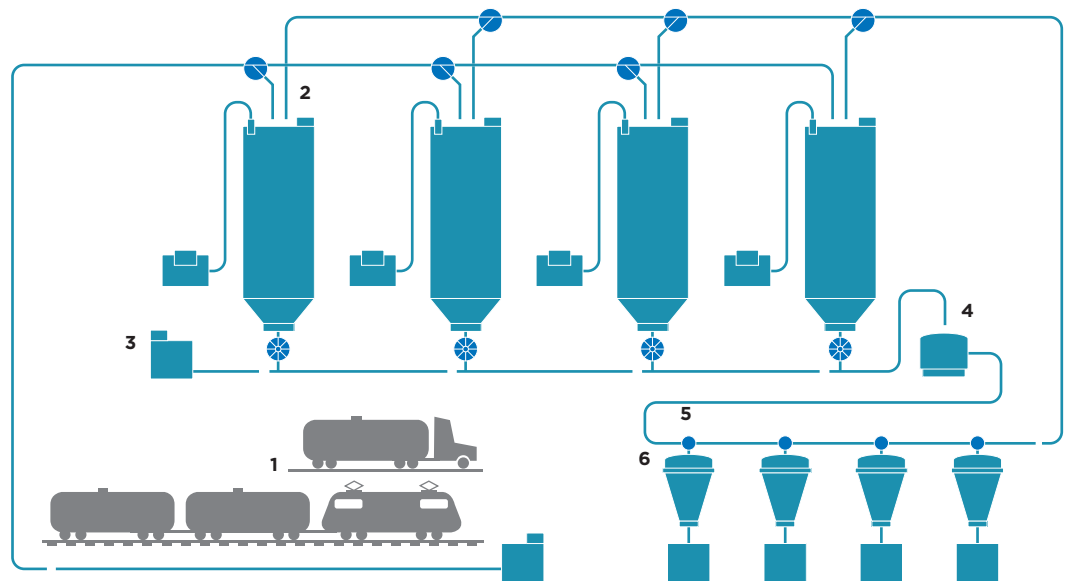


This specialty design material transfer line includes a custom designed glove box for optimal contained material transfer from bags directly to a Coperion K-Tron pneumatic receiver and loss-in-weight (LIW) feeder combination. The LIW feeder accurately batches micro-ingredients direct to the supersack packaging line. Ideal applications are handling of probiotics, prebiotics and vitamins.

APPLICATION EXPERTISE IN FEEDING AND CONVEYING

➤ CONVEYING OF MACRO AND MICRO-INGREDIENTS FROM SOURCE TO MIXERS

- 1 Rail or truck unloading
- 2 Storage silos with vibrating bottoms
- 3 Pressure blowers
- 4 In-line screen
- 5 Aeropass valves
- 6 Scale hoppers

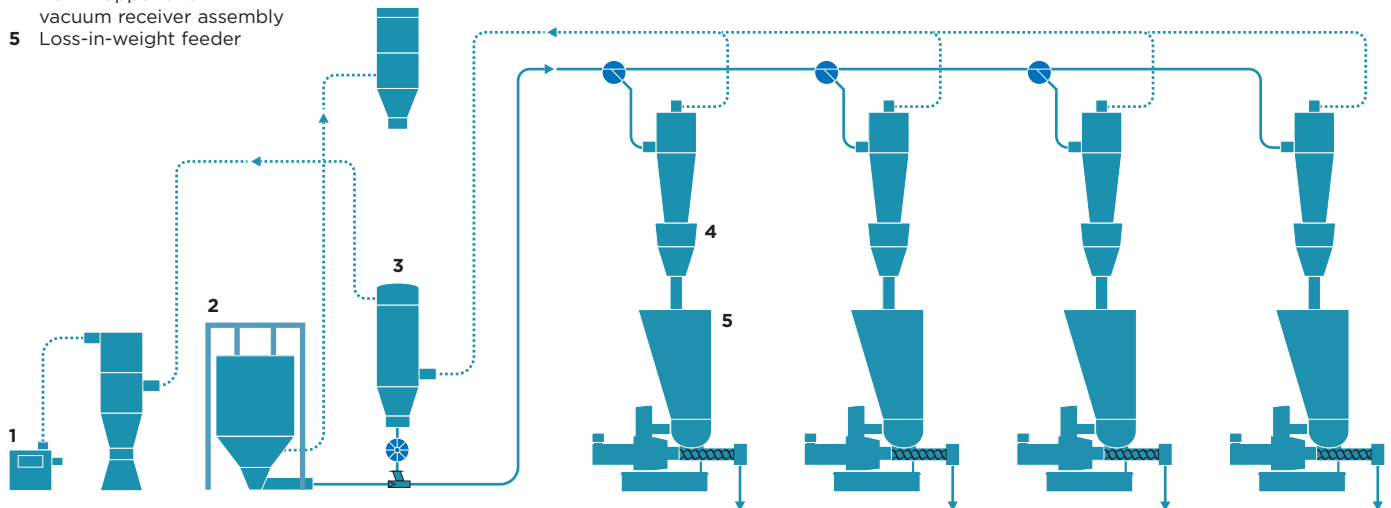


The systems engineers at Coperion K-Tron can help design the optimal ingredient transfer system for your operation, such as moving flour, starch, or sugars from railcars, trucks or bulk bags to the process. Flow diagram above illustrates PD rail unloading

of various corn flours to scale hoppers, where they are batch weighed before dumping into mixers. Scale hoppers are used for accurate gain-in-weight batch weighing of ingredients before mixing.

➤ CONVEYING OF INGREDIENTS DIRECTLY TO COPERION K-TRON LOSS-IN-WEIGHT FEEDERS FOR CONTINUOUS OPERATIONS

- 1 Vacuum pump assembly
- 2 Bulk bag unloading
- 3 Filter receiver
- 4 Refill hopper and vacuum receiver assembly
- 5 Loss-in-weight feeder

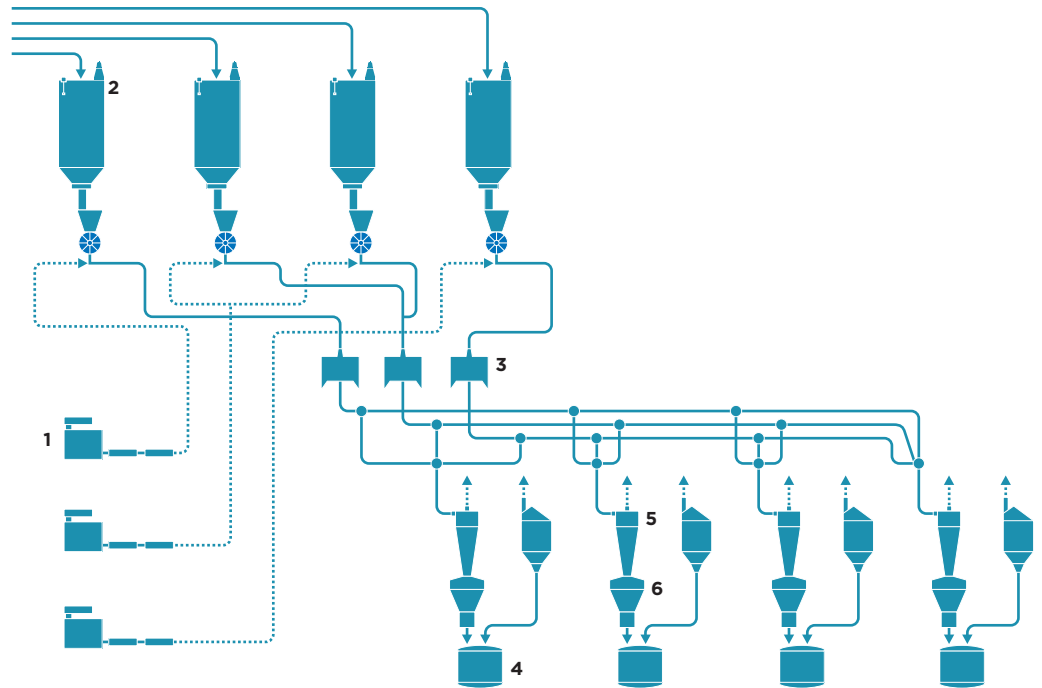


All continuous systems, whether for extrusion, mixing or coating, require accurate delivery of the product via loss-in-weight feeders, as well as continuous refill of the feeder hoppers. The

systems designed by Coperion K-Tron ensure accurate delivery of even the most difficult to handle ingredients. Ideal applications are pet foods, snack products and cereals.

INGREDIENT TRANSFER WITH IN-LINE SIFTING FROM SILOS TO TANKS

- 1 Pressure conveying system including dehumidification and chilling
- 2 Ingredient silos
- 3 In-line screening
- 4 Blender batching of majors, minors and micros
- 5 Cyclones
- 6 Scale hoppers

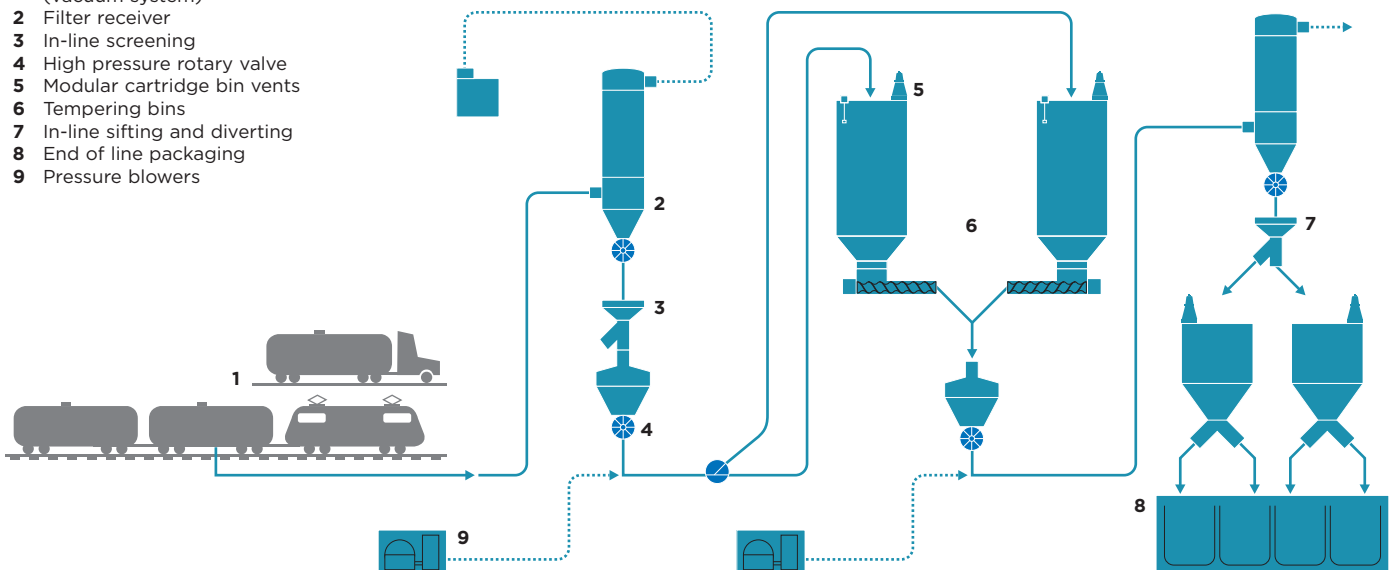


The systems engineers at Coperion K-Tron have extensive experience in handling and conveying even the most difficult materials. This process flow diagram illustrates a specialty material handling design which includes dehumidification systems for moisture-free conveying as well as in-line sifting and metal

detection to ensure safe process operations. Coperion K-Tron integrates a wide variety of process steps into their automated systems including mixing and sifting. All control systems are custom designed with the most efficient process in mind.

DENSE PHASE PRESSURE CONVEYING OF FOOD INGREDIENTS

- 1 Rail or truck unloading (vacuum system)
- 2 Filter receiver
- 3 In-line screening
- 4 High pressure rotary valve
- 5 Modular cartridge bin vents
- 6 Tempering bins
- 7 In-line sifting and diverting
- 8 End of line packaging
- 9 Pressure blowers

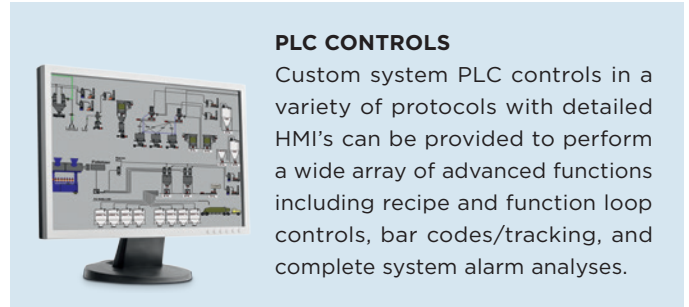


Coperion provides dense phase conveying systems for even the most fragile materials. The system shown illustrates rail and truck unloading of corn grits directly to a filter receiver, with in-line sifting prior to entrance to a dense phase positive

pressure convey line. Material is conveyed to tempering bins. Proportioned materials are then additionally conveyed in a secondary system where they are packaged into bulk bags or specialty bags via the Coperion packaging systems.

True total systems. One source. Coperion and Coperion K-Tron provide complete system design from start to finish.

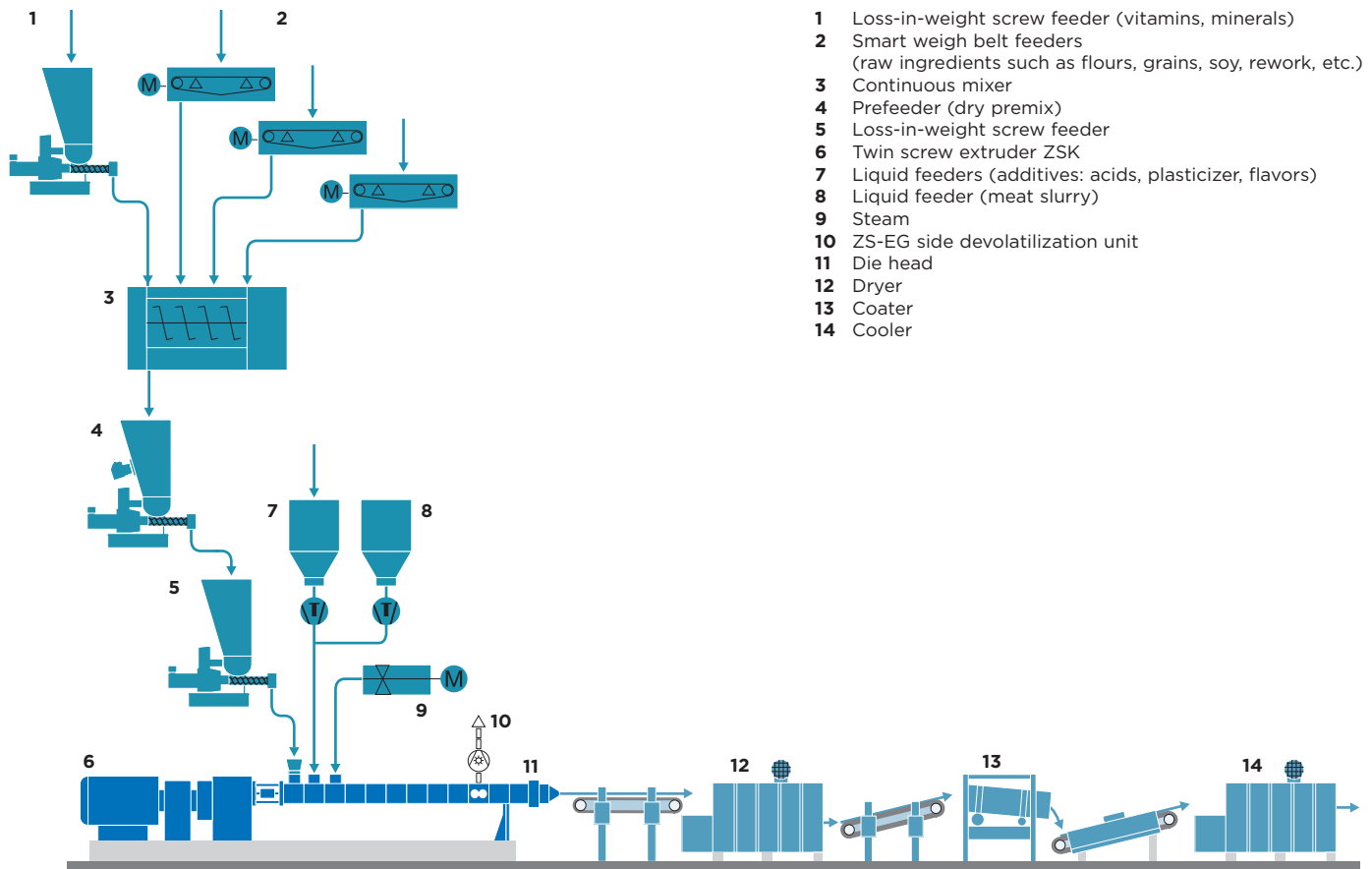
From raw ingredient transfer, batch weighing and high accuracy ingredient feeding to mixing, extrusion and packaging, Coperion's and Coperion K-Tron's global systems engineering network can supply single source complete system design for a variety of specialized applications. All designs are engineered with food safety and process efficiency in mind. In addition, our systems engineering groups ensure that all aspects of the complete system design conform with the most current process safety and hygienic design standards. We provide state-of-the-art integrated control systems for the most efficient overall process.



PLC CONTROLS

Custom system PLC controls in a variety of protocols with detailed HMI's can be provided to perform a wide array of advanced functions including recipe and function loop controls, bar codes/tracking, and complete system alarm analyses.

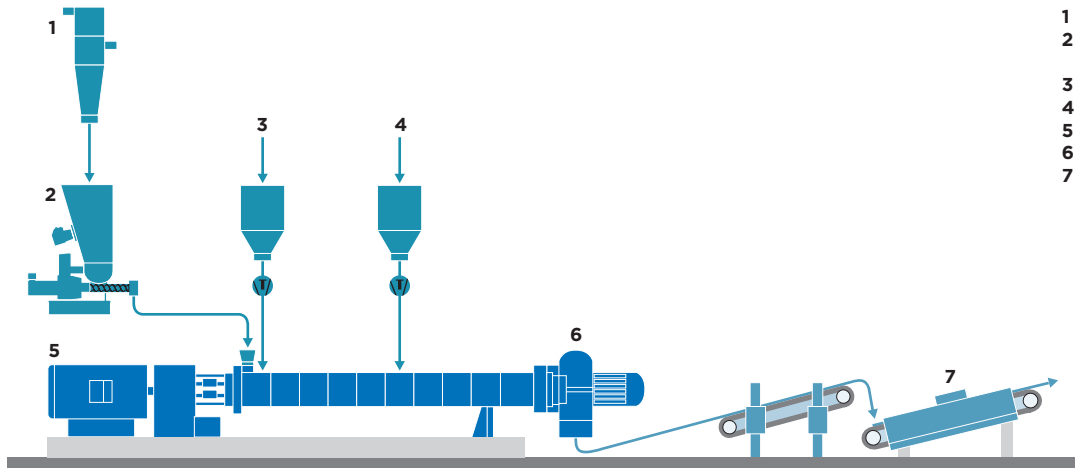
TYPICAL SET-UP FOR THE PRODUCTION OF PET FOOD/PET TREATS



Today's manufacturers of high quality pet food and pet treats rely on manufacturing processes which are cost-efficient, time-saving and sanitary in design. Screw feeders (both volumetric and loss-in-weight), liquid loss-in-weight, and weigh belt feeders are used for metering and highly accurate feeding of ingredients into mixers and extruders. In addition, Coperion pneumatic conveying systems and components are used for the transfer of dry bulk materials, such as grains, premixes, vitamins and even probiotics. Finally, the use of the Coperion ZSK Mv PLUS twin screw extruder delivers an extremely high

product output for optimal efficiency in dry pet food and treat production. Its balance of free volume and high speed range makes the ZSK Mv PLUS particularly suitable for the economical preparation of dried and semi-moist dog and cat food and treats. Throughputs of up to 15 t/h, combined with very good wear and corrosion protection of the components used, ensure an extremely economical production process within a very broad range of formulations.

▷ TYPICAL SET-UP FOR THE ENCAPSULATION OF FLAVORS AND AROMAS

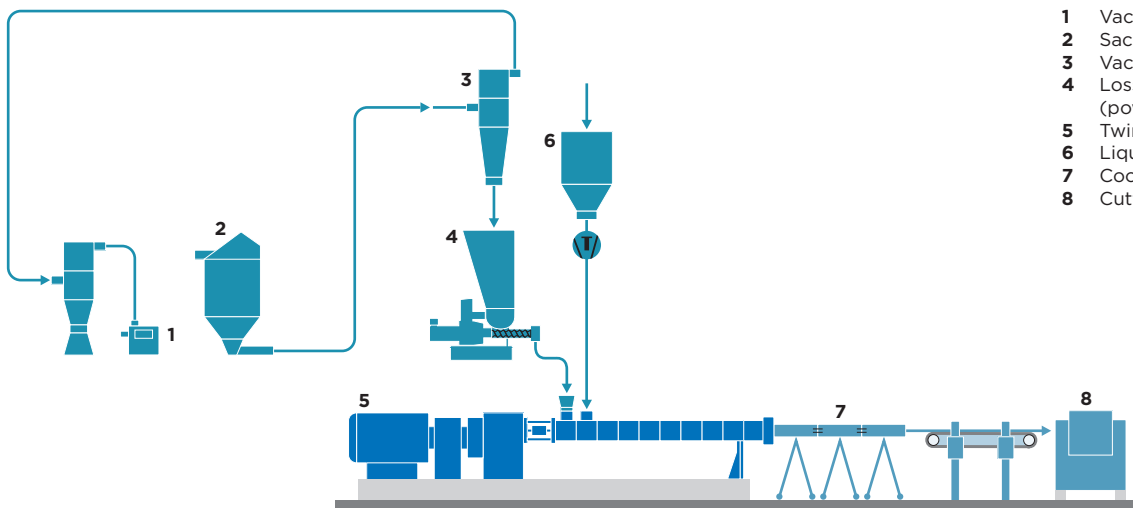


- 1 Pneumatic receiver
- 2 Loss-in-weight screw feeder with ActiFlow (powder premix)
- 3 Loss-in-weight feeder (water)
- 4 Loss-in-weight feeder (flavor)
- 5 Twin screw extruder ZSK
- 6 ZGF centric pelletizer
- 7 Sieving

The use of flavors and aromas in food processing plays an important role in food consumption and consumer acceptance. Coperion K-Tron feeders and pneumatic conveying systems are used extensively in the food industry for the accurate and gentle handling of flavor blends to minimize aroma degradation. Coperion's food components fulfill the highest demands in hygiene, easy cleaning and gentle product handling. In addition,

Coperion high efficiency ZSK Mv PLUS twin screw extruders are used to encapsulate volatile flavors and aromas. The intensive mixing action achieves a highly dispersed distribution of active ingredients. The encapsulated flavors can then be used to create food products with improved shelf life, easy product handling, and more controlled release properties.

▷ TYPICAL SET-UP FOR THE PRODUCTION OF MEAT ANALOGUES



- 1 Vacuum system
- 2 Sack dump station
- 3 Vacuum receiver
- 4 Loss-in-weight screw feeder (powder)
- 5 Twin screw extruder ZSK
- 6 Liquid feeder
- 7 Cooling die
- 8 Cutting unit

Plant-based products are in demand for many reasons. Some people want to reduce the amount of meat they consume. Others see tofu and similar products as a useful addition to their diet. With today's extrusion technology it is now possible to produce meat-like products that have a fibrous, meaty structure, resulting in flavor and texture profiles similar to chicken, pork, beef or even fish. Coperion has cooperated with the German Institute of Food Technologies (DIL), Quakenbrück, Germany, for quite some time. One focus of the cooperation is the further development of high-moisture extrusion cooking of textured

protein concentrate into a vegetarian meat substitute. Within this process the moisture content exceeds 50% (up to 70% in individual cases), which is comparable with the moisture content of lean meat. The meat substitutes obtained through extrusion are semi-finished products that are then subsequently processed into different end products. Typical examples are fried nuggets, marinated chunks or salad toppings - all completely vegetarian but with a tasty meat flavor. The combination of vegetable and animal proteins (meat, poultry, fish, etc.) as base materials is likewise possible with high-moisture extrusion cooking.

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