

One Source

FLSmidth® VXPmill



FLSmidth® VXPmill



Delivering Value

The VXPmill is designed as an efficient option for fine and ultra fine grinding applications and outperforms similar technologies in:

- **Capital cost**
- **Flexible design**
- **Operating power per ton processed**
- **Operating and maintenance costs**
- **Higher throughput and availability**
- **Smaller footprint**
- **Automation and data collection**

FLSmidth® VXPmills operate at a power intensity that is higher than low-speed mills and overlaps that of high speed mills. This allows the VXPmill to be customized to a wide range of grinding applications.

Lower ore grades and complex mineralogy are driving demand for more efficient fine grinding.

FLSmidth is a One-Source engineering and equipment supplier that provides a full range of fine-grinding mills designed for easy shipment, simple erection and trouble-free maintenance. Most importantly, the mills are customizable to each unique mining application, optimizing the performance of the mill and increasing ore recoveries. VXPmills are delivered with short lead times at market-leading capital and operating costs.

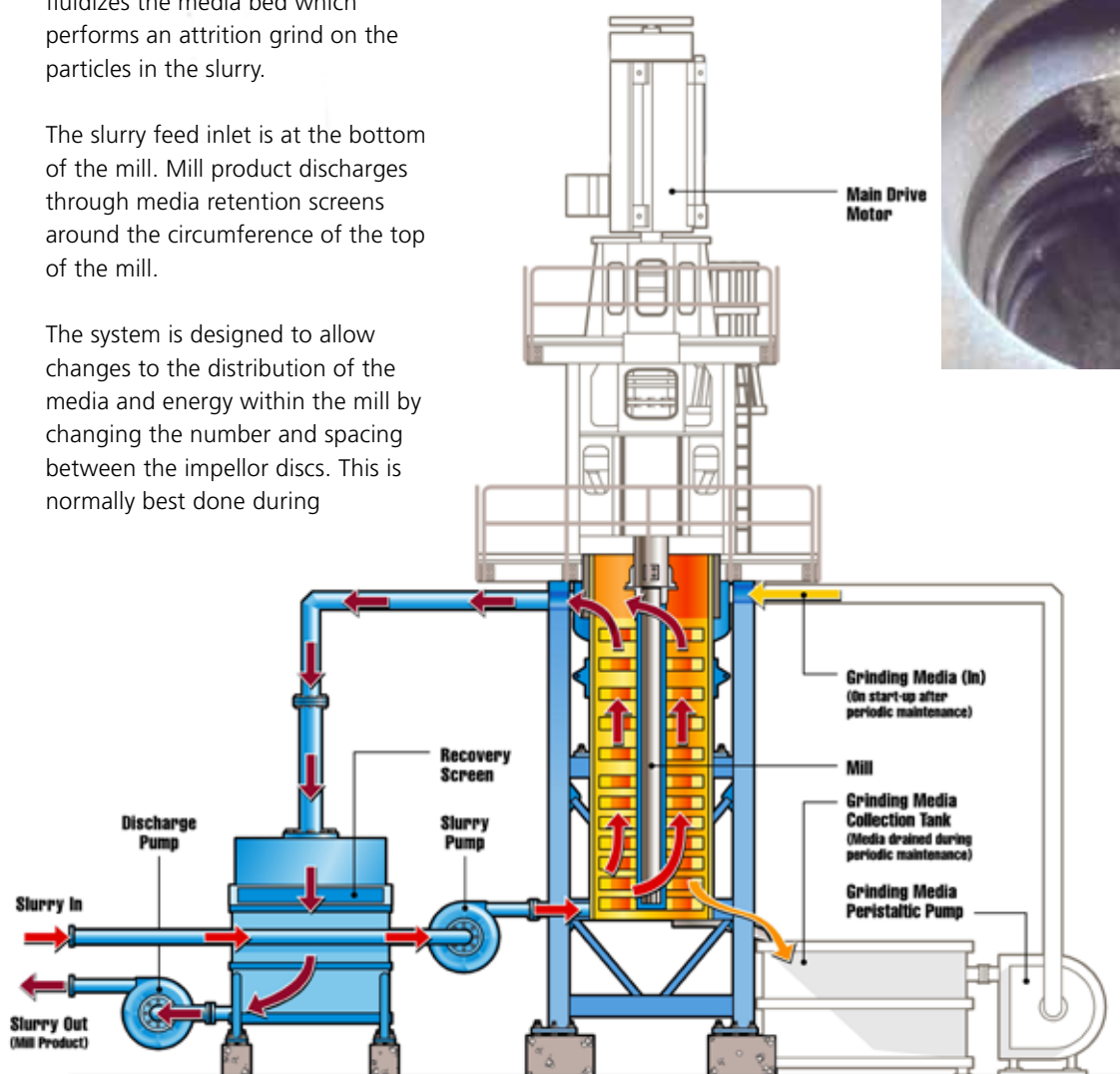
Mechanics of the VXPmill

The VXPmill is a vertically oriented stirred media mill that is open to the atmosphere. They are designed with a modular impellor that has removable discs and spacers. Slurry enters at the bottom, travels upward through the mill chamber, and overflows through a media retention screen at the top. The rotating polyurethane discs activate inert ceramic grinding media inside the milling chamber. This activation fluidizes the media bed which performs an attrition grind on the particles in the slurry.

The slurry feed inlet is at the bottom of the mill. Mill product discharges through media retention screens around the circumference of the top of the mill.

The system is designed to allow changes to the distribution of the media and energy within the mill by changing the number and spacing between the impellor discs. This is normally best done during

commissioning. Due to its customizable media stress intensity, the VXPmill can be used in applications where the design constraints of other mills limit their ability to operate at the optimum stress intensity for a given application.



Milling/comminution process



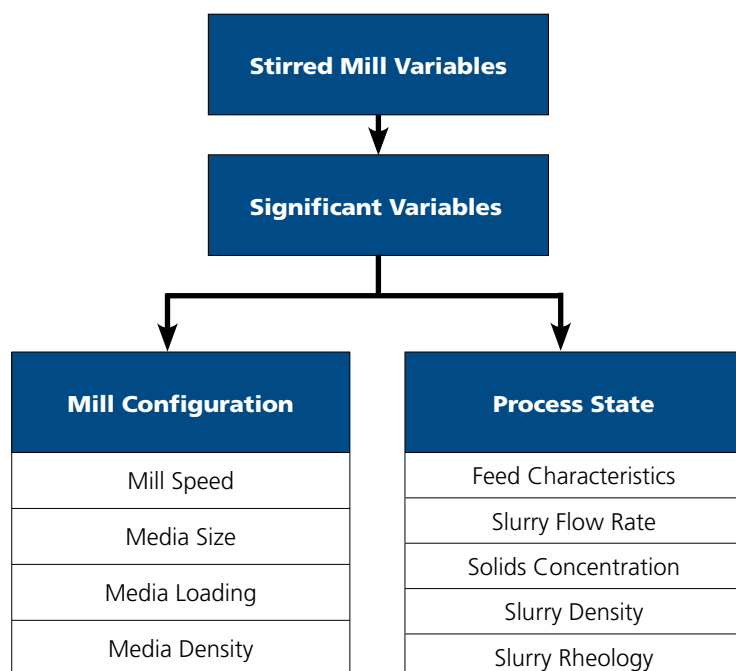
The amount of grinding energy allocated to fine grinding will only increase as finer ore deposits are mined. It is critical that fine grinding efficiency continue to improve through the selection of appropriate equipment and the development of best practices. The best practice using stirred mills will vary from site-to-site and from mill-to-mill. Optimization of a given stirred mill with respect to specific energy input depends on the complex relationships between a large set of parameters. Examples include mill speed, media size, media loading, slurry density, slurry flow rate, slurry rheology, feed material characteristics. This wide range of variables can be grouped into two classes of significant variables: mill configuration and process state. (See figure below)

Mill Configuration:

The mill configuration variables are those that can be physically changed as part of the optimization process. Of these, mill speed, media size, media loading and media density are the most important. The mill's speed determines the power intensity within the milling chamber and often has a direct impact on grinding efficiency. It impacts both the energy input to and frequency of breakage events.

The mills are designed to run at tip speeds between 10 and 12 m/s and are capable of operating with very dense grinding media. The result is a power intensity that is higher than the low-speed mills and overlaps that of the high-speed mills.

There is a large gap between the tip speed and power intensity of the low-speed vertical mills and the high-speed horizontal mills. The VXP mill bridges the gap between high-speed and low-speed mills



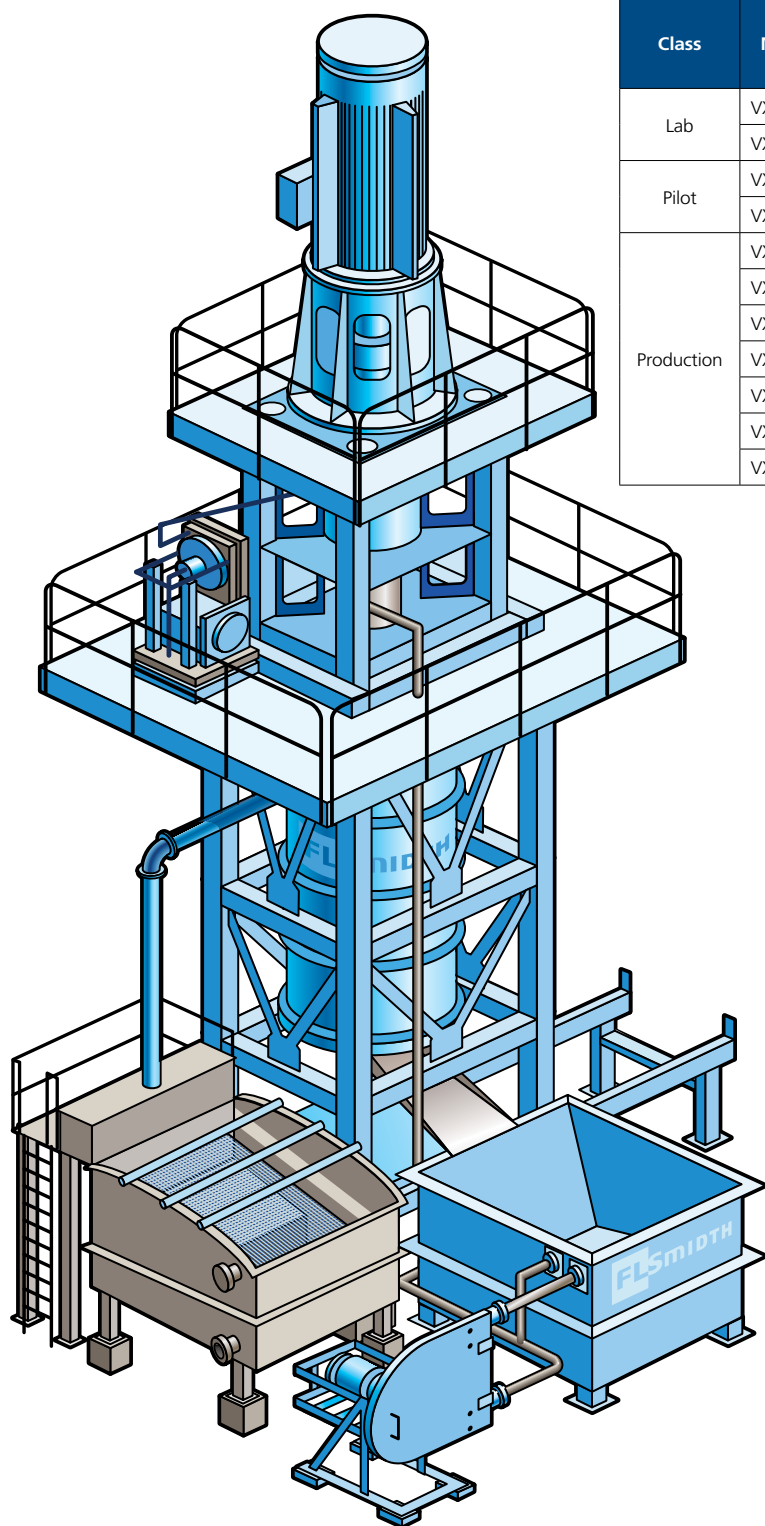
Process State:

The VXPmills are designed for fine and ultra fine grinding applications. In practice the mill performs best when the feed has a normal distribution. However the mill has been used to preferentially grind the coarser “hump” in bimodal distributions without over grinding the finer part of the distribution.

Grinding efficiency is affected by a wide range of variables. Process parameters such as, slurry flow rate, slurry density, and slurry rheology all affect grinding performance. These variables can often be regulated to fall within an acceptable design range. The mill configuration and/or operating conditions can then be modified to increase the grinding efficiency.



Model specifications



Class	Mill Type	Net Volume (L)	Design Speed (rpm)	Installed Power (kW/hp)
Lab	VXP2	3	3	3.7/5
	VXP10	10	11	15/20
Pilot	VXP25	27	1175	30/40
	VXP50	50	1175	56/75
Production	VXP100	110	764	110/148
	VXP250	290	509	132/177
	VXP500	480	432	224/300
	VXP1000	910	304	337/452
	VXP2500	2425	241	699/937
	VXP5000	5026	180	1475/1978
	VXP10000	10273	339	3000/4023

The mills are manufactured in a range of sizes to accommodate different feed rates and process conditions. The laboratory models are generally used for metallurgical and material testing. The pilot mills are designed as modular systems for use on site in pilot trials. These are generally replaced by the larger production mills once pilot trials have been completed. The mill types and their generic design parameters are shown above.

Advantages of the VXPmill



VXPmills arrive at site as assembled as possible, making for fast, simple erection.

FLSmidth's team of product engineers is continually improving the VXPmill milling technology. This has led to a robust milling system that is suitable for the fine grinding of a wide variety of mining ores, industrial minerals and chemicals. The current mill design includes long life wear materials and drive systems.

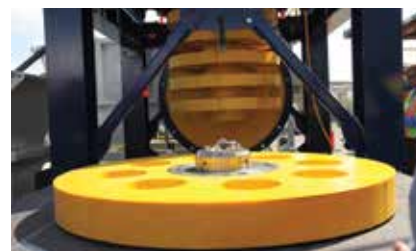
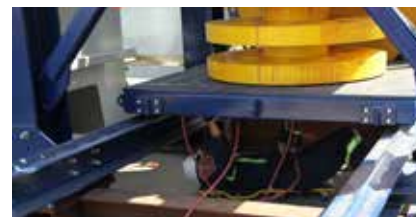
The advantages of the VXPmill are:

- Lower capital expenditures
- Shorter lead time than competitors
- Simple, containerized shipping
- Factory tested, pre-assembled mill components for rapid site erection
- Vertical orientation results in a smaller installation footprint than a comparable sized horizontal mill
- Mill is open to the atmosphere so there are fewer problems with back pressure within the grinding zone
- Impeller bearing housing is located above the grinding chamber. This eliminates problems with bearing seal leakage because the bearing is not in contact with slurry
- Reduced maintenance cost because there are no seals or filters within the mill chamber
- Mill does not require complex internal product separators because slurry discharge occurs by overflow through a polyurethane screen at atmospheric pressure
- Vertical design eliminates cavitation in the grinding zone at high speeds
- High-torque drive allows the use of grinding media with a wide range of intrinsic density.
- Variable speed drive allows the mills speed to vary with process conditions
- Quick, simple, safe maintenance procedure
- Worldwide support network

Fully assembled to ship

All VXPmills are designed with the customer's needs in mind. The VXP2500 mill and smaller sizes are able to ship nearly fully assembled. This decreases time and money spent on freight and makes for fast, simple site erection.

Maintenance features



Maintenance on modular impellor allows discs and spacers to be removed one at a time which saves on maintenance time, head space and improves safety while performing mill maintenance.

Maintenance process

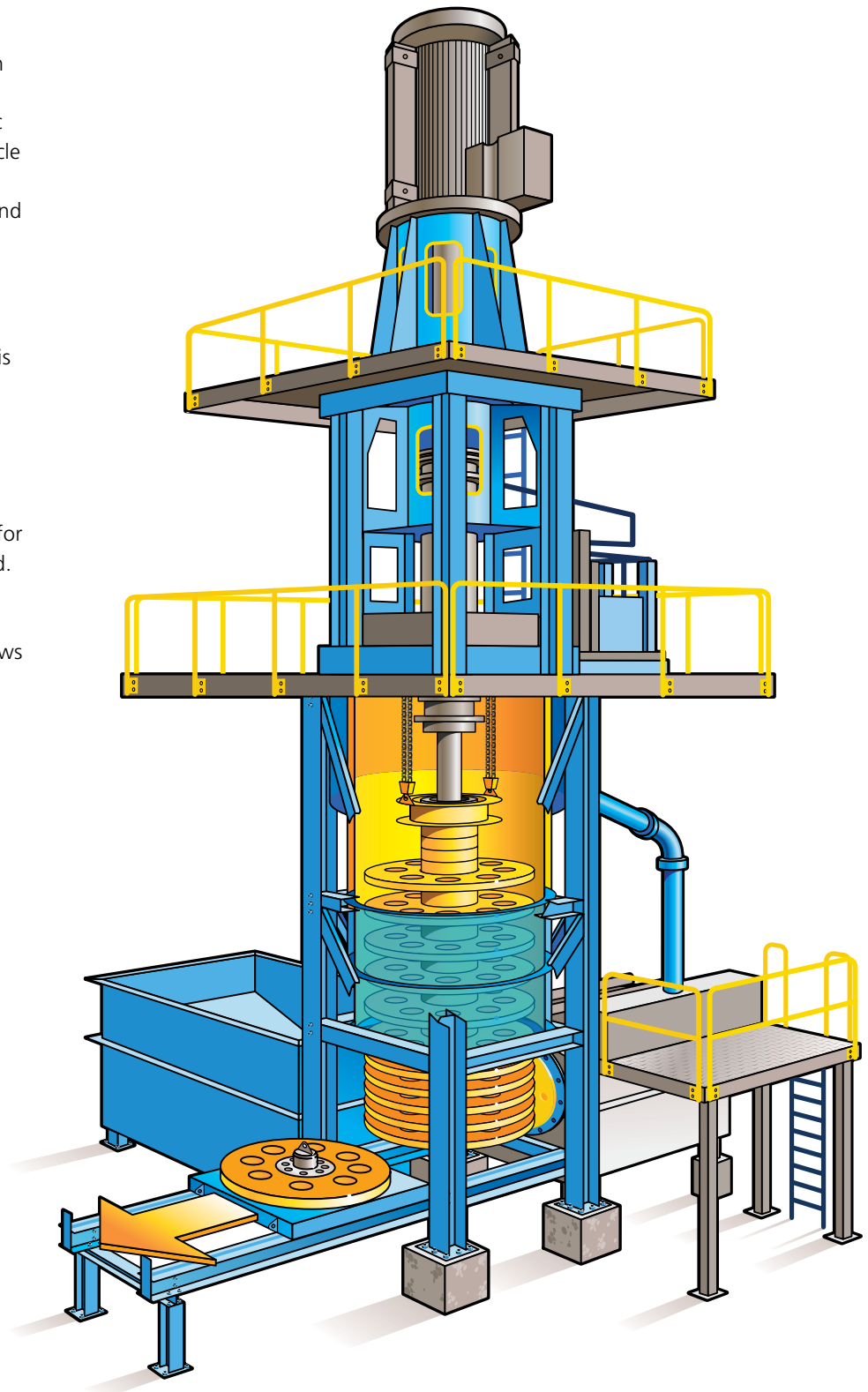
1. Run flushing water cycle to rinse slurry out of the barrel and grinding media (5 min)
2. Open knife gate valve at bottom of barrel to drain media into holding tank (20 min)
3. Open flange at bottom of barrel to expose grinding assembly (20 min)
4. Disconnect taper lock coupling at top of grinding assembly in order to lower grinding stack (15 min)
5. Lower grinding stack onto maintenance table
6. Unbolt worn discs and slide out for easy-access lifting
7. Slide new discs under grinding stack and bolt on (repeat until all worn discs are replaced, 15 min per disc/ per spacer)
8. Close bottom flange (20 min)
9. Add water to media tank and pump media back into barrel chamber (20 min)
10. Continue normal mill operation
11. Total down time(4-6 hours)

Maintenance benefits

The VXPmill's unique design allows operators to quickly flush and drain the media out of the mill into a holding tank in preparation for disc maintenance. After the flushing cycle is completed, a valve is simply opened at the bottom of the mill and the ceramic beads drain into a temporary media storage tank.

This simple feature allows media removal in a safe fashion, as there is no need for the operators to enter the milling chamber in order to remove the media. Once the beads are finished draining, the bottom flange of the milling chamber is lowered and the mill is then ready for maintenance work to be performed.

This is not only a safe solution, but the rapid maintenance process allows for increased time savings and machine availability.



Media



Media load, size, and intrinsic density are the main variables for the mill charge. The media load generally varies between 50%-65% by volume. The media sizes used with the VXPmill ranges between 1.5 and 12 mm.

Each grinding application has an optimum stress intensity. Media size, load and density play an important part in determining grinding efficiency.

- Media size must be selected based on the particle feed size.
- Bead load has an effect on both the number of breakage sites and the energy utilization within the mill

- Media density has an effect on both the torque required to drive the impellor (hence power) and the maximum slurry density that can be fed into the milling chamber.

FLSmith normally recommends that the intrinsic density of the bead be more than triple the expected slurry density.

During maintenance shutdowns, grinding media is quickly drained into a holding tank. Once maintenance is completed, water is added and the bead/water mixture is simply pumped back into the barrel chamber.

Testing

Slurry feed characteristics are unique to each ore body. Laboratory and/or pilot testing should be performed as part of the mill sizing process to ensure that correct mill is selected for a specific application.

FLSmidth has completed a state-of-the-art Ore Characterisation & Process Mineralogy Lab to support their Metallurgical Services, Engineering and Plant Construction. The lab also serves mining companies for exploration, mine site geology, expansions, feasibility studies, plant support optimisation, flowsheet development, and environmental work. The lab is staffed with highly experienced process mineralogists who utilize the most advanced laboratory technology.

This includes:

- Quantitative XRD Rietveld mineralogy
- SEM and optical microscopy
- Automated mineral analysis
- NIR data base development
- Clay analysis

Mineralogical laboratory services will include:

- Ore characterization & process mineralogy
- Plant surveys
- Lab technology development
- Lab design
- Lab automation
- Training in geo-metallurgy



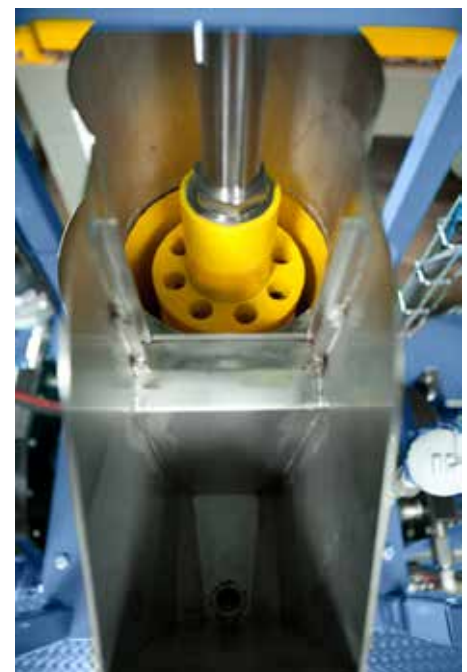
Minerals Testing and Research Center VXPmill client support:

Key test parameters

- Ore mineralogy
- Abrasion wear endex
- Specific throughput
- Metallurgical tests
- Modeling & scale-up

Test center program

- Exploratory VXPmill tests
- VXPmill leach tests
- VXPmill float tests
- VXPmill pilot testing of ore types
- Customer-specific tests



Global support

www.flsmidth.com

Rev 1/21/2014 al-us



Minerals Processing Technology Center

7158 S. FLSmidth Dr.
Midvale, UT 84047-5559
USA
Tel: +1 801 871 7000
Fax: +1 801 871 7001
Email: info.sl@flsmidth.com

VXPMill Service Center

19855 98 Avenue
Langley, BC V1M 2X5
Canada
Tel: +1 604 888 4015
Fax: +1 604-888-4013
Email: knelson@flsmidth.com

Australia

Tel: +61 2 4320 4700
Email: info.australia@flsmidth.com

Brazil

Tel: +55 15 3416 7400
Email: flsmidth@flsmidth.com.br

Canada (Orillia)

Tel: +1 705 325 6181
Email: flsm-ca@flsmidth.com

Chile

Tel: +56 2 290 0000
Email: flsm-cn@flsmidth.com

Peru

Tel: +51 - 1-708 0500
Email: flsmidthperu@flsmidth.com

South Africa

Tel: +27 - (0)10 210 4000
Email: flsm-za@flsmidth.com

United Kingdom

Tel: +44 1788 555 777
Email: fls.uk@flsmidth.com