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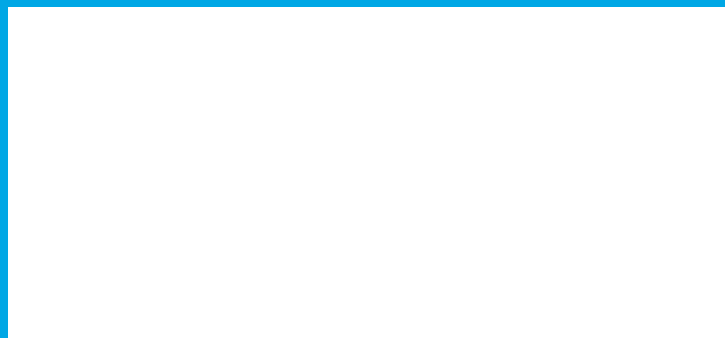
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A Macawber U.S. Group Company

ADVANCED PNEUMATIC CONVEYING SYSTEMS
CONTROLLED RATE INJECTION SYSTEMS
INFLATABLE SEAT VALVES

Your Local Distributor:

Product Safety requirements satisfy the
Directives of the European Commission.

ISO 9001

Company Management
Quality Certification
(parent company)



Pressure Vessel
Quality Assurance Certification

**Controlled Low Velocity**

pneumatic conveying & injection systems

Mactenn

Mactenn Systems

Mactenn Systems

Welcome to Mactenn Systems

Mactenn Systems is the European associate company of the Macawber Engineering USA Group of companies. Since its establishment in 1977 the Group has remained focused on its core technology to achieve a high level of expertise in Low Velocity Dense-Phase Pneumatic Conveying for fragile and abrasive bulk materials and advanced methods of Bulk Material Injection Systems for Pressure Processes.

Today, over 25,000 systems later, the Group has a worldwide reputation as a supplier of reliable and cost-effective systems for a wide variety of applications from lime to peanuts, coal to baby powder and everything in between covering every process industry involving bulk materials handling.

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Mactenn

System Performance and Reliability

Mactenn Systems' successful approach focuses on providing a system design most appropriate to each customer's unique requirements, while ensuring that an optimal systems performance and reliability is achieved at the lowest possible cost.

Total Materials Handling Solution Provider

Mactenn Systems expertise and experience lends itself to other areas in bulk materials handling and its product range now also includes complimentary products, such as mixers, weighing systems and inflatable seat valves, from single product supply to complete turnkey installations.

Markets

Each process industry has to consider a variety of industry or customer specific issues when choosing pneumatic conveying or injection equipment. With over 25 years of experience working around the world, with almost every type of process industry, Mactenn Systems brings a world of knowledge to share with every customer in each market division. In addition, Mactenn's product groups are designed to apply across a range of markets, being able to serve customers in the following industries:

- Basic Metals
- Chemicals
- Food/Pharmaceuticals
- Plastics/Resins
- Minerals
- Pulp/Paper
- Utility Power Plants
- Miscellaneous processes and applications

Quality, Manufacturing and Testing

The company has adopted ISO Management Quality Assurance procedure and in addition satisfies the conformity requirements of the European Directives for all machinery.

A common Group quality program implements the key quality controls that meet the requirements of all applications.

Manufacturing of our standard parts take place in our regional factories located in the USA, UK, China and Brazil.

Product testing can be carried out in a purpose-built test laboratory in which conveying circuits of up to 850 meters are installed.

Worldwide

Mactenn Systems activities are worldwide with close contact with other Macawber Group of companies in the United States, South America, India, Japan, China and Taiwan.

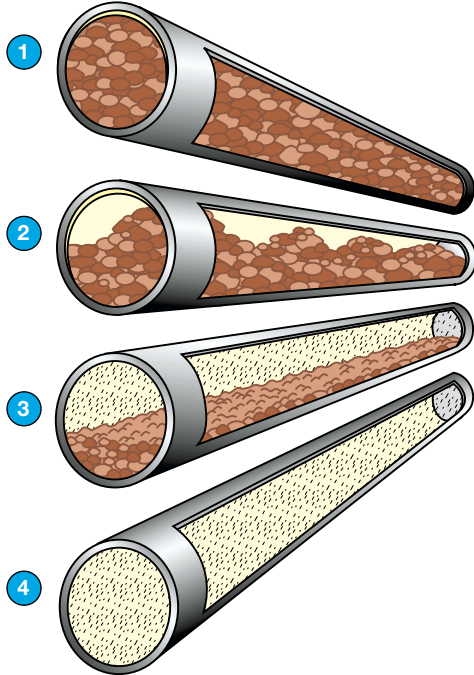
In most countries Mactenn Systems partner with associate companies with well established reputations for advanced bulk handling systems.



Understanding Pneumatic Conveying makes vital decisions much easier

Selecting the correct pneumatic conveying regime for your requirements is a vital decision for a successfully designed system.

Typical Conveying Regimes



- 1. Solid Dense Phase** - Very low material velocity, pipeline full of material - an excellent regime for fragile materials. Material velocity 1-2m/sec.
- 2. Dune Flow Dense Phase** - Low material velocity - with highline loading ... material moves in plug flow fashion - best regime for most applications in which power economy, pipe erosion, and material degradation issues are important. Average material velocity 1-5m/sec.
- 3. Moving Bed Dense Phase** - Higher velocity than dune flow dense phase, but much lower than dilute phase. Used for handling powders that can be fluidized. Average material velocity 3-7m/sec.
- 4. Dilute Phase** - Material velocity above the saltation velocity - no upper limit to the velocity - least attractive regime for operating economy - unsuitable for fragile or abrasive materials or materials with wide particle size distribution. Average material velocity >15m/sec. depending on material.

Almost all applications will benefit from a regime providing the heaviest pipeline loading and the lowest material velocity. The main benefits of low velocity pneumatic conveying are:

- Lowest air consumption and energy cost
- Little or no pipeline wear over very long periods
- Little or no degradation of fragile materials conveyed
- Small reception hopper filters
- Segregation of conveyed mixtures avoided
- No product spillage
- Environmentally acceptable



The Scientific Approach

Mactenn's philosophy is a scientific approach to design with unmatched innovation and experience. We realize that every system is different and each company has different needs.

Therefore, before we present any recommendations, we carefully review the two major issues of any bulk handling system: material characterization and the system design objectives.

The result? An optimized design for your individual needs, which addresses both technical and economic considerations, backed up with a wealth of experience.



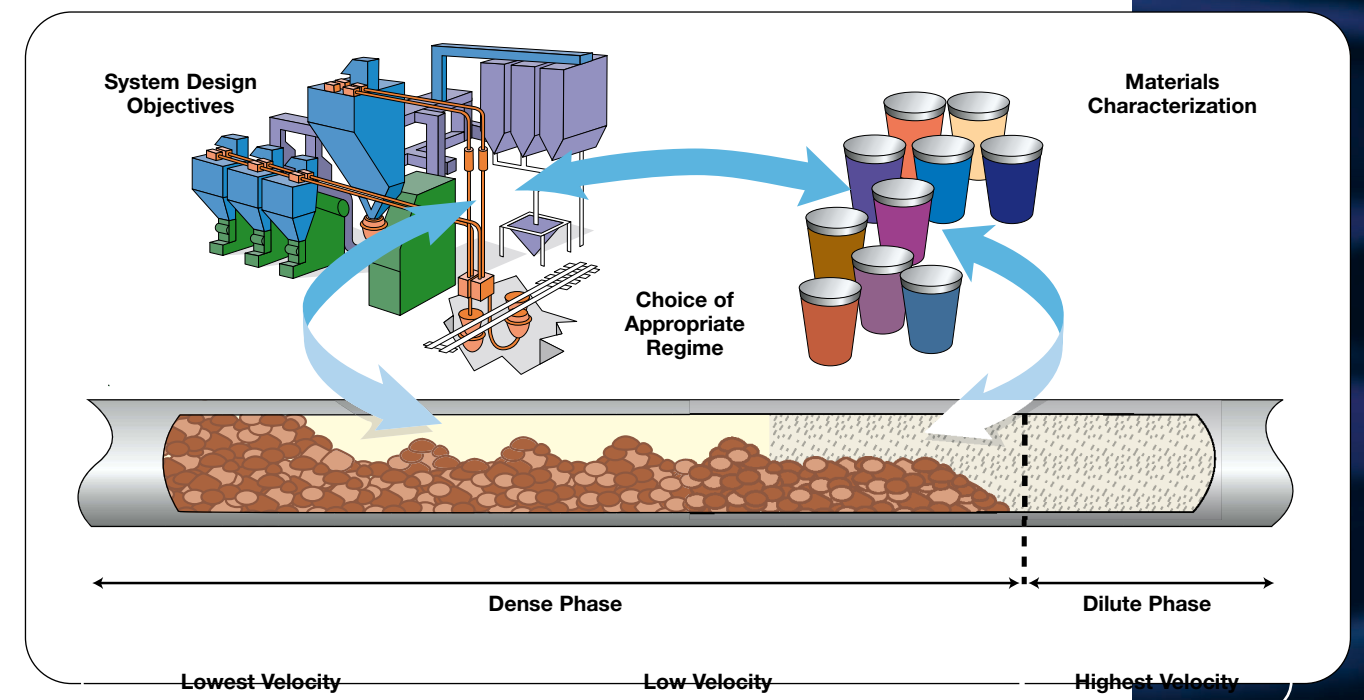
Considerations

Design Objectives

Transfer rate
Transfer or injection
Positive or negative pressure
Distance and conveying route
Feed consideration
Conveying medium type
Material integrity
Velocity / pipewear
Operating cost

Material Characterization

Particle size and distribution
Bulk density
Moisture content
Flowability
Chemistry
Abrasiveness
Friability
Temperature
Permeability



Technology Groups

Mactenn has developed a range of technology groups to reliably and economically satisfy a diverse array of market requirements.

The technology groups collectively respond to the entire spectrum of pneumatic conveying regimes and individually satisfy application-specific needs.

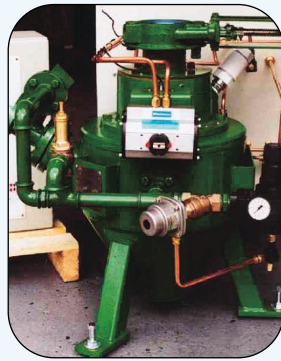


MAXFLO®

The ultimate system for handling difficult-to-convey materials; hot, abrasive, and wet materials; or for providing gentle handling of products to prevent degradation of friable materials or separation of blended materials.

MAXSANDFLO®

Designed specifically for dry sand conveying. The Mactenn Maxsandflo® is based on proven dense phase pneumatic principles. Air introduction, simplified system controls, and top discharge have been designed specifically for this use. The Maxsandflo® can be manufactured without custom modifications and sold "off-the-shelf" for fast, easy installation.



MINIMAXFLO®

A sensible alternative to high material velocity dilute-phase vacuum or dilute pneumatic conveying systems. High efficiency material transfer without material degradation is achieved in a very compact, low cost system. This is a perfect choice for low transfer rate requirements for fragile food or plastic materials.

MACPUMP®

A retrofit for conventional, screw pump conveying systems that reduces power consumption by half, and maintenance costs to almost nothing. Capable of conveying such materials as cement, lime, and fly ash at rates of 250 tonnes per hour up to distances of 2300m. The retrofit package is designed to be installed with the least amount of rework to the supply hopper and without change to the pipeline or the existing air source.



SUPERMAXFLO®

An important development of the Maxflo®, the Super-Maxflo® achieves a solid dense phase conveying regime for very low material velocities and little or no degradation of the most fragile materials, such as food products.

VARIFLO®

Low-cost, simple transfer systems for medium duty applications using a low pressure air source with a unique method of preventing pipeline blockages while maximizing conveying capacity. A unique approach for increasing transfer capacity in dilute phase pneumatic conveying systems.

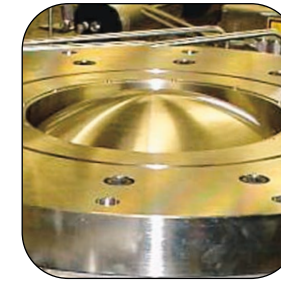
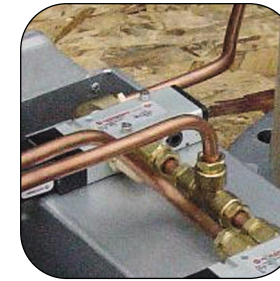
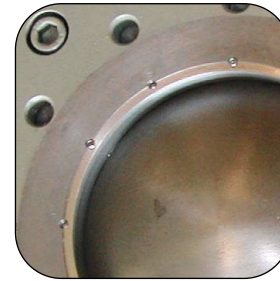


MULTIASHFLO®

Designed specifically for conveying hot, abrasive ash. The Mactenn Ash Conveying System will convey bottom ash, clinkers, or fly ash from boiler beds, baghouse, or electrostatic precipitators at temperatures up to 300°C, and may be arranged in multiples of one to ten units in a single line. Uses about 50% less power than existing fly ash conveying systems.

DOSAMATIC®

The Dosamatic provides accurate injection of powders and granular materials up to distances of 300m with flow accuracies of + 1%. Materials can be injected against high, varying back pressures without loss of accuracy and with smooth, unpulsed flow. 10:1 turndown is provided as standard.



The Incomparable Inflatek® Valve

The Inflatek® Valve is unique in its ability to close and seal in one action through a static or moving column of material.

Pressure tight sealing against a pressure differential is achieved with an inflatable elastomeric seal engaging the periphery of the dome component. The inflatable seal entraps particles preventing wear by erosion to the valve seat and seal. These advantages are maintained even through severe application conditions for abrasion, temperature and high pressure.

The Inflatek Valve is maintenance free with lubricated for life shaft bearings, and is rated at 1 Million cycles between inspections, virtually eliminating costly maintenance and down-time.

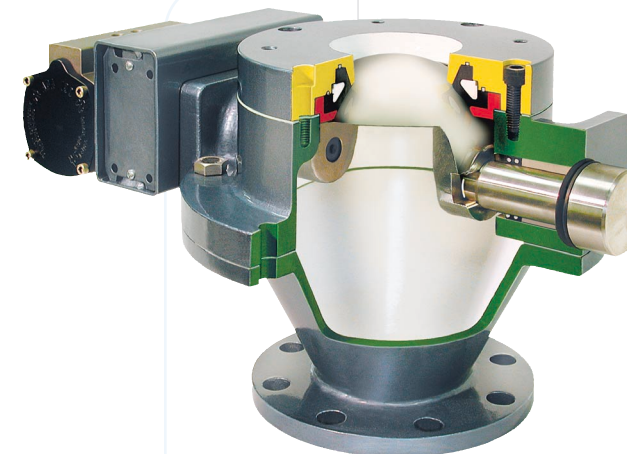
The Inflatek Valve is wear compensating.

Every Mactenn system is fitted with an Inflatek Valve to ensure operating reliability and system efficiency.

There are more than 30,000 valves in service throughout the world.

Standard designs available to 400mm and 7 barg performance, cast iron and stainless steel construction.

Special designs to 750mm and 7 barg.



Case Studies

Case Studies

BASIC DATA

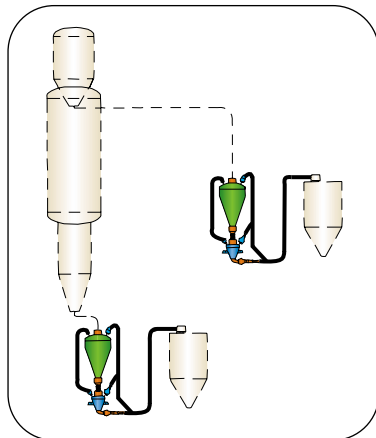
COARSE ASH

- 114/8 MultiAshflo® Systems
- 1500 kg/hour at 80m distance
- Operating pressure 2.5 barg
- Design pressure 6.8 barg
- Operating temperature 100°C
- Design temperature 300°C

ASH FINES

- 114/8 MultiAshflo® Systems
- 600 kg/hour at 80m distance
- Operating pressure 2.5 barg
- Design pressure 6.8 barg
- Operating temperature 100°C
- Design temperature 300°C

Shanghai Coking and Chemical Plants Wujin, China



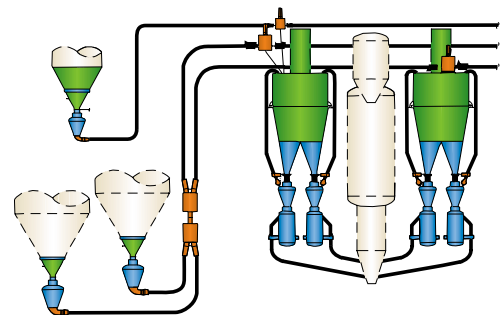
MARKET DIVISION

Combustion - Utility

PRIMARY APPLICATION OBJECTIVES

1. Ability to reduce pressure to atmosphere and convey ash at low velocity to a storage bin
2. Weigh and record all material conveyed to the bins
3. Low pipewear
4. Operate at 300°C for sustained periods of time

Each system received material from a cyclone collector which was operating at a 2.5 barg pressure. The ash was discharged by cooling screw into a pressurized surge vessel. The ash was gravity fed into the MultiAshflo® which had been pressurized to balance with the surge vessel. The MultiAshflo® then reduced the pressure to atmospheric conditions by venting the gas to an exhaust system. At this point the weigh system recorded the weight of ash in the MultiAshflo®, and the ash was conveyed by dense phase regime to a storage bin.



MARKET DIVISION

Combustion - Utility

PRIMARY APPLICATION OBJECTIVES

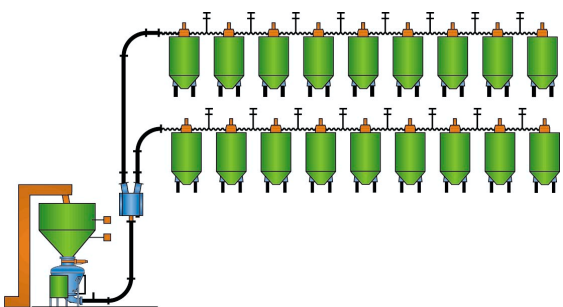
1. Controlled, adjustable accurate stable injection of fuel
2. Infinitely variable feed rate range up to 10:1 turn down from maximum rate
3. Accuracy of flow maintained regardless of process pressure variations
4. Operating reliability

Eight pressurized fluid bed gasifiers were installed to provide town gas for the city of Shanghai in China. Each gasifier was equipped with four feed points and operated at approximately 5.5 barg. The systems supplied were Dosamatic® fuel injection systems. Each system (32 in all) comprised a lock vessel and an injection vessel. The lock vessel enabled coal to be taken from overhead storage bins at atmospheric pressure and transferred to the injection vessel operating at 5.5 barg. The coal was injected on a continuous basis directly into the gasifiers. The systems met all primary objectives and are operating with a high degree of reliability.

BASIC DATA

- 32x50mm fuel injection systems
- Injecting 5mm coal into pressurized gasifiers
- 3.6 tons/hour
- 7m each system
- Ambient temperature

Hershey Foods H.B. Reese Division, Hershey, Pennsylvania, USA



MARKET DIVISION

Food and Pharmaceuticals

PRIMARY APPLICATION OBJECTIVES

1. Minimum damage to peanuts
2. Minimum peanut meal accumulation
3. Operating reliability
4. Elimination of spillage

Peanuts have traditionally been conveyed using mechanical systems. However, these systems cause spillage and accumulation of peanut meal requiring a high level of maintenance. The pneumatic conveying system had to produce degradation results equal or better than the mechanical system of at least less than 3%. The system supplied was the SuperMaxflo® which is the solid dense phase method of conveying. The velocities produced were extremely low, and all turbulence and agitation was eliminated. The system completely eliminated spillage and meal accumulation and provided degradation levels of less than 2%.

BASIC DATA

- 1x125mm low velocity SuperMaxflo® system
- 18 reception points
- 12 tons/hour - 42m
- Whole shelled peanuts
- Ambient temperature

ACE Hardware Matteson, Illinois, USA

MARKET DIVISION

Chemicals

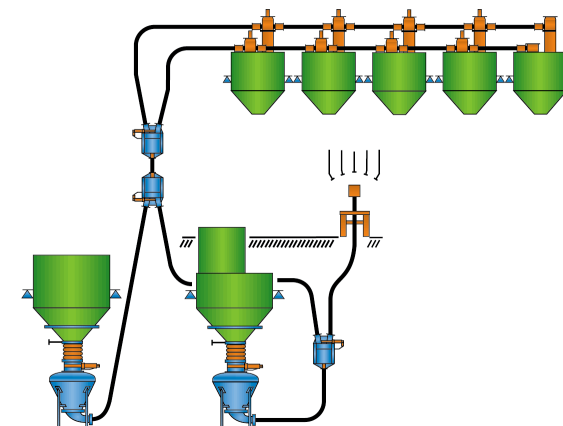
PRIMARY APPLICATION OBJECTIVES

1. Operating reliability
2. Accurate weighment
3. Low operating cost

A loss-in-weight batch weighment control was provided at each Maxflo® transfer unit. Any of six different materials were introduced to the system for pre-weigh and transfer to any of six receiving bins. TiO₂ is an unusual material which exhibits cohesive characteristics from its grain shape even when dry and apparently free flowing.

BASIC DATA

- 2x150mm low velocity Maxflo® systems
- 6 reception points
- 25 tons/hour - 210mm
- Titanium Dioxide (TiO₂) and other materials
- Ambient temperature



China Cement Hong Kong, China

MARKET DIVISION

Minerals

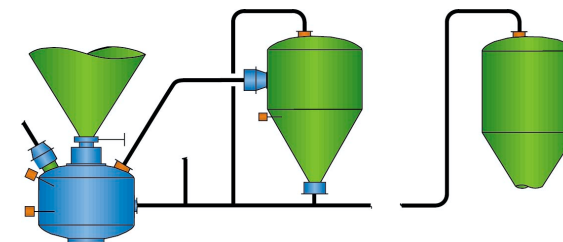
PRIMARY APPLICATION OBJECTIVES

1. Retrofit existing screw pumps re-using existing pipelines and air supply
2. Reduce energy consumption
3. Reduce maintenance costs
4. Optimize conveying rate

Each material was handled by Macpumps® using a horizontal configuration. The Macpump® transfer vessel was located below the modified existing feed hopper. The material was transferred to the Macpump® dispensing vessel which was adjacent to the transfer vessel and connected into the existing pipeline. The Macpump® saved between 100 kw and 200 kw per system for a total saving of 1300 kw.

BASIC DATA

- 3x200mm Fly ash Macpump® Systems
- 3x300mm Cement Macpump® Systems
- 2x300mm Cement/fly ash mixture Macpump® Systems
- Operating temperature ambient (material) 115°C (air)
- Fly ash 50 tonnes/hour - 290m
- Cement 140 tons/hour - 300m
- Cement/fly ash 140 tonnes/hour - 520m



Garware Polyester Waluj, Aurangabad, India

MARKET DIVISION

Plastics and Resins

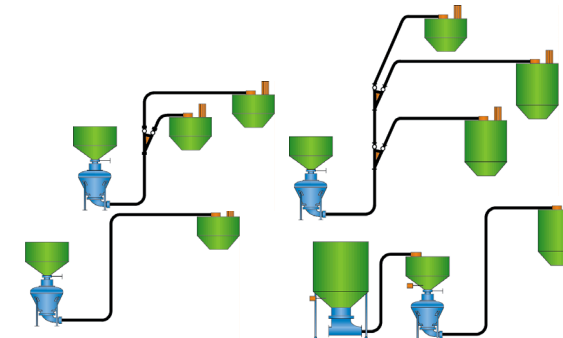
PRIMARY APPLICATION OBJECTIVES

1. Minimum particle size degradation
2. Operating reliability

Garware were very concerned about destruction of the polyester pellet in their new expansion program. The ten systems represented a major investment in upgrading and expanding their production process. In each, particle degradation was negligible, and all contract objectives were achieved.

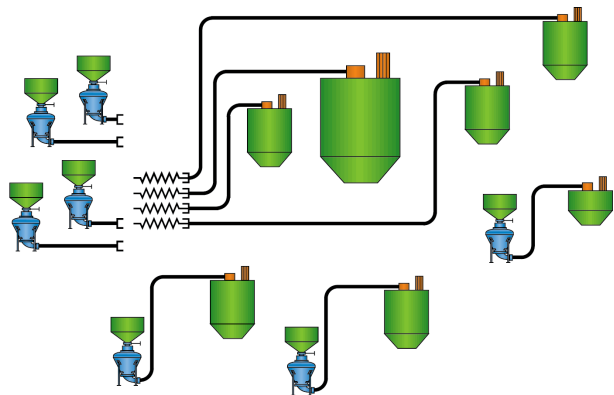
BASIC DATA

- 10x100mm low velocity Maxflo® systems
- 2 to 4 reception points
- 5 to 10 tons/hour - 60m
- Polyester pellets/powder
- Ambient temperature



Note: With the exception of installation references in Europe and India the installation references stated in this manual are those of our parent company in the USA.

B.F. Goodrich Oevel, Belgium



MARKET DIVISION

Plastics and Resins

PRIMARY APPLICATION OBJECTIVES

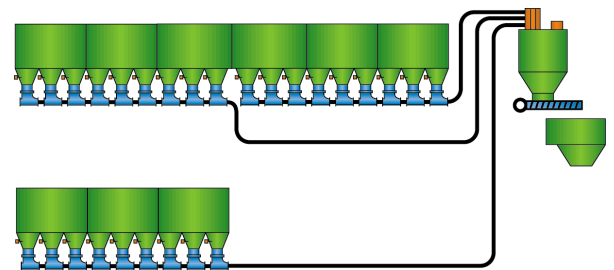
1. Operating reliability
2. Low energy cost

B.F. Goodrich required absolute system performance and operating reliability. The customer researched specialist vendors on two continents for this important expansion to their facilities. The resin powders exhibited unique characteristics, and experience with this material became a fundamental requirement. All systems were installed on time to specification and performed as required.

BASIC DATA

- 7x100mm low velocity Maxflo® systems
- 2 to 4 reception points
- Resin powders

U.S. Pipe and Foundry Birmingham, Alabama, USA



MARKET DIVISION

Combustion - Industrial

PRIMARY APPLICATION OBJECTIVES

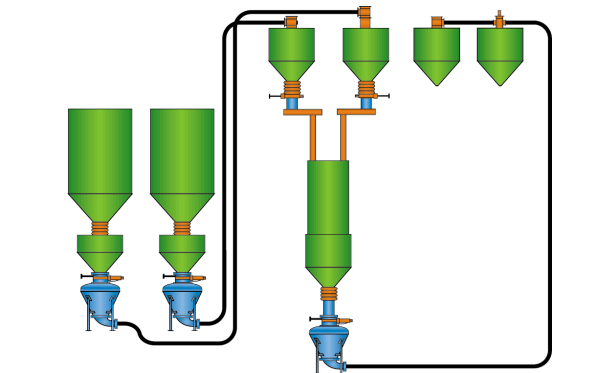
1. Low operating cost
2. Operating reliability

Minimal headroom and extreme operating reliability is the prime design feature of the MultiAshflo®. In this case, the collected dust from a very large baghouse was required to be transferred to a single day bin for subsequent treatment. The MultiAshflo® is less than 1 meter high, allowing small baghouse support structures. The operating regime of the system prevented dust re-entrainment into the gas flow.

BASIC DATA

- 27x100mm MultiAshflo® low velocity units
- 3 independent systems
- 1850 kg/hour - 90m
- 180°C
- Baghouse dust (cupola) with 5% moisture

Allen Sugar Cleveland, Ohio, USA



MARKET DIVISION

Food and Pharmaceuticals

PRIMARY APPLICATION OBJECTIVES

1. Minimum particle size degradation
2. Low operating cost

Allen Sugar required the most modern handling system for fragile granular sugar and dextrose without any change to the product grain size or shape. Exacting degradation limits were established for pre-contract engineering. The system satisfied all objectives with negligible degradation of the sugar granule or the dextrose material.

BASIC DATA

- 3 low velocity Maxflo® systems
- 3 low velocity Maxflo® systems
- 2 to 5 reception points
- 12-30 tons/hour - 80m
- Sugar, dextrose and sugar dextrose blend
- Ambient temperature

Emmy Building Products Athens, Greece

MARKET DIVISION

Minerals

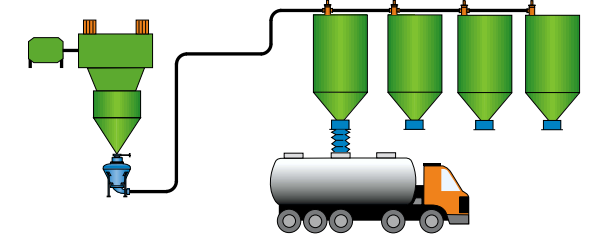
PRIMARY APPLICATION OBJECTIVES

1. Reliable operation
2. Minimal maintenance

The Maxflo was a direct retrofit of a dilute phase system. The system was required to transfer a building product powder from the mixer into a silo storage. The conveying vessel of the unsuccessful system remained in place and acted as a feed hopper to the Maxflo.

BASIC DATA

- 1x342/12-5 Maxflo
- 210m distance
- 14 tons/hour
- 125mm pipeline
- Average transfer velocity 5 metres/sec



LondonWaste London, England

MARKET DIVISION

Combustion

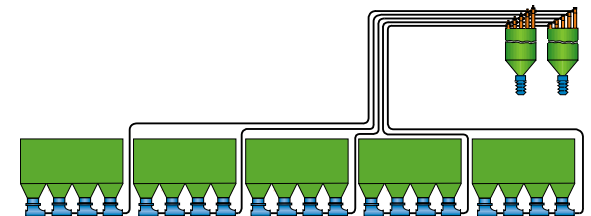
PRIMARY APPLICATION OBJECTIVES

1. Extreme reliability
2. Low power cost
3. Minimal maintenance

LondonWaste is one of Europe's largest garbage fired power stations. Operating reliability and economic operation is a 24/7 demand. The 5 MultiAshflo systems installed to handle household garbage fly ash were installed to retrofit previously unsuccessful handling system and all objectives were satisfied.

BASIC DATA

- 5 x 42/8-4 MultiAshflo systems
- 5 x 300m distance
- 5 x 10 tons/hour
- 100mm pipeline
- Average transfer velocity 6 metres/sec



Brunner Mond Northwich, England

MARKET DIVISION

Chemicals

PRIMARY APPLICATION OBJECTIVES

1. Minimum particle size degradation
2. Operating reliability

Customer manufactures sodium bicarbonate which is used for a wide range of individual and consumer products. The quality of the product depends upon the consistency of the particle size distribution with a severe limit on fines content. To satisfy these requirements, low material velocity is required, which was achieved by the Maxflo® system.

BASIC DATA

- 1x125mm low velocity Maxflo® system
- 1 reception point
- Sodium bicarbonate
- Ambient temperature
- 22 tons/hour

