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Bombay Convention & Exhibition Centre
Mumbai, India

POWDER & BULK SOLIDS INDIA 2015
EXHIBITION & CONFERENCE

Your one stop event for material handling and processing

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ORGANIZER – CONFERENCE & WORKSHOPS
Vogel Business Media

FOR MORE INFORMATION PLEASE CONTACT:
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Who offers what?

It might be true that belt conveyor design and engineering is not as complex as rocket science. However, it is also true that the design of a reliable and efficient conveying system is not a trivial job. To keep up-to-date with the latest developments in conveyor technology is, therefore, extremely important – just the knowledge of the right expert for a particular conveying ask.

To provide a general survey of what is going on in bulk materials handling technology is the primary purpose of the regular issues of “bulk solids handling”. To present a more concise overview of who offers what in conveying technology is the goal of this special issue – the “Conveyor Technology Guide”, which is also available for download on our newly designed website www.bulk-solids-handling.com.

Marcel Dröttboom Wolfgang Geisler
mdroettboom@woma-media.com wgeisler@woma-media.com

News, pictures and product information – always current, always to the point and 24/7 available. Have a look at bulk solids handling on your smartphone.

mobile.bulk-solids-handling.com
POWX is the premier event in Russia which is solely devoted to bulk solids and powder technologies for processing valuable primary and secondary raw materials. POWX 2014 covers all technologies regarding material handling and transportation, storing, screening, drying, sorting, filtration, separation, breaking, milling and packaging. The trade fair and the conference connect the best Russian and international experts of the industry at Moscow’s Central Fairgrounds. If you are interested in exhibiting at POWX2014 or participating in the conference, please contact our sales team @ OWP International: (phone) +49 (0)911 / 50711 - 150 (fax) +49 (0)911 / 50711 - 250 (email) info@powx-russia.com

www.powx-russia.com

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ASGCO Manufacturing, Inc.
Complete Conveyor Solutions

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Web: www.asgco.com

Productive, Safe & Reliable Complete Conveyor Solutions

ASGCO “Complete Conveyor Solutions” founded in 1971 and headquartered in Allentown (PA), USA, is a leading global manufacturer and service provider of proprietary bulk conveyor components and systems. We use proven products, practical engineering and turn-key service solutions to increase conveyor efficiencies and production capabilities while improving safe work environment.

ASGCO is a diversified and innovative company with six major divisions that serve specific targets of the material handling industry. We market innovative products and services through selected distributors, joint ventures, and representatives worldwide. The growth of the company, over the years, is due to recognized improvements in the productivity of our customers operations, and to these essential attributes:

- Develop productive cost effective and technologically advanced safe and reliable products specifically for the bulk material handling industries to optimize conveyor performance.
- Provide assistance to customers that require specific application advice, customized product or fabrication, surveys, recommendations, certified CAD drawings – all aimed at providing solutions that can be pragmatically implemented. From installation through on-going services, we can provide a tailored maintenance program, ensuring that cost savings and benefits are continuous.
- Establish a national and international network of local distributors that are selected based on their expertise in the conveyor material handling industry and their commitment to 24/7/365 customer service that provides our customer base of end-users and OEM’s the best products and services available.
- Actively continue to provide our distributors and customers with conveyor-training programs that help with an overall safe and efficient performance of their conveyor systems.
- Maintain a safe working environment for our employees and a culture that is open to new ideas and develop and retain employees that demonstrate the ability to excel.

TOTAL SATISFACTION GUARANTEE – Our (TSG) policy will insure that our products and services have performed above and beyond your expectations. We have built our reputation for retaining and growing our customer base by solving complex application problems using our expertise, innovative products and exceptional service. We ensure that your conveyor systems will run more efficiently, providing a rapid return on investment.

Core Competence

- Belt Conveyors, Conveyor Belt Cleaners, Chute Design, Conveyor Belt & Training Idlers, Belt Conveyor Transfer Points.
Benetech, Inc.
2245 Sequoia Dr. Suite 300
Aurora, Illinois 60506, USA
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Fax: +1 (630) 844 0064
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Web: www.benetechglobal.com

Igori ne Solutions for the Handling of Bulk Solids

Established in 1983, Benetech is a pioneer in dust mitigation and bulk material handling. Initially focused primarily on dust suppression, Benetech quickly became respected as the premier provider in the United States. As client relationships grew, Benetech’s expertise was called upon to handle a variety of bulk material handling issues. This natural progression led to a company initiative to provide a complete line of products and services.

Thru two acquisitions and the building of “best-in-class” divisions for Dust Collection, Advanced Transfer Systems, Washdown Systems and Suppression, Benetech has become the only EPC with in-house engineering, equipment, manufacturing, research, chemical productions and field service capabilities.

Benetech’s Total Dust Management (TDM®) product line represents a comprehensive range of technologies and services for handling all aspects of bulk material handling. Our TDM offering allows us to take a unique approach when finding the best solutions for a facility. Rather than focusing on one technology, we focus on the right combination of technologies. With over 30 years of bulk material handling experience, our TDM approach assures each client’s individual needs are met.

Benetech’s Comprehensive Solutions include:
- Asset Optimization and Safety Audits
- Engineered Transfer Systems
- Dust Suppression
- Washdown System
- Wet Dust Extraction
- Conveyor Containment
- Conveyor Components
- Engineering Services
- Housekeeping/Maintenance

As a global leader in bulk material handling solutions, Benetech is currently represented in North and South America, Asia and The United Kingdom.

Headquartered in Aurora, Illinois, Benetech has manufacturing facilities in Marmet, WV, Marshall, TX, Hazelwood, MO, Cheyenne, WY, Montgomery, IL, Vitoria Brazil and Kaohsiung, Taiwan.

A full service engineering department located in Aurora, IL supports the design and application of our products and equipment systems. Benetech also maintains product research and development facilities in Montgomery, IL.

Core Competence

- Conveyor Belt Components, Transfer Systems, Dust Suppression, Washdown Systems, Dust Collection
BEUMER Group GmbH & Co. KG
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Fax: +49 2521 24 28 0
E-Mail: beumer@beumergroup.com
Web: www.beumergroup.com

BEUMER offers Sustainable Systems

The Beckum (Germany)-based BEUMER Group with affiliations around the globe develops customised system solutions that provide increased efficiency in the bulk material and cement industry. With the integration of Enexco Teknologies of India, the BEUMER Group strengthened its presence in the cement industry in one of the most important future markets. Manageable growth, global market presence and a large range of products in the conveying, loading, filling, palletising, packaging segments, as well as sortation and distribution technology, ensure the long-term success of the company. The BEUMER Group employs about 3,700 people and achieved 2013 an annual turnover of about 627 million EUR. BEUMER offers comprehensive service for all product lines. In all developments, the Group focuses on sustainability. To evaluate the sustainability of its machines in a continuous, systematic and verifiable way, the single-source provider developed a validation system called the BEUMER Sustainability Index (BSI).

To ensure when making products the consistent quality of the raw materials used, BEUMER handles the complete engineering work on blending bed equipment. In addition, the system supplier designs stackers and bridge scrapers.

Depending on the requirements, BEUMER provides open troughed belt conveyors for higher throughput, larger mass flows as well as larger curve radii, and closed Pipe Conveyors for slight routing and products that need to be protected against environmental stress. In order to load bulk materials quickly and without dust in bulk transporter vehicles or bags, BEUMER offers bulk loading heads and loading systems for trucks, ships and wagons.

BEUMER has expanded its product portfolio with the BEUMER fillpac for filling bulk materials in bags. Thus, the single-source provider is offering equipment and systems for packaging lines from one source. An electronic calibration weighing system guarantees the weight accuracy of the bags and excludes rejects caused by too high or too low filling weights.

The layer palletiser series BEUMER paltpac® palletises these bags to accurate and stable stacks. This enables easy storage and ensures secure conveyance to the packaging system downstream. On top of this, BEUMER has developed and designed from scratch a new machine from the BEUMER stretch hood® model range. Our specialists analysed various components and optimised them in terms of function, arrangement and ergonomics.

Core Competence
- Curved Troughed Belt & Pipe Conveyors, Apron Conveyors, Bucket Elevators, Alternative Fuel Handling Technology, Bag Loading
Conveyor Dynamics, Inc. (CDI)

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E-Mail: cdi@conveyor-dynamics.com
Web: www.conveyor-dynamics.com

A Leader in the Design of Belt Conveyors and Transfer Chutes

Incorporated in 1981, CDI is recognized internationally for its pioneering work in dynamic analysis and rubber based power predictions. It has numerous publications, and patents to its credit, and projects in over 30 countries and 5 continents.

CDI twice broke the world record for longest single flight trough conveyor: first in Zimbabwe in 1996 (Zisco mine, 15.6 km), and then in Australia in 2007 (Curragh mine, 20.3 km). This year CDI will break the record again in South Africa, when it commissions a 27 km conveyor for Sasol. CDI has been involved in the design of over 87 km of pipe conveyors, including an 8.1 km single-flight 5000 t/h pipe conveyor.

CDI is a technology driven company combining expertise in mechanical and control systems with extensive field experience. This enables CDI to take a global approach to conveyor design stressing reliability, low capital costs, control simplicity, flexibility and expandability. CDI also develops, uses, and sells the most sophisticated conveyor analysis software in the industry, and produces advanced tachometers and data acquisition systems.

CDI has long term agreements with many EPC and equipment suppliers around the world, including Australia, China, Germany, India, South Africa, the Americas, and Russia. It supplies owners, operators, and our partners with numerous services, including:

- Feasibility studies, route selection and optimization
- Overland, horizontally curved, regenerative, bi-way conveyors
- Static and dynamic analysis of trough and pipe conveyors
- Low rolling resistance technology and belt rubber rheology test
- Conveyor component design (pulleys, chutes, brakes or splice)
- Holdback loadsharing devices
- Lightweight ground based and elevated conveyor structures
- Control logic and PLC / DCS programming
- Fully automated stacker, reclaimer, and wagon loading controls
- Soft-start and -stop controls for head, tail and booster drives
- Brake controls and hydraulic system design
- Commissioning and field testing

Forensic Engineering

- Failure analysis (e.g. drive, reducer, splice, pulley, holdbacks)
- Conveyor design verification

Transfer Chutes, Bins, and Feeders

- Geometry optimization using Rocky Discrete Element Modeling (DEM) package
- Expertise in highly cohesive and adhesive materials

Core Competence

- Trough and Pipe Conveyors, Transfer Chutes, Control Systems, Forensic Engineering, DEM Analysis with material calibration

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Company Presentation

Conveyor Technology Guide 2014/2015

www.conveyor-dynamics.com
Dos Santos International (DSI) is founded on our extensive worldwide experience in sales, engineering and construction of bulk materials handling systems and equipment. This has included major contributions that have expanded the range of bulk handling and transport solutions. Most notably advances in sandwich belt high angle conveyors have led to their worldwide utilization. The company’s expertise spans a wide range of materials handling systems and equipment.

**High Angle Conveyors**
Dos Santos International is the world’s foremost authority on high angle conveyor applications and design of sandwich belt type high angle conveyors. DSI is the ideal consultant and supplier for this technology. We offer the Snake Sandwich Conveyor, the most reliable and economical solution for your steep angle and vertical high tonnage conveying requirements.

**ExConTec Analysis**
At Dos Santos International we have developed the “Expanded Conveyor Technology,” a comprehensive approach, extending the conventional conveyor technology beyond its currently perceived limits. This has proven successful and especially advantageous in analysis of complex curving conveyors and high angle conveyors.

Our in-house analytical techniques and computer software facilitate our complete belt tension and power analysis of the most complicated conveyor systems under steady state running, starting, stopping and other transient conditions.

**DSI Sandwich Shop**
The DSI Sandwich Shop was first developed for quality control related to the DSI Sandwich Belt High Angle Conveyors. Too often, end users were replacing original parts with non-conforming replacement parts, often on the bad advice of unqualified suppliers. This was to the detriment of the equipment and its performance.

To ensure the continued intended performance, DSI formed the Sandwich Shop from which end users could buy authentic DSI specified replacement parts. This has been a resounding success and the product line has expanded to stand alone subsystems that are useful at conventional belt conveyors as well.
Company Presentation

Moving beyond Conveying

FLSmidth’s experience and know-how meets all your expectations in the design and supply of major material handling systems worldwide. Its rich heritage of products, brands and expertise has helped pioneer and even dominate the cement and minerals landscape for over a century. Now combining its strengths with proven material handling technologies from the well-known and reliable brands of KOCH®, MVT™, RAHCO®, CONVEYOR ENGINEERING™, KOVAKO®, and MÖLLER®, FLSmidth has created an unmatched portfolio of accomplishments.

FLSmidth is your one source for mechanical and pneumatic conveying equipment including KOCH Pipe Conveyor®, mobile material handling solutions, in-pit crushing and screening, stacking and reclaiming, port facility, stockpiling equipment, and dry tailing management systems. FLSmidth BulkExpert™ automation technology has allowed the unmanned and optimized operation of any type of stacker/reclaimer on the market, as well as a very efficient and accurate inventory management system.

A complete line of equipment
Delivering a complete line of reliable material handling equipment combined with optimal efficiency in manufacturing and operation and the highest possible degree of customization in conceptual planning and design, means you get the right solutions designed to your demanding requirements. You also benefit from enhanced performance, increased energy efficiency and safety, while helping to reduce emissions and operating costs.

Worldwide presence
FLSmidth maintains strong customer relationships through its technology centers and regional sales offices located throughout the world. The company employs over 14 000 employees worldwide and is known locally in many countries with technical sales, customer services, and support staff located throughout Europe, North and South America, Africa, Russia, the Middle East, India, China and Australia.

A global procurement strategy allows FLSmidth to source equipment and materials competitively, creating more opportunities for cost reduction and optimization of your project schedules.

When selecting FLSmidth as your partner, you also bring this solid foundation and over a century of experienced support to your business. Let FLSmidth help you tackle your specific challenges for your next material handling project.

Core Competence
- Stacking/Reclaiming, Belt/Pipe Conveying, Ship/Barge/Train Loading/Unloading, Feeding, Integrated automation solutions
CleanScrape – innovative belt cleaning to enhance your profits

Conveyor belt scrapers typically work at a 90 degree angle to the belt surface. They frequently need adjusting and a lot of spare parts. The novel belt scraper CleanScrape developed by IBS Industriemaschinen-Bergbau-Service GmbH in Germany instead adopts a diagonal positioning. It is far more efficient, cleans the belt evenly and doesn’t need spare parts.

Features
- Optimum cleaning results
- Simple installation
- Removed material returns to main flow
- Low wear to the belt
- Low wear to the cleaner
- Suitable for all belt speeds
- Suitable for use with all types of mechanical joints
- Long life expectancy
- Low maintenance
- Low life-cycle costs
- Available with stainless steel installation kits
- Suitable for use in explosive atmospheres
- Suitable for use with reversing belts

Efficient, low-maintenance, safe – The patented primary belt cleaner CleanScrape Primary (CSP) is installed diagonally across the discharge pulley and forms a three dimensional curve. The cleaner incorporates a matrix of tungsten carbide scrapers and is tensioned against the belt. Despite an extremely low contact pressure between belt and cleaner, 85% to 95% of stuck material is removed.

Applications can be found in mining (coal, salt, etc.), coal handling facilities, power plants, cement works, quarrying, concrete plants, recycling or waste incineration plants as well as in the metallurgical and chemical industry.

Since 1971 IBS Industriemaschinen-Bergbau-Service GmbH has been offering equipment for the mining and tunneling, and the bulk goods industry, since 1994 under the name IBS. Sales, development and production of high-quality products “made in Germany” can be found under one roof.

CleanScrape: Winner of the Australian Bulk Handling Awards 2013!
Belt conveyor station at the Garzweiler open pit lignite mine in Germany.
Company Presentation

Martin Engineering

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E-Mail: info@martin-eng.com
Web: www.martin-eng.com.com

Martin Engineering – Global Leader in Innovation

Established in 1944, Martin Engineering is the leading international developer, manufacturer and supplier of innovations to make bulk material handling cleaner, safer and more productive. Martin offers technologies that boost flow, reduce dust and spillage, extend component life and reduce downtime, resulting in improved operating environments and increased profitability.

Our Global Team of experts from every part of the world, work together to produce and manufacture high quality products that deserve the Martin seal of approval. Our service technicians average 27 years of experience in bulk material handling. Our product engineers and development teams work side by side with our sales and service leaders to share innovative ideas within our corporate community around the globe and to help facilitate the development of new products that make bulk material handling cleaner, safer and more productive worldwide. This experience and expertise made Martin Engineering the leader in bulk material handling solutions.

Martin Engineering has a reputation for high-quality products and skilled, dedicated employees. But more importantly, we have a reputation for partnering with our customers to develop solutions that best suit their problems and make their jobs easier. Our Certified Conveyor Technicians are in the field working side by side with our customers and see firsthand what the issues are and how best to provide the solutions for their individual problem.

Because we work so closely with our customers, we know firsthand what the problems are, not just by industry but by individual plant. Our technicians then provide this information to our Product and Development team who work continuously developing new technologies that enhance and improve our current products while always thinking ahead to develop advanced technologies that will provide new solutions.

Developing strong relationships with our customers is the only way to maintain that knowledge base which continues to feed innovation in Research and Development and provide unique, practical solutions to age-old problems.

Martin Engineering is headquartered in Neponset, IL with business locations include Mexico, Brazil, China, France, Germany, United Kingdom, South Africa, Turkey, Indonesia, India, Canada, Australia, Japan, Chile and Colombia.

Problem Solved.™

Core Competence

► Belt Conveyor, Vibration, Belt Cleaner, Bulk Material, Air Cannon
Great Belt Conveyor Design and Engineering Support

Consulting
Associates of Overland Conveyor Co are totally dedicated to understanding and designing reliable bulk material handling belt conveyors. The more difficult the application, the better we like it.

Headquartered in the USA since 1996, we serve all mining and belt conveyance industries throughout the world.

Core competencies include general design principals of moving bulk materials between two points on an endless belt. Whether your application can be done conventionally or is best served by a non-conventional approach, our unbiased engineers can find the best solution and most importantly, provide the best advice.

We understand every component and sub-system that makes up a conveyance solution. Services span from budgetary studies to conceptual design to manufacturing and commissioning to improving system or component availability to root cause failure analysis.

Our "Applied DEM" division was formed in 2003 to bring advanced Discrete Element Modeling (DEM) technology to all conveyor engineers. http://applieddem.com/

Software
Our company requires the best design tools possible. We know ours are the best because we develop them ourselves and spend considerable time every day making them better. These same tools used to design the biggest conveyors in the world are available to everyone.

Belt Analyst™ is a general purpose workhorse for all belt conveyor professionals. Calculate power requirements and size components. Design from scratch, upgrade equipment or solve problems.

Dynamic Analyst™ is a high end, flexible body simulation tool for analyzing conveyor controls for the most critical transient conditions of stopping and starting belt conveyors. This tool has become a necessity for engineers designing long or high capacity conveyor.

Bulk Flow Analyst™ simulates the flow of bulk materials through transfer chutes using DEM. Identify and eliminate plugging, spillage, impact and wear points before cutting any steel. The most effective way to insure the most critical areas of loading and unloading are optimized to be as safe and effective as possible.

Core Competence
- Belt Conveyor Design
- Transfer Design
- Conveyor Design Software
- Discrete Element Modeling
- Pipe Conveyors
Specializing in Maximizing Conveyor Uptime

**Conveyor Pulley Specialist**

RAS is a global leader in the design and manufacture of engineered class conveyor pulleys. Using our proprietary P-Flex software and over 40 years of experience, we design and manufacture pulleys for the world’s highest tension applications and most demanding climates.

From Mongolia and Chile, to Indonesia, Canada and Sweden, RAS has supplied engineered class pulleys for clients all around the world.

**Flexible Design Means Infinite Life**

The key to our success is focusing 100% on flexible design principals and a complete understanding of dynamic pulley loads and how they relate to each component. Rigid design pulleys that are commonly manufactured in today’s marketplace often lead to high localized stresses and therefore downtime caused by broken shells and shaft fretting corrosion failures. The RAS infinite life design evolves within P-Flex, our in house engineering program developed for pulley design, estimating, manufacturing and ISO 9001 quality management.

P-Flex focuses on actual material properties and locking device bending moments, while checking both peak and running conditions in real time. We engineer flex into homogenous areas, where static and alternating stresses can easily be handled. The net result; a lighter, stronger, cost effective, fully engineered infinite life pulley that utilizes modern technologies to increase your uptime.

**Product Lines**

You can count on RAS for Engineered Conveyor Pulleys, Apron Feeder Head Shaft Assemblies, Take Ups, Bearing Assemblies, Couplings, Keyless Frictional Locking Devices and Standard Pulleys. As well as being your team member from the design phase right through to installation and after sales service.

**Our Future**

We recently engineered and manufactured the first gearless drive pulley to be commissioned in over 20 years and have already designed ST 10000 pulleys.

On February 1st 2014 we opened the doors of our new 5000 square meter manufacturing facility to keep up with industry demands for higher tension pulleys.

**Core Competence**

- Conveyor Pulleys, Apron Feeders, Take-ups, Bearings, Keyless Fittings, Drive Couplings, Design

R.A.S. Industries Ltd.
Conveyor Pulley Manufacturing

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E-Mail: info@RASpulleys.com
Web: www.RASpulleys.com
World Class Weighing Solutions

Rice Lake Weighing Systems is an international leader in the manufacture and distribution of weight-related products and process-control equipment. Since 1946, Rice Lake has planted its roots firmly in the principles of quality and customer service. Progressive new technologies merge with the wisdom of industry experience to create the future of weighing through cutting-edge research and design. Today, Rice Lake offers over 35,000 weighing, control, data collection and communication products with over 40,000 items in stock. Additional products manufactured and/or distributed by Rice Lake include the highest quality belt scales, bench, crane, counting, and floor scales, remote displays, balances, printers, junction boxes and hardware. Rice Lake’s corporate headquarters, metrology laboratory and main manufacturing plant are located in Rice Lake, Wisconsin with support facilities throughout the world including North America, South America, India, and Europe (The Netherlands).

Broadening our Technological Base

In 2013, the European division, Rice Lake Weighing Systems Europe B.V., acquired Dutch belt-scale manufacturer Master Engineering. Known for being a key systems and solutions provider of static and dynamic weighing (belt scales) throughout the Netherlands and Belgium, Master Engineering’s progressive technology provided durable, reliable, and efficient solutions for various weighing applications. Now, Rice Lake Weighing Systems offers a broad delivery program of Master belt scales, streamlining the same durability, reliability and efficiency customers have come to know and trust.

Currently located in Heteren, Rice Lake Weighing Systems Europe B.V. is expanding its European customer base by offering six different models of Master belt scales in addition to its already expansive line of European customer base by offering six different models of Master belt scales in addition to its already expansive line of weighing equipment and process-control solutions. From the mining, food, recycling, or chemical industry to steel, animal feed, and compost production, Rice Lake Weighing Systems guarantees quality weighing solutions for your specific application.

To be the Best by every Measure

Rice Lake continues to be dedicated to being the best by every measure, from community involvement to global commitment, and the promotion of ethical business practices that represent the values of their customers, employees, and company.

Core Competence

- Belt Scales, Batching Systems, Dosing Systems, other Weighing- and Process Control Equipment
Rulmeca Holding S.p.A.

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Phone: +39 035 4300 11 1
Fax: +39 035 5457 00
E-Mail: rulmeca@rulmeca.it
Web: www.rulmeca.com

Leading Manufacturer of Rollers, Pulleys & Components

RULMECA is a family owned, worldwide Group of Companies, with headquarters in Italy, specialising in the development, production and sales of belt conveyor rollers/idlers, motorized pulleys, fabricated pulleys and other components for the worldwide bulk handling industry. RULMECA have been working since 1962 with conveyor components for the bulk handling industries and today as a global market leader in rollers and motorized pulleys.

Rulmeca are working internationally with leading OEM’s, Engineering Companies and End Users Groups in the major applications within the handling of bulk materials such as coal and lignite mining, cement, quarries, tunnelling, power plants installation, ports, salt and fertilisers, sugar plants, recycling and demolition, crushing and screening etc...

Market demands of improved efficiency and higher throughput simply do not allow for maintenance stops or breakdowns. The selection of quality rollers and motorized pulleys are more vital than ever to ensure a long troublefree life of the conveyors.

The result of RULMECA’s total quality philosophy is evident in the expansion of the group as global market leader. From research and development to the final product quality control the RULMECA Group’s commitment to quality is always evident and present. This choice has led to a group-wide policy oriented toward continual investment in manufacturing and technology, in the quality of the materials used and in research and development.

This unwavering commitment has received a positive response from the market.

By an ongoing focus on market demands and customer requirements the RULMECA Group offer:

- A close partnership and consultancy to our customers for the correct selection of our products.
- A range of products designed to last.
- Our own Rulmeca company or distribution in all major countries with a strong tradition in bulk handling activities;
- A market leading product range within rollers and motorized pulleys distributed globally.
- A group-wide implemented quality system helps to ensure RULMECA is meeting and exceeding customer expectation.
- A continuously expanding and evolving product range;
- Constant improvement in technical, design, and service;
- A global market reach thanks to ten manufacturing sales companies and ten sales companies.

Core Competence

- Motorized Pulleys, Bulk Handling Equipment, Equipment for Belt Conveyors, Idlers for Belt Conveyors, Rollers for Belt Conveyors
TAKRAF GmbH
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04347 Leipzig, Germany
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Fax: +49 341 2423 510
E-Mail: takraf.sales@tenova.com
Web: www.takraf.com

A Specialist in Open Cast Mining and Bulk Materials Handling Equipment

Tenova TAKRAF with its company headquarters in Leipzig and modern manufacturing facilities in Lauchhammer can point to a remarkable history with roots back to 1725.

With an over hundred-year-old tradition in the fields of open cast mining, extraction, processing, storage, conveying and bulk materials handling Tenova TAKRAF maintains subsidiaries and representative offices on all continents.

TAKRAF supplies equipment and systems for the complete process chain in open cast mining from overburden removal, raw materials extraction, processing, homogenizing and storage to onward transport or shipment. TAKRAF provides a full range of services, from development, planning, engineering and design to fabrication, supply, erection, commissioning, startup assistance and after-sales service.

The product range offered by TAKRAF includes – among others – bucket wheel excavators, in pit crushing systems, conveyor systems, crushing plants, spreaders, mine auxiliary equipment, stockyard equipment like stackers, reclaimers, combined stacker/reclaimers, scrapers, pipe conveyors etc.

Its equipment has proved robust and reliable in adverse geological conditions, in extreme climates with temperatures down to minus 45 °C, in dust, wind or extreme humidity, as well as in seismic zones and altitudes of up to 5000 m above sea level.

Highest attention is dedicated to the design of each functional element and the overall operating concept to ensure best products in terms of functionality, reliability and quality. Its priority is to develop flexible, tailor-made and effective design concepts in order to provide ideal solutions which meet the customers’ requirements and expectations.

Tenova TAKRAF offers time-effective and efficient technical services. Immediate response to customer needs, reliability and a proactive style are integral elements of our service concept.

Our range of services includes:
- erection, supervision & commissioning
- spare parts & after sales support
- inspection
- maintenance & management system
- operational assistance
- preventive Maintenance
- trouble shooting

Core Competence
- Open Cast Mining Equipment, Bulk Materials Handling Equipment, Port Equipment
EXPLORE THE DYNAMICS OF POWTECH 2014

World-Leading Trade Fair for Processing, Analysis, and Handling of Powder and Bulk Solids

30.9 - 2.10.2014
IN NUREMBERG, GERMANY

Groundbreaking expert solutions for analysing, size reduction, screening, mixing, conveying, dosing and compacting.

POWTECH.DE

HONORARY SPONSOR

TOGETHER WITH

TechnoPharm 2014

NÜRNBERG MESSE
## Company Directory

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<th>Company Name</th>
<th>Address</th>
<th>City, State, Country</th>
<th>Zip/Postal Code</th>
<th>Tel.</th>
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<tbody>
<tr>
<td>4B-Braime Elevator Components</td>
<td>Hunslet Rd.</td>
<td>Leeds, LS10 1JZ, United Kingdom</td>
<td>113 246 18 00</td>
<td>+44</td>
<td></td>
<td><a href="mailto:4b-uk@g04b.com">4b-uk@g04b.com</a></td>
<td><a href="http://www.g04b.com">www.g04b.com</a></td>
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<tr>
<td>AC-Tek Advanced Conveyor Technologies</td>
<td>19415 594th Avenue</td>
<td>Mankato, MN 56001, USA</td>
<td>345 57 48</td>
<td>+1 (507) 345 57 48</td>
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<td><a href="mailto:kruse@actek.com">kruse@actek.com</a></td>
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<td>Aerzener Maschinenfabrik</td>
<td>Postfach 1163</td>
<td>Aachen, Germany</td>
<td>5154 81 0</td>
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<td>Anker-Flexco</td>
<td>Leidringer Str. 40</td>
<td>72348 Rosenfeld, Germany</td>
<td>7428 94 06 0</td>
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<td><a href="http://www.anker-flexco.de">www.anker-flexco.de</a></td>
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<tr>
<td>Arch Environmental Equipment</td>
<td>P.O. Box 1760</td>
<td>Paducah, KY 42002, USA</td>
<td>553 45 67</td>
<td>+1 (800) 553 45 67</td>
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<td><a href="mailto:info@archenv.com">info@archenv.com</a></td>
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<tr>
<td>Artur Küpper</td>
<td>Postfach 100953</td>
<td>Bottrop, Germany</td>
<td>2041 177 0</td>
<td>+49</td>
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<td><a href="mailto:Bottrop@kuepper.eu">Bottrop@kuepper.eu</a></td>
<td><a href="http://www.kuepper.eu">www.kuepper.eu</a></td>
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<td>Asgco Complete Conveyor Solutions</td>
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<td>Allentown, PA 18102, USA</td>
<td>821 02 16</td>
<td>+1 (610) 821 02 16</td>
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<td><a href="mailto:info@asgco.com">info@asgco.com</a></td>
<td><a href="http://www.asgco.com">www.asgco.com</a></td>
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<td>Aumund Fördertecnik</td>
<td>Saalhoffer Str. 17</td>
<td>47495 Rheinberg, Germany</td>
<td>2843 72 0</td>
<td>+49</td>
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<td><a href="mailto:info@aumund.de">info@aumund.de</a></td>
<td><a href="http://www.aumund.de">www.aumund.de</a></td>
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<td>Aurecon</td>
<td>152 Beach Road, #22-02 Gateway East</td>
<td>Singapore, Singapore</td>
<td>189721, Singapore</td>
<td>+65 (0) 6256 61 88</td>
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<td><a href="mailto:sales@ap.aurecongroup.com">sales@ap.aurecongroup.com</a></td>
<td><a href="http://www.aurecongroup.com">www.aurecongroup.com</a></td>
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<tr>
<td>Ausenco</td>
<td>144 Montague Road</td>
<td>South Brisbane, QLD 4101, Australia</td>
<td>7 3169 70 00</td>
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<td><a href="mailto:info@ausenco.com">info@ausenco.com</a></td>
<td><a href="http://www.ausenco.com">www.ausenco.com</a></td>
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<tr>
<td>B + W Gesellschaft für innovative Produkte</td>
<td>Boschstr. 12a</td>
<td>Dortmund, Germany</td>
<td>4045 11 83 0</td>
<td>+49</td>
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<td><a href="mailto:info@bwiwp.de">info@bwiwp.de</a></td>
<td><a href="http://www.bwiwp.de">www.bwiwp.de</a></td>
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<td>Baldor Electric Company</td>
<td>5711 R.S. Boreham, Jr. St.</td>
<td>Fort Smith, AR 72901, USA</td>
<td>497 646 47 11</td>
<td>+1 (479)</td>
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<td><a href="mailto:info@baldor.com">info@baldor.com</a></td>
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<tr>
<td>Bedeschi</td>
<td>Via Prainbole, 38</td>
<td>Limena, Italy</td>
<td>3050 31 00</td>
<td>+39</td>
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<td><a href="mailto:sales@bedeschi.it">sales@bedeschi.it</a></td>
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<tr>
<td>Beltwall Division of Beltservice Corporation</td>
<td>4143 Rider Trail North</td>
<td>Earth City, MO 63045, USA</td>
<td>314 344 85 00</td>
<td>+1 (630)</td>
<td></td>
<td><a href="mailto:sales@beltservice.com">sales@beltservice.com</a></td>
<td><a href="http://www.beltservice.com">www.beltservice.com</a></td>
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<td>Beltrac International</td>
<td>32925 Sequoia Dr., Suite 300</td>
<td>Aurora, IL 60506, USA</td>
<td>7081 177 0</td>
<td>+1</td>
<td></td>
<td><a href="mailto:info@beltracglobal.com">info@beltracglobal.com</a></td>
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<tr>
<td>Benetech Inc.</td>
<td>1314 Rider Trail North</td>
<td>Earth City, MO 63045, USA</td>
<td>314 344 85 00</td>
<td>+1 (630)</td>
<td></td>
<td><a href="mailto:sales@benetechusa.com">sales@benetechusa.com</a></td>
<td><a href="http://www.benetechusa.com">www.benetechusa.com</a></td>
</tr>
<tr>
<td>BMT WBM</td>
<td>Level 11, 490 Upper Edward Street</td>
<td>Brisbane, QLD 4000, Australia</td>
<td>73 11 1</td>
<td>+61 (0) 7383 67 44</td>
<td></td>
<td><a href="mailto:bmtwbm@bmtwbm.com.au">bmtwbm@bmtwbm.com.au</a></td>
<td><a href="http://www.bmtwbm.com.au">www.bmtwbm.com.au</a></td>
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<tr>
<td>Bonfiglioli Riduttori</td>
<td>Via Giovanni XXII, 7/A</td>
<td>Lippo di Calderara di Reno, Italy</td>
<td>39 05 164 73 11</td>
<td>+39</td>
<td></td>
<td><a href="mailto:bonfiglioli@bonfiglioli.com">bonfiglioli@bonfiglioli.com</a></td>
<td><a href="http://www.bonfiglioli.com">www.bonfiglioli.com</a></td>
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<tr>
<td>Brelko Engineering</td>
<td>P.O. Box 62392</td>
<td>Marshalltown, Rep. South Africa</td>
<td>27 (0) 1 1 838 29 91</td>
<td>+27</td>
<td></td>
<td><a href="mailto:info@brelko.co.za">info@brelko.co.za</a></td>
<td><a href="http://www.brelko.co.za">www.brelko.co.za</a></td>
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<tr>
<td>Bruks Rockwood</td>
<td>5975 Shiloh Road, Suite 109</td>
<td>Alpharetta, GA 30005, USA</td>
<td>770 849 01 00</td>
<td>+1</td>
<td></td>
<td><a href="mailto:info@bruks.com">info@bruks.com</a></td>
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<tr>
<td>Cambelt International</td>
<td>W 1100 South 2820</td>
<td>Salt Lake City, UT 84104, USA</td>
<td>801 972 55 11</td>
<td>+1 (801)</td>
<td></td>
<td><a href="mailto:info@Cambelt.com">info@Cambelt.com</a></td>
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<tr>
<td>Canning Conveyor</td>
<td>Sandy Lane Ind. Estate</td>
<td>Workhop, S80 1TN, United Kingdom</td>
<td>1909 50 06 38</td>
<td>+44 (0)</td>
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<td><a href="mailto:sales@canningconveyor.co.uk">sales@canningconveyor.co.uk</a></td>
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<tr>
<td>Cablevey Conveyors</td>
<td>2397 Hwy. 23</td>
<td>P.O. Box 148, Oskaloosa, IA 52577, USA</td>
<td>611 673 84 51</td>
<td>+1 (641)</td>
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<td>Sörnäisten rantatie 23</td>
<td>Helsinki, Finland</td>
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<td>1111West Holly St., Suite A</td>
<td>Bellingham, WA</td>
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<td>Celsius</td>
<td>Lipstraat 42</td>
<td>Amsterdam, The NL</td>
<td>+31</td>
<td><a href="mailto:info@celsius.nl">info@celsius.nl</a></td>
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<td>CFM</td>
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<td>Zocca, Italy</td>
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<td>Schanzenstraße 40</td>
<td>Buxtehude, Germany</td>
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<td>Doncaster, UK</td>
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<td>Conveyor Accessories</td>
<td>7013 High Grove Blvd.</td>
<td>Burr Ridge, IL</td>
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<td><a href="mailto:cai@conveyoraccessories.com">cai@conveyoraccessories.com</a></td>
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<td>Conveyor Dynamics, Inc.</td>
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<td>Di Matteo Förderanlagen</td>
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<td><a href="mailto:info@dimatteo.de">info@dimatteo.de</a></td>
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Dynamic Air
1125 Willow Lake Blvd.
St. Paul, MN 55110, USA
Tel.: +1 (651) 484 29 00
E-Mail: info@dynamicair.com
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F

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Finnova
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Flexicon Corporation
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German Belt Beteiligungsgesellschaft mbH
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Web: www.germanbelt.com
## Company Directory

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**Ilchmann Fördertechnik**  
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<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Phone</th>
<th>Email</th>
<th>Website</th>
</tr>
</thead>
<tbody>
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<td>9400 N. Lakebrook Rd. Charlotte, NC 28214, USA</td>
<td>+1 (704) 399 45 01</td>
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<td><a href="http://www.goughcon.com">www.goughcon.com</a></td>
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<tr>
<td>Guttridge</td>
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<td><a href="mailto:sales@guttridge.co.uk">sales@guttridge.co.uk</a></td>
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<td>Hecht Technologie</td>
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<td>Hein, Lehmann Trenn- u. Fördertechnik</td>
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<tr>
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</table>
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| Hennlich Industrietechnik | Ceskolipska 9 41201 Litomerice, Czech Republic | +420 416 711 111 | novakova@hennlich.cz | www.hennlich.cz |
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<table>
<thead>
<tr>
<th>Company</th>
<th>Address</th>
<th>Phone</th>
<th>Email</th>
<th>Website</th>
</tr>
</thead>
<tbody>
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<td>+1 (316) 264 46 04</td>
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In April 2014, the Conveyor Equipment Manufacturers Association (CEMA) published the 7th edition of the book Belt Conveyors for Bulk Materials [1] colloquially known as “The Belt Book” or “CEMA-7”. The Belt Book is the de-facto standard of the North American belt conveying industry. The first edition of this book “CEMA-1” appeared in 1966 [2], and was 300 pages long. To keep pace with advances in conveyor engineering, CEMA expanded the belt book, and today the seventh edition is an 800 page volume.

Improved understanding of rubber lies at the root of one of the most important advances in conveyor design. Recognizing this improvement, the latest edition of CEMA offers three different horsepower prediction methods:

- The “CEMA Classic Method” which appears virtually unchanged in all editions of The Belt Book.
- The “Small Sample Method” that first appeared in CEMA-6.
- A new “Large Sample Method” appearing for the first time in CEMA-7.

This paper investigates the history leading to the development of these three methods and provides insight into and justification for adding a new method into the latest edition of The Belt Book.

CEMA’s Classic Horsepower Formula

In the CEMA Classic Method, belt indentation, flexure, and trampling losses are calculated using the following formula:

\[
H = \frac{W \cdot L}{V \cdot e}
\]

Where:
- \(H\) is the horsepower
- \(W\) is the weight of the material
- \(L\) is the length of the conveyor
- \(V\) is the velocity of the belt
- \(e\) is the efficiency factor

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\[ \Delta T = L \cdot (W_b + W_w) \cdot K_f \cdot K_T \]  

(1)

where:
\( \Delta T \) change of tension in a section of the belt.
\( L \) length of this section of belt
\( K_f \) dimensionless constant that is a function of idler pitch and belt tension
\( K_T \) dimensionless constant that is a function of temperature
\( W_b \) weight per unit length of the belt
\( W_w \) weight per unit length of material carried by the belt

This formula differs from the friction factor based formulations in the international standards like DIN-22101 and ISO-5048 in one important aspect: the CEMA classic method provides designers with charts of friction factor vs belt tension, belt load, temperature, and idler pitch. The other standards simply state that belt friction should be set based on the experience of the designer, but suggest 0.02 be used as a base case [3].

CEMA’s friction factor charts were probably given to CEMA by Hewitt-Robins, Inc (HRI). In the early 1950s, HRI awarded the Department of Mining at Pennsylvania State University (Penn State) a contract to improve the accuracy of their conveyor power prediction methodology.

Between 1954 and 1956 researchers at Penn State tracked power consumption in 14 different conveyors [4] at a wide variety of plants around the East Coast of the U.S.A. The conveyors ranged from small 70 t/h machines to large 1920 t/h systems. In addition to field measurements, the researchers built a 50 ft (approx. 15.2 m) long conveyor in Penn State’s College of Mineral Industries. To determine drag, they suspended the stringers on this conveyor by cables attached to the ceiling and measured the change in cable inclination under different tensions and loads [5].

They also adapted a similar device to measure the friction in conveyors in the field. Ten years before the original publication of CEMA-1, Asman [6] presented a plot of “Carrying Strand Resistance Factor” vs “Carrying Strand Weight” for belt tensions ranging from 1000 to 16000 lbs (approx. 454 to 7260 kg) that is identical to CEMAs’ \( K_f \) charts.

The classic CEMA method is a reliable predictor of the power which is consumed by belts constructed from conventional rubbers. It is still widely used in North America today, and its popularity endures because the calculations are easy to understand and implement in spreadsheets.

The “CEMA Universal” or “Small Sample” Method

Empirical methods like the classic CEMA formulation give good results when the design parameters are close to the experimental data from which the empirical formulations were derived. The classic CEMA method works fairly well even outside the experimental parameter range as long as the temperature is above zero and the belt rubber compounds are similar to the compound tested by Penn State in 1954. Because of the inherent limitations of empirical methods, a number of researchers have proposed semi-analytical and theoretical methods of predicting conveyor power consumption [7 – 10].

In 1989 Conveyor Dynamics, Inc (CDI) commissioned two overland conveyors at the Channar Mine in Western Australia. Before commissioning this system, a number of major firms predicted that CDI had undersized the motors. After commissioning, CDI showed that the friction factor on the straight overland was only 0.0098 and the friction factor on the horizontally curved belt was 0.011 [11]. Later, the friction even fell to 0.0085. This marvelous result (less than half of the recommended DIN standard base friction) surprised everyone. The conveyor had exceeded even CDI’s expectations, and convinced CDI to invest in developing a new method of predicting conveyor power.

In 1990 Syncrude Canada realized that they had a number of issues with their conveyors stemming from the fact that their power consumption was vastly different from the CEMA predictions. To solve this problem, Syncrude awarded CDI a contract to invent a new theoretical model of conveyor power consumption capable of explaining the strange behavior they observed in their conveyors [12]. Our earlier model is described by Nordell in [13].

The model we use now is a two-dimensional plane-strain semi-analytical model that allows us to engineer the most energy efficient conveyors operating in the world today including the world’s longest single flight conventional belt conveyor [14].

In 2006 Overland Conveyor Co (OCC) proposed a simpler idler-belt interaction model but instead of a 2D plain stress model, they chose a 1D spring-dashpot model which, unlike the CDI formulation, neglects shear stress [15].

Both CDI and OCC’s indentation models are classified as “Small Sample Indentation Tests” (SSIT) because they require the engineer to measure the viscoelastic properties of a “small sample” of rubber used in the bottom cover of a conveyor belt. The rubber is characterized using master curves of \( G’ \) (elastic stored energy) and \( G” \) (energy lost to heat) as functions of time, temperature, and frequency. Both methods predict the indentation losses in a uniformly loaded slice of belt (shown in Fig. 1 with width \( \delta \)). In this figure the belt is not rebounding as fast as it compresses. This causes the rubber entering the idler roll to push harder on the roll than the rubber leaving the idler which in turn, creates a force (indentation loss) that resists belt motion.

The total resistance to motion is the sum total of the resistances contributed by all the \( \delta \) thick slices in a belt cross-section. The pressure on each slice depends on the load the slice is supporting, the stiffness of the belt, and the trough angle.

CDI’s methodology remains largely a trade secret. OCC’s methodology was incorporated into the sixth and seventh editions of The Belt Book. However, programming small sample methods is a daunting task for many users of the Belt Book, and while several companies, including CDI, sell expensive software packages to perform these calculations, many designers still prefer to work with spreadsheets and programs they created themselves. For this reason, the CEMA-6 and CEMA-7 small sample methods are quite controversial.

The Large Sample Method

Before developing our Small Sample Method, CDI and Syncrude Canada built a number of large scale test machines to study the behavior of their conveyors. Two of the machines we built are shown in Fig. 2. Our indentation loss machine directly measured indentation losses for different temperatures, pressures, and speeds. Since the pressure on the idler is
uniform, one can divide the measured resistance by the idler roll length to get values with units of [Force/Width]. This is exactly the value calculated using the small sample method.

We could avoid all the small sample method calculations using machines like this, but these machines require a "Large Sample" of rubber which is expensive to obtain, handle, and store. Having proven that our small sample method yielded the same results as our large sample indentation test (LSIT) machine, we decommissioned the device.

Recently, interest is again growing in LSIT machines. Hannover University in Germany is operating one such machine [17]. To develop new types of low rolling resistance (LRR) belting, CDI, Laing O’Rourke, and Veyance Belting jointly contributed to a grant which the University of Newcastle used to build the large sample test machine shown in Fig. 3 [18]. Both of the Hannover and the Newcastle machines are essentially short flat belt conveyors with uniformly loaded idler rolls creating indentation losses.

The drag measured by large sample test machines is much easier for laymen to understand than master curves produced by small sample test machines. For this reason, mine owners are beginning to require belt manufacturers to submit samples of their LRR belts to large sample testing laboratories so that owners can compare the efficiencies of these belts. Results from LSIT tests are making their way into the industry at large. In recognition of this fact, the German Industrial Norming committee (DIN) recently defined a new standard, DIN-22123:2012, to standardize LSIT test procedures and reports.

DIN 22123 specifies that LSIT reports shall include a list of "Width Related Load [N/mm]" ($W_{RL}$) which is the applied load divided by test belt width, and a resulting "Width Related Indentation Rolling Resistance [N/mm]" ($W_{IRR}$) which is the indentation resistance divided by test belt width. Sample data from a typical LSIT appear in Fig. 4. The appendix of DIN 22123 recommends fitting each temperature line on this plot with the function $W_{IRR} = a \cdot (W_{RL})^b$.

Another function could be used, but DIN’s function is simple and passes through (0,0) which is critical. To compute the power loss over the cross-section of a real conveyor with the same idler diameter, temperature, and belt construction of the test, the engineer:

Step 1: Determines the distribution of load on the idlers at the interface between the belt and the idlers — $W_{in}(z) = q(z)$. 

---

Fig. 2: CDI’s model validation test machines: trampling and flexure loss test machine (left); indentation loss test machine (right)

Fig. 3: University of Newcastle, large sample testing machine

Fig. 4: LIST data from an LRR belt
Step 2: Fits the \( W_{RL} \) and \( W_{RRR} \) data from the LSIT report with a function that relates load to resistance, such as

\[
W_{RRR} = a \cdot (W_{RL})^b
\]

(2)

Step 3: Computes:

Total Resistance = \( \int C q(z) dz \)

(3)

The pressure distribution on an idler roll, \( q(z) \), is not trivial. Fig. 5 shows the pressure distribution Grabner [16] measured on typical carry side troughed belt idler rolls in a straight section of belt. Since the belt below the junction regions 'A' and 'B' does not touch the rolls, the load in these regions is supported by the belt at the edges of the junction. While the integral of the force in the vertical direction must equal the weight of the belt plus material, the pressure distribution is different from a hydrostatic distribution because bulk materials, unlike fluids, support shear. This means that centrally located particles can transfer some of their weight to the wing rolls through friction forces. The effect is particularly pronounced when the belt is moving, because the sides of the trough compress into the material when the belt enters the idler trough and relax when the belt leaves the idler trough.

Large Sample Integration Example

For this example, we will predict the indentation losses of a carry side idler set in a straight, horizontal, section of a conveyor with the following parameters:

- \( B_w \) = belt width = 1600 mm = 1.6 m
- \( \gamma \) = bulk density = 800 kg/m³
- \( v \) = belt speed = 7.5 m/s
- \( Q \) = tonnage = 4860 t/h = 13,230 N/s
- \( \beta \) = surcharge angle, = 15 degs
- \( \beta \) = trough angle = 45° (carry), 30° (return)
- \( S_i \) = carry idler spacing = 2 m (carry), 8 m (return)
- \( D_i \) = idler diameter = 194 mm (carry), 178 mm (return)
- \( W_b \) = belt weight = 39.5 kg/m
- \( R_L \) = center roll length = 593.6 mm
- \( T \) = temperature = 20°C
- \( h_b \) = bottom cover thickness = 6 mm

Bottom cover rubber type: LRR Rubber

Mathematical formula for the pressure distribution on an idler roll can be quite complicated [19] and are beyond the scope of this paper.

To simplify our example, we shall adopt the distribution used by Tapp [20]. For a 45° trough, Tapp evenly distributes 75% of the load in the center roll, and allocates the remaining 25% of the load to the wing rollers using a triangular distribution.

Accordingly, we compute \( q(z) \) for the carry:

\[
q_c(z) = 0.75 \frac{(W_b + Q/v) \cdot S_i}{R_L} = 5.44 \text{ N/mm}
\]

(4)

The pressure of the belt against the wing roll is:

\[
q_{wl}(z) = \text{cos}(\beta) \left[ 0.25 \frac{Q}{v} \frac{S_i}{L_{wm}} - 0.25 \frac{Q}{v} \frac{S_i}{L_{wm}} \right] = 2.45 - 0.0079 \cdot z, \quad 0 < z < L_{wm}
\]

(6)

Combining \( q_c(z) \), \( q_{wl}(z) \), and \( q_{wl}(z) \) we get the pressure distribution shown in Fig. 6.

The pressure levels in this figure are fairly typical of the pressures found in conveyor belts. A good range for large sample test data is between 0.5 N/mm and 9 N/mm. Some laboratories [17] are currently testing large samples at pressure several times higher than this. The LSIT
data in CEMA-7 combines results from several sources and thus includes a much wider range than the engineer is likely to find on trough belts operating in the field. Fig. 7 shows a plot of the 20°C LRR data from CEMA-7 fitted with the formula Eq. 2. According to CEMA-7, for an LRR belt at 20°C, ‘a’ = 6.59 x 10^{-3} and ‘b’ = 1.28. Since the CEMA test data was measured on a belt with a 7 mm bottom cover and an idler roll diameter of 219 mm, we must scale the CEMA results to model our conveyor. To estimate how much this friction would change if we retested the sample using a different idler diameter and/or belt thickness we multiply constant ‘a’ by the following equation [13]:

\[
C_{fr} = \frac{H_{test}}{H_{test}} \cdot D_{test}^{0.25} = 1.05
\]

where:
- \( H_{test} \) = belt bottom cover thickness used to produce the LSIT test
- \( D_{test} \) = diameter of the idler roll used to produce the LSIT data

Finally, we substitute Eqs. (4), (5), and (6) into Eq. (2) and integrate the result over the width of the belt as follows:

\[
R_{constr} = 0.00692 \left( \frac{5.44 N}{mm} \right)^{1.28} \cdot 593.6 mm = 35.9 N
\]

\[
R_{WengEdge} = 0.00692 \left( \frac{1.54 N}{mm} \right)^{1.28} \cdot 193 mm = 2.32 N
\]

\[
R_{WengMaterial} = \int_0^{10 mm} 0.00692 \left( 4 \frac{N}{mm} - 0.0112 \cdot z \frac{N}{mm^2} \right)^{1.28} dz = 6.33 N
\]

Thus, using this methodology, the total indentation loss on an idler set is:

\[
35.9 N + 2 \cdot (2.32 N + 6.33 N) = 53.2 N
\]

**Transforming Large Sample Test Data for Use in the Classic CEMA Formulation**

For more than half a century conveyor designers used simple friction factor based formulas like Eq. (1) to design conveyors. Experienced conveyor engineers have a “feel” for what friction factors are reasonable on various types of systems, and often the first question auditors ask conveyor engineers is, “what friction factor did you use?”

To get a friction factor, we could simply divide Eq. (3) by the total load on the idler. However, by reconditioning LSIT results in terms of friction factors we can use them in formulas that conveyor engineers are familiar with. This was one of the primary goals of the committee charged with writing the LSIT section in CEMA-7.

To transform the \( C \) and \( W_{RIRR} \) into a new friction factor we simply divide the resistance by the applied load and multiply by \( C_{fr} \):

\[
K_{LST} = \frac{W_{RIRR}}{W_{RL}} \cdot C_{fr}
\]

The question then becomes, “which \( W_{RL} \) should I use to select a \( W_{RIRR} \)?” The LSIT Section in CEMA-7 recommends selecting the \( W_{RIRR} \) which corresponds to the average load on the belt cross section:

\[
W_{RL, AVG} = \left( W_{R} + W_{m} \right) \frac{S}{B_{w}}
\]

However, since the relation between \( W_{RL} \) and \( W_{RIRR} \) is nonlinear, we need to correct this friction to account for the non-linear pressure distribution. The small sample method in CEMA-6 and CEMA-7 has the same problem. OCC did not provide CEMA with a pressure distribution and did not describe how to perform the integration discussed in the previous section. Instead, users of the small sample method in CEMA-7 apply the following correction factor to the small sample method results:

\[
C_{wl} = 1.239 + \frac{0.010866}{5.22} \left( \frac{y \cdot S}{in^2} + 0.005 \right) \frac{lbs}{in^2} - 0.00476 \cdot B_{w} - 0.00263 \cdot \phi \]

Where bulk density has units of lbf/in³, angles are in degrees, belt width has units of inches, and idler spacing has units of inches. The author of this paper has no idea how this formula was derived, but to maintain consistency the writers of CEMA-7 LSIT also recommend using the same formula to scale LSIT results. Accordingly, we can define a new friction factor:

\[
K_{y1} = C_{wl} \cdot K_{LST}
\]

The indentation loss is then calculated using the following formula:

\[
\Delta T = L \cdot (W_{R} + W_{m}) \cdot K_{y1}
\]

For the example conveyor in the previous section, \( W_{RL, AVG} = 2.69 N/mm, K_{LST} = 0.00913, C_{wl} = 1.113, K_{y1} = 0.0103 \)

To calculate the drag on a single idler set we set \( L = S \). Thus, using this friction factor based method, we predict that the drag is:

\[
\Delta T = 2 \cdot \frac{387.1 N + 1764 N}{m} \cdot 0.013 = 44.3 N
\]
Comparison with Field Measurements

While commissioning the Dahej Overland Conveyor in India [21], the author used strain gauges to measure the drive torque during the exact scenario described in the previous two sections. The author also measured the torque on the motor shafts while the belt ran empty. Fig. 8 shows the torque on the shaft and speed of the belt during an empty drift stop. 26% motor torque is equivalent to a drag of 35,468 N. As the conveyor slows, there is less friction retarding conveyor motion and this is reflected in the deceleration curve shown in Fig. 9. Using these curves and Newton’s 2nd law we compute that mass of the empty conveyor is 196,546 kg.

Although the weigh scale was not operational while CDI was present at site, we repeated the drift stop when the belt had enough load to require 63.2% of motor torque. This test showed that 4860 t/h require 63.2% motor torque which is equivalent to 85,885 N of drag. There are 817 idler sets on the carry side of the Dahej conveyor and thus the additional drag created by loading material on the belt is (85,885 N – 35,468 N) / 817 sets = 61.7 N/set.

The 61.7 N/set figure includes trampling losses, load dependent idler losses, and flexure losses. Using our proprietary flexure and trampling losses method, CDI predicts the 11% of the losses at Dahej resulted from trampling and flexure. If so the indentation losses were less than 55 N/set.

Further, the LRR belt data presented in CEMA is an LRR rubber compound made by an American manufacturer. The LRR rubber at Dahej is a different compound manufactured by a German company so the CEMA LSIT data does not really apply. The comparison is not perfect but these values are all in the right ballpark for an LRR belt.

Conclusions

Computing conveyor power using theoretical models involves a substantial amount of advanced mathematics, physics, and material science. Empirical methods like the classic CEMA method offer time tested simple methods of estimating a conveyor’s horsepower requirement as long as conventional rubbers are used in the belt. Large sample indentation tests allow designers to derive new empirical power consumption formulas and predict...
the behavior of modern rubbers with classical methods of conveyor design.

The indentation loss prediction using the method described in CEMA-7 is simple to implement in a spreadsheet and very similar to the classic CEMA horsepower equation. However, the derivation of CEMA-7’s formula for \( C_{rpm} \) is not known to the author. Field measurements suggest that CEMA-7 works well in some scenarios, but without the derivation of \( C_{rpm} \) it is difficult for the author to determine the range of conditions for which CEMA-7 applies. The latest editions of CEMA are a step forward for the industry, and will allow designers to estimate the savings LRR rubbers can yield for operators.

Still, the methods presented in CEMA include a number of simplifications and approximations which impact their accuracy. CDI recommends that designer apply at least a 15% margin on top of any CEMA-7 based design. Internally, we do not plan to adopt the CEMA approach ourselves. We will continue to use the more detailed theoretical models we developed for Syncrude.

Acknowledgements

The author wishes to gratefully acknowledge Linda Musser, Head of the Earth and Mineral Sciences Library at Penn State for her assistance in locating documents associated with the work Penn State did with Hewitt-Robins.

References:


Technical information, business news and market trends for all aspects of bulk materials handling.

.. with the bulk solids handling-newsletter. Weekly news and information from research, science and industry.
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Keep the Dust!

Power Supplier’s Dust Management improves Safety, reduces Maintenance

Coal fired power plants always face the problem of dust. Not only on top of the stack, but also in the process of conveying the solid fuel to the boiler. With regard to conveyor belt transfer points, there is a practical solution available on the market.

RICK FELDE *

A key Florida power supplier has adopted a series of innovative dust containment measures on its coal handling system, helping the facility reduce potential hazards from fugitive material accumulations and significantly cut down the number of man-hours spent on clean-up. By limiting dust and spillage from one of its primary conveyors, the energy provider has reduced airborne particles and virtually eliminated a potential source of trips and falls, while allowing critical manpower to be deployed on core business activities. Preventing coal dust spillage also helps minimize wear on rollers and other moving components, saving on replacement part costs and labor.

Orlando Utilities Commission - Stanton Energy Center (SEC) is one of Central Florida’s leading environmental stewards, meeting or exceeding all air permit limits with advanced pollution control equipment, while generating electricity to serve more than 342,000 residents. The company also follows a well-structured housekeeping policy with respect to its working environment, cleaning the entire coal yard and all handling equipment every day.

“Typically each day after we finish filling or bunkering the silos, the whole system is cleaned,” explained Material Handling Supervisor Stuart Cason. “That includes the yard, all the conveyors, chutes, floors, impact zones and rollers. In some places, it’s a wet washdown, while in others we sweep. It’s 7 days a week, every week of the year.

As engineers planned the upgrades, SEC contacted Martin Engineering (Neponset, IL) to review the conveyor system. The team started by looking at the areas which could benefit most from new containment technology on the 36-inch conveyor, which travels at about 700 feet per minute. “We were looking for a better method of sealing the transfer zone, for starters,” explained SEC Plant Engineer Brian Moore. “We had skirt blocks and seals in place, but they were getting old, and some of them were leaking or repeatedly coming loose.”

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Installed at the bottom of the loading zone skirtboard, Martin Double Apron Seal Skirting employs two wear surfaces on each sealing strip for 2x the service life.
"Coal dust is pretty abrasive, and when it got down into the impact rollers, idlers and troughers, it would pretty much eat them up," remembered Cason. "We tried everything we could think of to improve the service life, but we were constantly replacing them."

To address the situation, Martin Engineering supplied and installed a number of upgraded components, including Double Apron Seal Skirting, which employs two wear surfaces on a single elastomer sealing strip installed along the bottom of the skirtboard in the loading zone. When the bottom side of the sealing strip is worn, it can be inverted to deliver a second service life.

The skirtboard sealing system is installed on the sides of the loading zone to contain dust, eliminate spillage and reduce cleanup expenses. Believed to be the first dual-sealing system of its type, it incorporates a primary seal which is clamped to the steel skirtboard to keep lumps on the belt and a secondary or "outrigger" strip to capture any fines or dust particles that might pass beneath the primary seal.

Next, Martin Engineering technicians installed an impact cradle to better absorb the force of the falling material and protect the belt and structure. The cradle stabilizes the belt’s line of travel to help prevent the escape of fugitive material. In addition, a belt support system was added to better support the edges and eliminate sagging. To maintain precise centering in the loading zone, a belt tracking system was also installed for immediate, precise adjustment. Comprised of upper and lower components, the tracker works to reduce belt edge damage, prevent spillage and extend belt life.

A key element in the material handling system upgrade was addressing the large, under-performing dust collector. "We wanted to upgrade our dust collection equipment, because we knew technology had advanced since ours was installed," said Maintenance Supervisor Jon Janis. "Even when it was functioning properly, the old unit was a high-maintenance item," he added.

The Martin Engineering team installed a high-efficiency insertable air cleaner with an explosion-proof motor. The automatic, self-cleaning design employs filter elements approximately one-eighth the size of conventional filter envelopes, allowing a significant reduction in the dust collector’s space requirements, so it can be installed in tight quarters.

"The old unit had a large footprint, and it was too close to the emergency reclaim area," added Cason. "A smaller integrated unit gives us back that space and actually does a better job of filtering the air."

The mesh-like material not only filters better, but lasts longer - while consuming less energy - than conventional filter bags. Further, the new filters allow a smaller size fan to move air through the elements, helping to reduce the overall power consumption of the collection system. The new design features a pulse cleaning system, which uses a short burst of air sent back through the filter to dislodge accumulated material. Filter changes are a no-tool procedure from the clean side of the dust collector.

Asked to summarize the results of the upgrades, Stuart said, "For me, not having those clean-up and repair battles is a huge relief. And the whole area is a cleaner, safer working environment."

Janis was unequivocal. "No question that the system has paid for itself. We used to spend a lot of time making adjustments and repairs, but since the install, the system has been essentially maintenance-free. It doesn't matter what kind of coal we run, or whether the coal is damp or dry. The fines are contained."

"We could see the improvement right away," Cason added. "It's not just the savings in cleanup time, but also in preventing the idlers from wearing out prematurely. Now I don't have to send my guys out there to replace those failed components, so it saves on labor and replacement parts, as well as the housekeeping time."

He added that continued service excellence has helped to make OUC a repeat customer.

"Manpower is at a premium right now, and every expenditure is closely scrutinized. Martin Engineering has proven its value repeatedly. They have advanced technology, but their approach is to provide application-specific solutions, not just try and sell us the latest product."

OUC is a municipal utility owned by the citizens of Orlando, providing electricity and water services to customers in Orlando, St. Cloud and parts of Orange and Osceola counties.
Belt Scales

Weighing in Motion

Established in 1946 as a repair shop for scales, mainly from the prevalent dairy industries, Rice Lake extended its portfolio with weighing equipment, like belt scales. Today they offer all kinds of scales all over the world.

JAAP OOSTERLEE *

Rice Lake Weighing Systems started as a service company in 1946, repairing scales for the area’s famous dairy industry. In 1971, they began supplying new and refurbished pivots and bearings, and soon began including precision test weights, building an advanced metrology lab to become a major supplier of test weights and recalibration services. The next addition to the catalog were electronic parts and components. “Service, selection and speed” became Rice Lake’s motto to live by. The entire weighing industry welcomed that commitment and soon depended on Rice Lake for critical parts and components as well as 24/7 technical assistance. Today, Rice Lake Weighing Systems is at the forefront of the evolution in weight-based measurement and automated process control. Rice Lake’s corporate headquarters, metrology laboratory and main manufacturing plant remain in Rice Lake, Wisconsin, employing more than 500 employees. Additional manufacturing facilities are located in Alabama, Connecticut, Nevada and Washington. Internationally, Rice Lake’s presence is represented by manufacturing facilities in Brazil, India, the Netherlands, and Mexico. Rice Lake has a unique global distribution and service network including more than 2000 distributors in 75 countries with trained technicians and finest factory support.

In 2013, the European division, Rice Lake Weighing Systems Europe B.V., acquired Dutch belt-scale manufacturer Master Engineering. Known for being a key systems and solutions provider of static and dynamic weighing throughout the world.

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BS 143
Netherlands and Belgium, Master Engineering’s progressive technology provided durable, reliable, and efficient solutions for various weighing applications. Now, Rice Lake Weighing Systems offers a broad delivery program of Master belt scales, streamlining the same durability, reliability and efficiency customers have come to know and trust. Rice Lake Weighing Systems has six different models of Master belt scale frames ensuring the possibility of one or more solutions for every application. From the mining, food, recycling, or chemical industry to steel, animal feed, and compost production, Rice Lake Weighing Systems is committed to quality belt scale solutions.

A belt scale consists of a weigh frame with one or more load cells, a speed pick up, and a weigh processor, which integrates the two signals (kg/m and m/s) into a value of kg or tons per hour. The selection of the weigh frame and speed pick up is determined by the requested accuracy; variables such as belt scale speed and inclination of the belt, the structure of the transport belt, and external circumstances like moisture and aggressive environment. Optimize your belt scale system by choosing the right indicator for your application. Some factors to consider when selecting an indicator are:

- Functionality: Are you simply measuring the product quantity or do you need to control the dosing of the product as well?
- Communication: Are you connecting to a PLC, PC, or other device?
- Environment: What sort of elements will this indicator be exposed to? Dust, wind, rain, snow, and heat are all environmental factors when considering the right indicator.
- Miscellaneous factors: Are you seeking an MID approval or Atex classification?

The same factors can be considered when choosing the right belt scale frame. With six different models of belt scale frames to choose from, Rice Lake Weighing Systems will guide you through every step of the decision making process. Here are our three most popular frames to consider when optimizing your weighing, dosing, and batching process:

- The BS143 model weighs three idlers on an inner frame that is supported by four load cells. This makes it the most accurate belt scale from Rice Lake Weighing Systems and is particularly qualified for higher capacities and high belt speeds. It is often used in OIML certified applications at harbors for loading ships and trucks, as well as offloading bulk cargo. Made using specifications of the conveyor belt, the frame is suitable for most conveyor belt models.

- The BS221DB model consists of two arms, each equipped with a pivot and a load cell, that are mounted to the outside of the side supports of the conveyor belt. The idler or weighing roller will be mounted on top of both arms. This model provides easy assembly and good accessibility for service. The BS221DB is suitable for most belt widths and capacities, which makes it applicable in various market segments.

- The BS311 model consists of an idler or roller placed on a simple load cell beam, which makes it a very cost effective solution. This frame is often used in dosing belts that can regulate the capacity of a bulk flow using the measured value and a controlled belt speed.

When choosing a belt scale, experienced and professional industry experts can help you choose the right one for your specific application. Rice Lake offers a full line of advanced weighing equipment, supplies and parts, plus the capability to design custom equipment and integrated systems quickly and economically. Your process and your business are guaranteed to be serviced and supported by dedicated scale experts in the industry, 24 hours a day, 7 days a week, 365 days a year.
Conveying Products

Discrete Element Modelling

**Simulate non-round Particles**

Rocky is a powerful, 3D Discrete Element Modeling (DEM) program from Granular Dynamics International (GDI) that quickly and accurately simulates particle behavior within a conveyor chute, mill, or other materials handling system. The software simulates more than 5 million particles in nearly limitless shapes and size distributions. Coupled with variable wet, dry, and dust-like properties, easy CAD import of geometries; and ability to move boundaries and vibrate surfaces, Rocky allows to replicate nearly any type of material and handling environment. Rather than just the typical spheres or sphere clumps used by many other similar DEM programs, Rocky also enables you to use non-round particles in the simulations. Shapes like faceted polyhedrons, briquettes, and cylinders compact, settle, and behave just like real-world particles, which lead more realistic simulations and results. And because each particle is calculated as one item, as compared to sphere clumps which are calculated as many individual spheres stuck together, it takes less time to calculate, reducing the overall processing time drastically.

Web: www.conveyor-dynamics.com

Conveyor Drive Systems

**Motorized Pulleys**

Rulmeca Motorized Pulleys are internally-powered. The drive’s AC squirrel cage induction motor and gearbox are hermetically-sealed within the pulley’s oil-filled shell, making the drives self-lubricating. This makes drive reliability high and maintenance requirements low. The drives are available in nine diameters combining 0.37 to 135 kW motors with two or three stage gearboxes in virtually any face width. Common applications for Rulmeca Motorized Pulleys include: mobile crushing/screening plants, transfer conveyors, overland conveyors, reclaimers, and stackers.

Web: www.rulmeca.com

**High Angle Conveying**

**Sandwich Belt Conveyors**

The Dos Santos International sandwich belt conveyor uses two conveyor belts, face-to-face, to gently but firmly contain the product being carried, hence making steep incline and even vertical-lift runs easily achievable. The company’s Snakes Sandwich conveyors are available in widely ranging profiles of C and S-Shape. In any case, a long bottom belt approach is possible to the sandwich entrance, and discharge may be on the high incline or may be after the extension of the carrying belt beyond the mouth of the sandwich. The smooth surfaced belts allow continuous belt cleaning by scrapers and plows. This also facilitates intermediate material discharge by belt plows, as appropriate, before and/or beyond the sandwiched part of the snake profile. According to its developer this type of conveyor offers unlimited conveying capacity and is suitable for the most rugged mining applications, also due to its high availability and low operating costs. Dos Santos-design sandwich belt conveyors have been proven in more than eighty successful conveyor systems installed throughout the world over the past eighteen years.

Web: www.dossantosintl.com

Flexible Feeder Hose

**For abrasive Materials**

The Granit 4910 feeder hose by Erwin Telle is a robust high-performance material handling hose with black, corrugated cover, designed for the conveyance of extremely abrasive bulk materials. Ceramic bricks are incorporated in the rubber lining of the hose with the result that abrasion resistance of the inner lining of Granit 4910 is increased considerably compared to conventional material handling hoses made of rubber or rubber-coated metal pipes. The hose construction guarantees excellent flexibility which makes Granit 4910 a multi-purpose and cost-efficient solution in process technology.

Web: www.telle.de

Web: www.conveyor-dynamics.com
Conveying Products

High Angle Conveying

Sandwich Belt Conveyors

With over a quarter century of experience, Benetech’s chemical suppression systems have been proven to be a highly reliable, efficient, safe and economical solution. According to the Benetech, their Cleanpak application system, combined with the company’s environmentally friendly chemical suppression, stops dust before it is generated. The all-in-one wet chemical dust suppression system combines a minimal amount of water with concentrated chemical agents to produce unique dust suppressing solutions. Benetech say that their Cleanpak system provides optimum results without expensive and complex equipment, and that installation is simple and requires a low initial cost. The system utilises an existing water system and a single chemical pump to provide a balanced flow of wet surfactant solution to the application points. The chemical rates are adjusted based on water hardness, amount of fines in coal and type of application. The system allows on-off operation for performance test, as well as automated operation for permanent installation using on belt detection and belt running signals.

Web: www.benetechglobal.com

Drive Systems

Integrated Planetary Gear Unit

The Siemens Drive Technologies Division now offers a new highly integrated solution that combines planetary gear unit technology with geared motor technology. With this new solution Siemens offers an integrated drive system in a single product consisting of a Flender standard industry planetary gear unit (SIP), a Simogear geared motor and a Sinamics G110M inverter. This integration allows the weight and mounting space to be reduced considerably and provides numerous mounting options, resulting in a high level of flexibility where the system design is concerned.

Web: www.siemens.com

Curved Belt Conveyors

Low-cost Transport

Beumer curved conveyor systems are designed as open trough belt conveyors or closed pipe conveyors. In power stations they move large quantities of coal from storage or receiving points to the boiler and convey waste products such as ash, slag or FGD gypsum to landfills or other disposal sites. Beumer conveyor systems are also the perfect solution for conveying substitute fuels, which are coming into increasing use. Trucks have considerable disadvantages in this regard. Road building is expensive, and the more raw materials have to be transported from the excavation point to the factory, the more journeys have to be made. Belt conveyors from Beumer are equipped with environmentally friendly electrical drives and low-energy belts. As they are usually designed with closed-loop controls, the load can be optimally distributed on the drive unit for different operating conditions. When the belt conveyor is running downhill, the system works in generating mode. The recovered electrical energy is fed back to the public electricity supply via a feedback unit.

Web: www.beumergroup.com

Pneumatic Conveying

Dense Phase Solutions

Dense phase pneumatic conveying is suitable for transporting difficult, abrasive or friable materials and pushes material along a pipe in a plug form at relatively low velocities. Schenck Process dense phase pneumatic conveying systems are designed to be a simple and effective method of transferring material from single collection point to either a single or multiple reception points and can be used to transfer all types of bulk solid materials ranging from fine cohesive powders to wet lump coal. Systems are available for handling material temperatures up to 450°C and at rates of up to 100 t/h for distances up to 200 m.

Web: www.schenckprocess.com
Conveying Products

Conveyor Technology Guide 2014/2015

Conveying Products

Transport Crawler

To Convey the Conveyors

Transport crawlers are indispensable for the transport of large and heavy subassemblies of any kind, but also of complete opencast mining equipment, head or tail stations of conveyor systems or semi-mobile crushing plants. The Takraf series for transport crawlers starts at a payload of 250 t and ends at 1200 t including a gradeability of up to 20 % (1:5). Main component of a transport crawler is the substructure with two travel gears which are normally rigidly connected with each other in case of the smaller machine sizes. Hinged crawler girders are, however, used in the bigger machine sizes from 500 t. The lifting platform including centric guide is arranged on top of the substructure. The platform supports itself via hydraulic cylinders on the substructure. The transport crawler is operated from the operator’s cabin or by radio control. Opposite the operator’s cabin the diesel engine coupled with the hydraulic drive components is installed as central unit in the substructure. All Takraf transport crawlers are diesel hydraulically driven. They are built, assembled and put into operation in the Lauchhammer works.

Web: www.takraf.com

Chain Conveyors

Conveying under Cover

The completely closed chain conveyor is frequently used for the transport of easy flowing products. Not only in the grain and feed industry, but also for slag, ash, powders and alike the chain conveyor, if designed properly, proves to be a low maintenance and durable machine. By using wear resistant synthetic plates on the bottom of the trough, the lifetime of the chain conveyors is extended and the noise level as well as its power consumption are significantly reduced.

Due to its closed housing dust emissions are easily kept under control with a chain conveyor.

Web: www.jh.nl

Conveyor Maintenance

Let the Specialists do the Job

Asgco Complete Conveyor Solutions provide bulk material handlers ways to cut operating costs and down time along with improving the safety of their operations. It includes a complete on-site survey of all conveyor systems involved in each plant providing a comprehensive report based on this inspection. Asgco’s trained professionals walk each belt line looking for potential problems “from the tail pulley to the head pulley and everything in between” with special emphasis on belt condition and cleaners, belt tracking issues, chute flow problems and potential safety hazards. On completion of the survey, a computer generated report is created to include pictures and information regarding each situation found on a particular belt line, along with products and systems designed to alleviate those problems. This helps establish a baseline point of reference on each conveyor indicating what needs to be fixed urgently to what can be upgraded in the future. This forward thinking approach will reduce unscheduled downtime, extend the life of the conveyor components and create a much safer environment for operators.

Web: www.asgco.com

Tubular Drag Conveyor

Safe Handling of Biomass

Energy companies see biomass as an alternative source of clean fuel that will help meet carbon reduction targets. Wood chip, sawdust, pellets and shavings are not easy to handle, they do not all flow freely, can be combustible, are quite fragile and need totally secure handling. Spiroflow’s Atex compliant conveyors offer total dust free handling and movement of products over distances of 3 to 60 m at rates of up to 120 t/h.

Web: www.spiroflow.com

Web: www.asgco.com
Conveying Products

Belt Cleaning

New Secondary Belt Cleaner

Improved belt cleaning efficiency and easy maintenance are just two of the benefits of the recently introduced Y-Type™ secondary cleaner from Flexco. The easy-to-install cleaner comes with urethane blades that provide a tough, yet gentle solution for belt-cleaning challenges. The three-inch (76 mm) urethane blade segments on the cleaner conform to worn or damaged belts, while the spring tensioner ensures that there is consistent blade-to-belt interaction and constant pressure on the belt. Available in sizes to fit belt widths of 18” to 48” (457 to 1219 mm), the y-type secondary cleaner is available with an abrasion-resistant purple blade or a white chemical-resistant food-grade blade. The blades can be removed and replaced either individually or all at once. The new cleaner is ideal for use in emerging markets, OEMs, sand and gravel, and, utilising the food-grade blade, sugar processing. It can be used in conjunction with the EZP1 Rockline® or MSP standard mine-duty precleaner.

Web: www.flexco.com

Safety Door

Safety for Your Operators

Engineering Services & Supplies (ESS) provides a range of solutions that are designed to eliminate challenges such as spillage, carryback, blockages and dust control of fugitive material. Its products are designed to eliminate operational inefficiencies at conveyor transfer points to ensure a safer, cleaner and more productive system, increasing productivity and cost-effectiveness. The product range includes conveyor belt cleaners, skirting sealing systems, belt training devices, impact cradles, support bars, air blasters, and access doors. The Ezi-Guard is a system comprising of several versatile and easily installable brackets, lightweight panels and standard structural tubing to form an ‘off the shelf’ system, which is adaptable to almost any materials handling application including corrosive environments. This solution enhances the safety of operators by reducing the dangers associated with moving parts and pinch points of machinery, whilst avoiding the usual manual handling problems of heavy and cumbersome guards.

Web: www.esseng.com.au

KS-Engineering
Ingenieurbüro Klaus Schneider

Pneumatic Conveying
Environmental/Air Pollution Control
Injection-/Fluidizing Equipment
Sieving/Sifting/Dust Separation

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www.bulk-solids-handling.com
Your desire is our drive

Every project presents its own particular characteristics and challenges, especially in the mining industry. Tenova TAKRAF approaches each open-cast mining project from the customer’s viewpoint to deliver an optimized solution that meets and exceeds requirements and expectations.

Extensive experiences in heavy duty material transportation with reference installations all over the world makes Tenova TAKRAF a strong partner for its customers. High reliability and longevity combined with low operation cost ensure our customers valuable, tailor-made, optimized conveying solutions.

Total technology solutions for mining, bulk materials handling and minerals beneficiation.

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Tenova is a worldwide supplier of advanced technologies, products, and engineering services for the metals and mining & minerals industries.