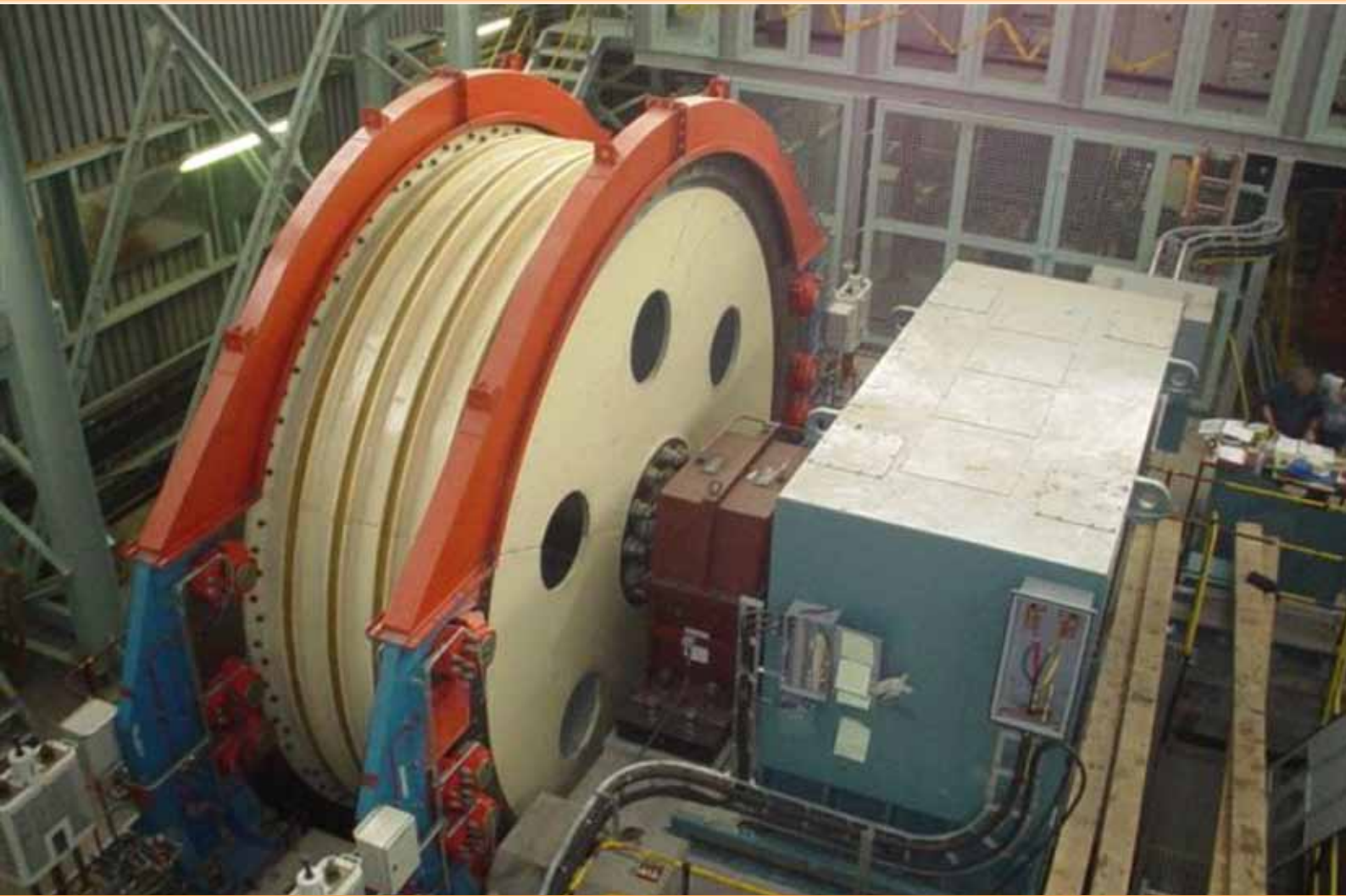


# Vecor Hoists



- Friction Hoists
- Drum Hoists
- BMR Hoists



# Background

## About FLSmidth

FLSmidth is your One Source, One Partner for mining and minerals processing equipment and services. Utilizing the latest in technology, resources, and materials, our engineered solutions provide you with the ideal design, equipment, and process support for your systems.

Behind our organization is Denmark-based FLSmidth, an international group of companies delivering equipment, systems, and high technology engineering services for the cement and minerals industries. This dedicated focus and international scope provide FLSmidth – and FLSmidth – a solid foundation. When you select FLSmidth as your partner, you also bring this solid foundation and support to your business.

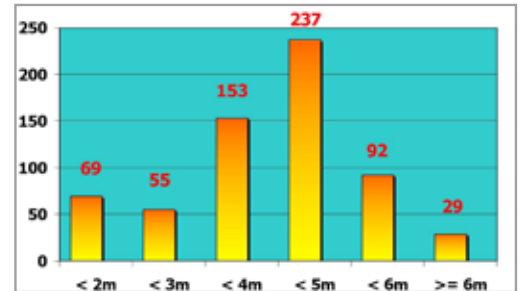
FLSmidth has a proven history in the design, manufacture and supply of robust, reliable mine hoists. The company is based in Johannesburg, South Africa and is the centre of excellence for hoisting technology within the FLSmidth group.

The “Vecor” arm of the company has its origins in the late 1940’s when Vanderbijlpark Engineering Corporation began operations, designing and supplying mine hoisting systems for the booming gold mining industry. Fuller Company invested in the Vecor supply operation, then trading under Dorbyl Heavy Engineering, to form Fuller-Vecor in 1997.

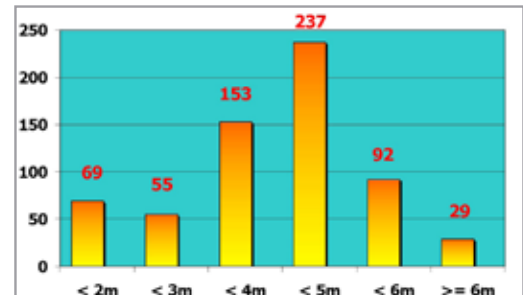
In order to focus its activities in the mineral processing field, Fuller Company, based in Bethlehem, Pennsylvania, USA, and Fuller-Vecor has since been renamed FLSmidth as part of the global brand strategy. The present day company has, over the years, developed an international reputation as being a leader in the supply of heavy industrial mining equipment, particularly in the Fields of mineral processing and hoisting.

FLSmidth has a hoist reference list that exceeds 500 installations worldwide over a period spanning more than 100 years. This includes machines from the previous mine hoisting business of GEC Alstom,

*5.5 m dia Koepe Hoists Drum during manufacture at the Vecor Works in the early 1950’s*



*Hoists manufactured by size*



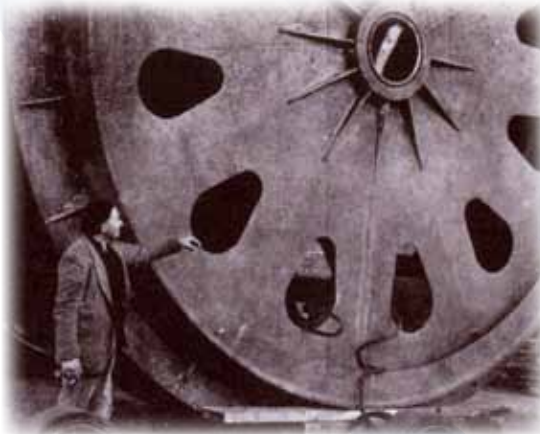
*Hoists manufactured by type*

South Africa, which was purchased by FLSmidth in October 1997.

We have extensive experience in the supply of hoists in the three principle categories, namely:

- **Friction/Koepe Hoists**
- **Drum Hoists (Single and Double Drum)**
- **Blair Multi-Rope (BMR) Hoists**

Hoists for specialist applications such as stage hoists for shaft sinking operations have also been designed and supplied. FLSmidth have supplied hoists with drum diameters ranging from less than 1.0 meter to greater than 6.0 meters. The majority of these hoists have been of the double drum configuration with dual clutched drums and diameters greater than 5.0 meters.



# Design & Braking Systems

The FLSmidth design team has pioneered and perfected many hoisting configurations particularly in the field of deep level hoisting. FLSmidth has designed, manufactured and supplied more BMR hoists than any other hoist supplier. We were also the first company to successfully supply a hoist operating over a single winding depth in excess of 3000 meters.

The hoist design process makes extensive use of our in-house finite element analysis (FEA) facilities. Modern software allows for all geometric details to be modelled and fully analysed, ensuring robust and reliable designs for which we are reputed. Our designs have been proven over many years in the field, with performance being backed by field strain gauge testing.

Drum design is a crucial component for all hoists. Drums are exposed to heavy loads of a cyclical nature and are therefore designed in accordance with recognised international standards for fatigue design. Various drive configurations can be offered including geared, direct drive with overhung motors and Integral. Motors can be AC Induction, AC Synchronous or DC and would be supplied through a preferred supplier.

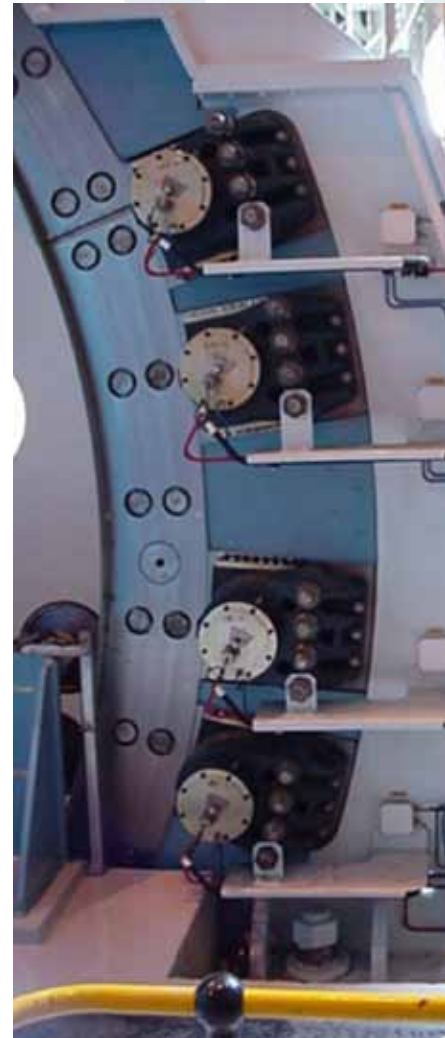
For the purposes of cost competitiveness, FLSmidth employs concepts of “designed for manufacture” and make use of their global network for material and component sourcing in order to provide hoists of the finest quality with unparalleled levels of reliability and production availability. FLSmidth is able to offer fully customised designs to suit individual client needs and

requirements. These customised designs make use of commonly used standard components such as bearings and clutches.

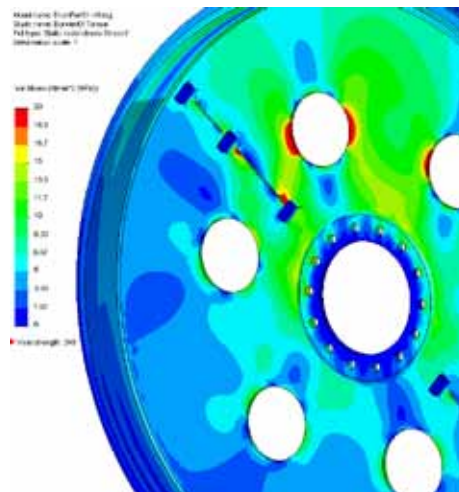
FLSmidth as an international leader in hoisting technology, has developed hydraulic systems for „Escort“ and „Closed-Loop“ brake control. The developments in „Closed Loop“ control were stimulated by the need to reduce dynamic rope loads under emergency braking conditions.

The resultant reduction in peak rope loads has facilitated deep shaft hoisting. Sophisticated hydraulic systems are employed to ensure rapid speed of response and repeatable control accuracy.

Disc braking systems are the preferred arrangement for current hoists. The design of the brake path or brake disc ensures minimum deflection under rope loading and high stability under thermal loading. Friction hoists, commonly referred to as „Koepe“ hoists, provide an economical solution to many hoisting applications.



Disc braking arrangement



FEA model for hoist drum

# Friction & Drum Hoists



Koepe Hoist - Lonmin K4



Ø 6.0 m Double Drum Hoist, 19 tonne payload - Moab Khotsoeng

These hoists typically have lower capital costs when compared to drum hoists due to characteristic lighter, single-drum constructions and lower installed power requirements.

Koepe drums are subjected to high cyclic fatigue loads, typically reversed during every drum revolution. Design is of necessity for infinite fatigue life.

The head ropes of a Koepe hoist are subjected to cyclic variations in operating loads due to the required use of tail, or balancing ropes. For adequate rope life, the static load range should be limited to approximately 12 % of the rope breaking strength. Regular rope maintenance and replacement is essential on these hoists.

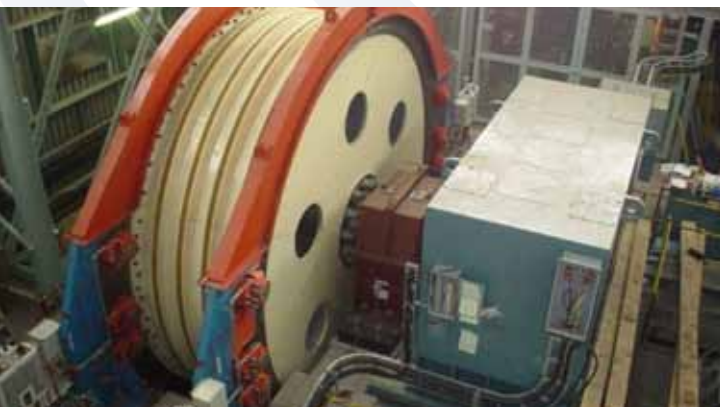
Koepe hoists are not normally favoured for depths of wind greater than 1800 m. However, for depths within the 1800 m range, very large payloads can be handled by increasing the number of head ropes. Koepe hoists frequently find application as service hoists for men and materials using a cage and counterweight arrangement. These are often configured for use with push button cage control.

Drum hoists, both single drum and double

drum, are the most frequently used type of hoisting system. With multi-layer coiling the double drum hoist is frequently used for lengths of wind to 2500 metres, but can be used for lengths of wind greater than 3000 metres.

Although normally winding in balance, the range of brake torque required during emergency braking requires some form of brake control system to provide acceptable retardation levels under all winding conditions. The control of emergency braking retardation for single drum hoists is particularly problematic due to the high out of balance loads and great variation in the natural rates of retardation for different hoisting conditions. FLSmith has extensive experience in the design of suitable brake control systems.

The conventional double drum hoist underwent a major development in 1957 when Robert Blair introduced the concept



Ø 6.0 m 4-Rope Koepe Hoist - Lonmin K4



Ø 6.0 m Double Drum Hoist - Impala 14#

# Blair Multi-Rope Hoist



Ø 5.7 m Electrically Coupled BMR Hoist - Moab Khotsong

of combining the load carrying capacity of multiple ropes in the friction hoist system with the simplicity and flexibility of drum hoists. Each drum of a BMR hoist is divided into two (or more) compartments with a single rope per compartment - each rope on the drum being attached to the same conveyance. Systems are incorporated to ensure load sharing between ropes and protection against miscoiling.

The BMR system significantly increases the hoisting capacity of a drum hoist. Hoists with end loads of 32 tonnes at depths of 2500 meters are common. The Moab Khotsong BMR winder, supplied by FLSmidth to AngloGold Vaal River Operations, was the first hoist to operate to a depth of 3150 m in a single wind with an end-load of 23 tonnes.

The most frequently encountered problem with a BMR hoisting system is that of Fleet angle control because of the wide drums inherent in BMR hoists. A number of solutions are employed.

- Arranging the drums in tandem and mechanically coupling through gears;
- Arranging

the drums in tandem, or side by side, but inclined at an angle, and coupling electrically.

- In-line arrangement of drums where the shaft system allows for conveyances at large centre distances, for example using the outer compartments of a shaft.
- Arranging the drums inclined to each other, but mechanically coupled through a Hookes Joint.

FLSmidth offers a comprehensive range of services to their products and clients.



Ø 5.1 m BMR Hoist with Hookes Joint Coupling - South Deep

# Customer Service



Skip



Cage

These include:

- Pre-feasibility studies for „Order of Magnitude“ budgets.
  - Full design audits and feasibility studies.
  - Full duty cycle analysis to ensure selection of the optimum equipment solution.
  - Pricing and packaging of a hoisting system to suit client requirements.
  - Design, planning, fabrication, project management and Internat ISO accredited quality control systems to ensure the highest quality standards at all times.
  - Full turnkey solutions from installation and commissioning of new equipment, to regular inspections, service contracts, refurbishments and supply of high quality spare parts. FLSmidth will provide value added engineering to suit your every need.
  - Stripping, inspection, refurbishment, relocation and recommissioning of used hoists.
- Supply and replacement of worn components.
  - Retrofits and upgrades to increase payload capacity and efficiency.
  - Training of maintenance and operational staff
  - Lebus Coiling Sleeves “LEBUS®” FLSmidth is the exclusive African licensees for “LEBUS®” rope coiling technology

Our FLSmidth Dorr-Oliver Eimco Canadian office offers a wide range of underground mining equipment including sheave wheels, ore skips, man cages, skip charging/ discharging arrangements and Ross Chain Feeders. FLSmidth is the largest supplier of this shaft equipment in North and South America and have installations globally. This equipment has an 80 year history and is considered the standard of the industry. These products can be sourced through our Canadian and South African offices.



[www.FLSmidth.com](http://www.FLSmidth.com)

## FLSMIDTH (Pty) Ltd.

c/o Constantia Boulevard &  
Albert Schweitzer Streets  
Constantia Kloof  
Weltevreden Park 1715  
Gauteng, South Africa  
Tel.: +27-(0)860 FLSmidth  
Fax: +27-(0)860 357 643  
E-mail: [FLSM-za@flsmidth.com](mailto:FLSM-za@flsmidth.com)

## FLSMIDTH Ltd.

174 West Street South  
Orillia, Ontario L3V 6L4  
Canada  
Tel.: +705 325 6181  
Fax: +705 325 3363  
E-mail: [info.doecanada@flsmidth.com](mailto:info.doecanada@flsmidth.com)

©FLSMIDTH Group 2008. All rights reserved. This brochure makes no offers, representations or warranties (express or implied), and information and data contained in this brochure are for general reference only and may change at any time. Please contact FLSmidth for specific information or data that may relate to your interests