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# Philippines discovered

## 发现菲律宾

### FEATURE:

**Intex Resources adds value to Mindoro Nickel Project**

特写：  
Intex资源公  
司为  
Mindoro镍项  
目提升价值

**ASIA FOCUS:  
Gold shines brightly**

聚焦亚洲：  
黄金光芒耀眼

PHOTO: Supplies being carried to Intex Resources' camp and drill sites in the mountains of central Mindoro.

Photo from Intex Resources

照片：向位于Mindoro中部山区的Intex资源公司营地和钻探现场运送供应物资 照片由该公司提供



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# IsaMill circuit in operation at Phu Kham

**A**N Xstrata Technology IsaMill regrind circuit is being utilized at PanAust's Phu Kham Copper-Gold Operation in Laos.

The first concentrate was produced by PanAust in April 2008 at Phu Kham, which is about 120km north of the Lao capital Vientiane.

The operation is designed to mine and treat 12 million tonnes of ore each year. This is processed through a conventional flotation process, producing about 260,000 dry metric tonnes of concentrate annually, containing 65,000 tonnes of copper, between 70,000 ounces and 80,000 ounces of gold and between 400,000 ounces and 600,000 ounces of silver. The concentrate is exported to custom smelters.

The flowsheet incorporates conventional primary grinding, followed by flotation. All of the rougher concentrate is treated through a M10,000 IsaMill, before the concentrate then passes to a cleaner flotation circuit.

The IsaMill is designed to treat up to 168 tonnes/hour of concentrate, with feed coming into the mill up to 106µm and product leaving the mill at 38µm.

The IsaMill operates with a 2.6MW motor (larger 3MW, 4000Hp units are available), and uses Magotteaux's Keramax - MT1 ceramic

## Technology

grinding media.

The Xstrata IsaMill at Phu Kham is operated in open circuit, similar to most IsaMill circuits. The grinding action in the mill involves stirred grinding, combined with an internal classification mechanism, which results in only oversized particles being ground.

This in turn produces a sharp discharge sizing and allows the IsaMill to operate without the need of classification equipment such as cyclones and associated pumps and pipe work, resulting in a small footprint compared to other grinding circuits.

Also the use of ceramic media in IsaMill circuits allows the grinding action to take place without the presence of ferric ions produced by steel media, as is the case in ball and tower mills, which provides metallurgical benefits in downstream flotation and leaching circuits as well as lower reagent usage.

IsaMills are now treating a range of minerals including lead, zinc, copper, gold, PGMs and

nickel in a variety of tertiary and secondary operations. The key to their operation is the improved energy efficiency compared to other grinding methods, with energy savings between 33% and 50% compared to traditional grinding technologies.

This is due to the mill operating with a packed bed of grinding media in its shell, through which eight grinding discs rotate at relatively high speeds. This creates a high probability of high energy intensity media-particle collisions, resulting in attrition grinding as well as limiting short circuiting, as the multiple discs act as independent grinding chambers.

The internal classifier at the end of the mill retains the oversize particles and media, and pumps them back into the mill for further grinding, allowing the ground particles to pass out the mill.

New operations and projects using IsaMill technology include Oz Minerals' Prominent Hill in Australia, Goldcorp's Penasquito project in Mexico and Envirogold's Las Lagunas tailings treatment project in the Dominican Republic.

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PanAust's Phu Kham Copper-Gold Project in Laos.



RIGHT:  
Xstrata's IsaMill  
regrind circuit in  
use at Phu Kham

## Phu Kham铜金矿采用IsaMill二次磨矿工艺

泛澳公司 (PanAust) 位于老挝的Phu Kham铜金矿采用了Xstrata技术公司的IsaMill二次磨矿工艺流程。

泛澳公司的Phu Kham铜金矿于2008年4月出产第一批精矿, 该矿位于老挝首都万象以北120公里处。

该项目年设计开采并处理矿石1200万吨。采用常规浮选流程年产精矿26万干吨, 其中含铜金属量6.5万吨, 含金金属量约7-8万盎司, 含银金属量约40-60万盎司。产出精矿被出口至承包加工的冶炼厂。

项目工艺流程包括常规首道磨矿加浮选。在进入更干净的浮选流程前, 较粗些的精矿将通过M10,000 IsaMill磨床进行二次磨矿。

IsaMill的设计产能最高可达168吨/小时, 可接受的最大进料颗粒粒度106微米, 磨后粒度38微米。该设备马达功率是26万千瓦 (还有更大功率的30万千瓦、4000匹配置备选), 并采用Magotteaux's Keramax - MT1陶瓷碾磨介质。

与大多数IsaMill流程一样, Phu Kham项目的Xstrata IsaMill也是采用开放回路。磨矿用的是搅拌磨矿方法, 且包含一套内部分级机制, 保证只有粒度过大的颗粒才会进入二次磨矿。这样一来实

现了精准的出矿粒度分级, 使得IsaMill磨床无需分选设备如旋流器及其配套泵和管道系统就可以工作, 较其他磨矿流程而言占用空间较小。

采用陶瓷介质的IsaMill流程还保证了在磨矿过程中不会掺入铁介质如球磨机或塔式粉碎机带来的铁离子, 因此可为下游的浮选和浸出流程带来冶金上的便利, 且可降低试剂用量。

IsaMill现已被广泛应用于多种金属如铅、锌、铜、金、铂族金属和镍的二道及三道磨矿工序中。该工艺的核心优势在于与传统磨矿方法相比能源效率得到提升, 可节省能源33%至50%。

这是由于磨矿机外壳中包含一块碾磨介质衬板, 其中8个磨盘高速旋转。这使得高能状态下的介质-颗粒碰撞的可能性较高。

位于磨矿机末端的内部分级器将较大粒径的颗粒和介质截留, 然后把他们泵回去进行在此碾磨, 直到粒径达到要求后再允许通过。

采用IsaMill技术的其他矿山和项目还包括: Oz Minerals公司位于澳大利亚的Prominent Hill项目; Goldcorp公司位于墨西哥的Penasquito项目以及Envirogold公司位于多米尼加共和国的Las Lagunas尾矿处理项目。

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