



FERRO-ALLOY
RESOURCES GROUP

公司介绍

2020年10月

公司概况——一家哈萨克斯坦钒生产商

拥有世界上最具勘探前景的矿床

公司：

- 在伦敦证券交易所和阿斯塔纳国际交易所上市
- 总部：根西岛
- 运营地点：哈萨克斯坦

业务活动

- 现有业务处于盈利中——目前正在将每年产能扩大到1500吨（五氧化二钒）
- 巴拉索斯坎迪克（Balasausqandiq）钒项目——每年22400吨

钒市场

- 属于快速增长的传统市场
- 作为电池金属，也是巨大的新市场



钒市场

钒

这种金属用于成熟产业和新兴绿色技术

用途:



全球钢铁工业消耗90%



钒液流电池



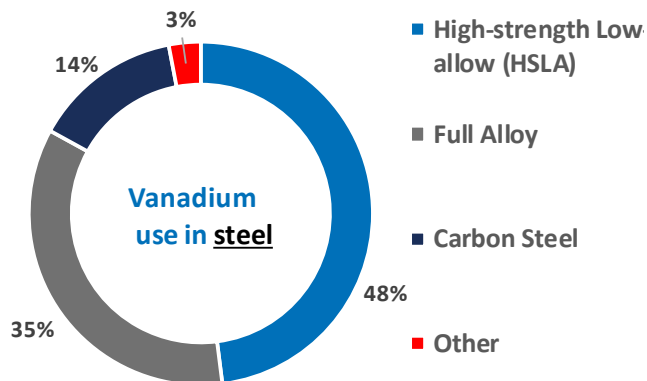
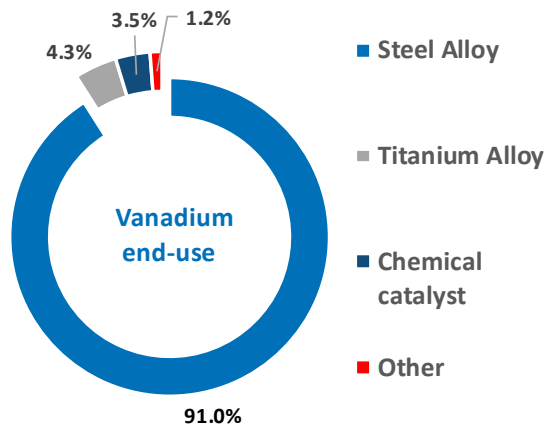
钛合金-例如喷气发动机和飞机



陶瓷化工

主要产品:

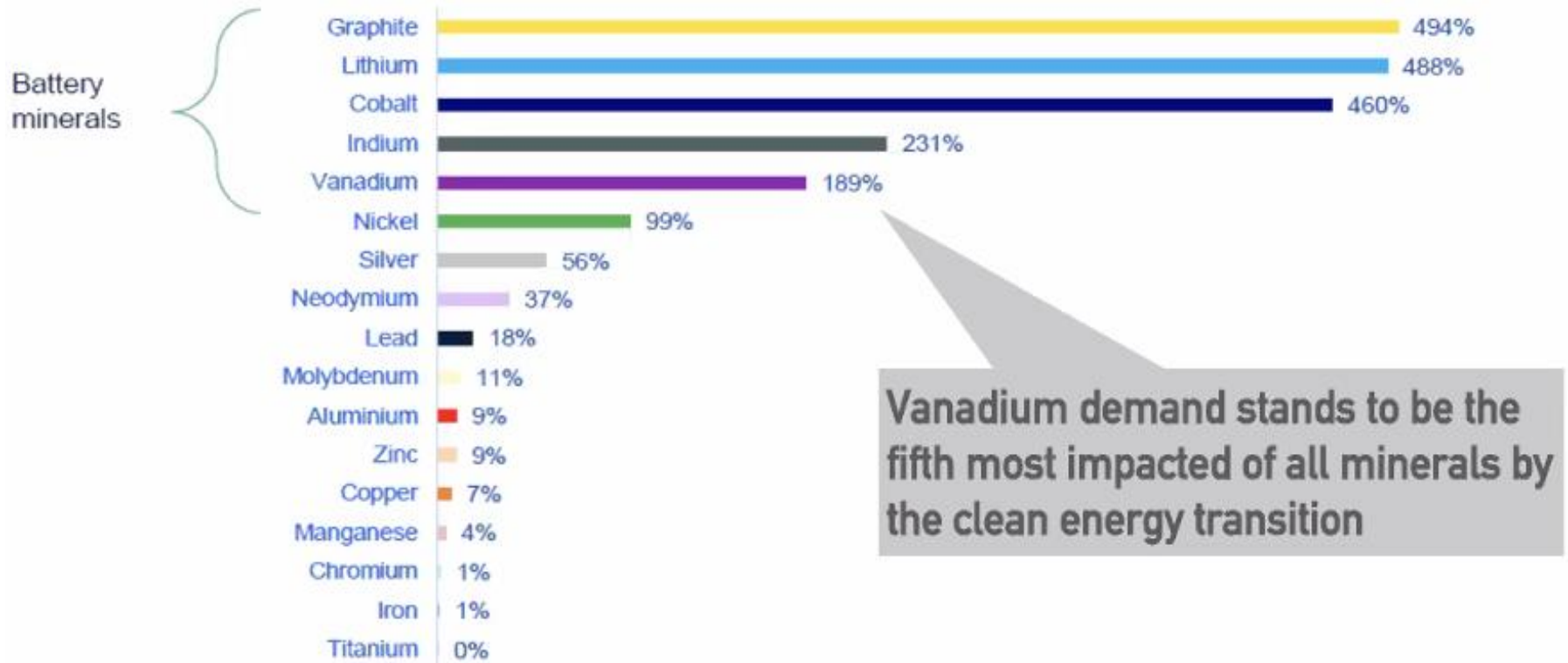
- 五氧化二钒 (V₂O₅)
- 钒铁合金(FeV)
- 蓄电池电解液



钒是一种电池金属

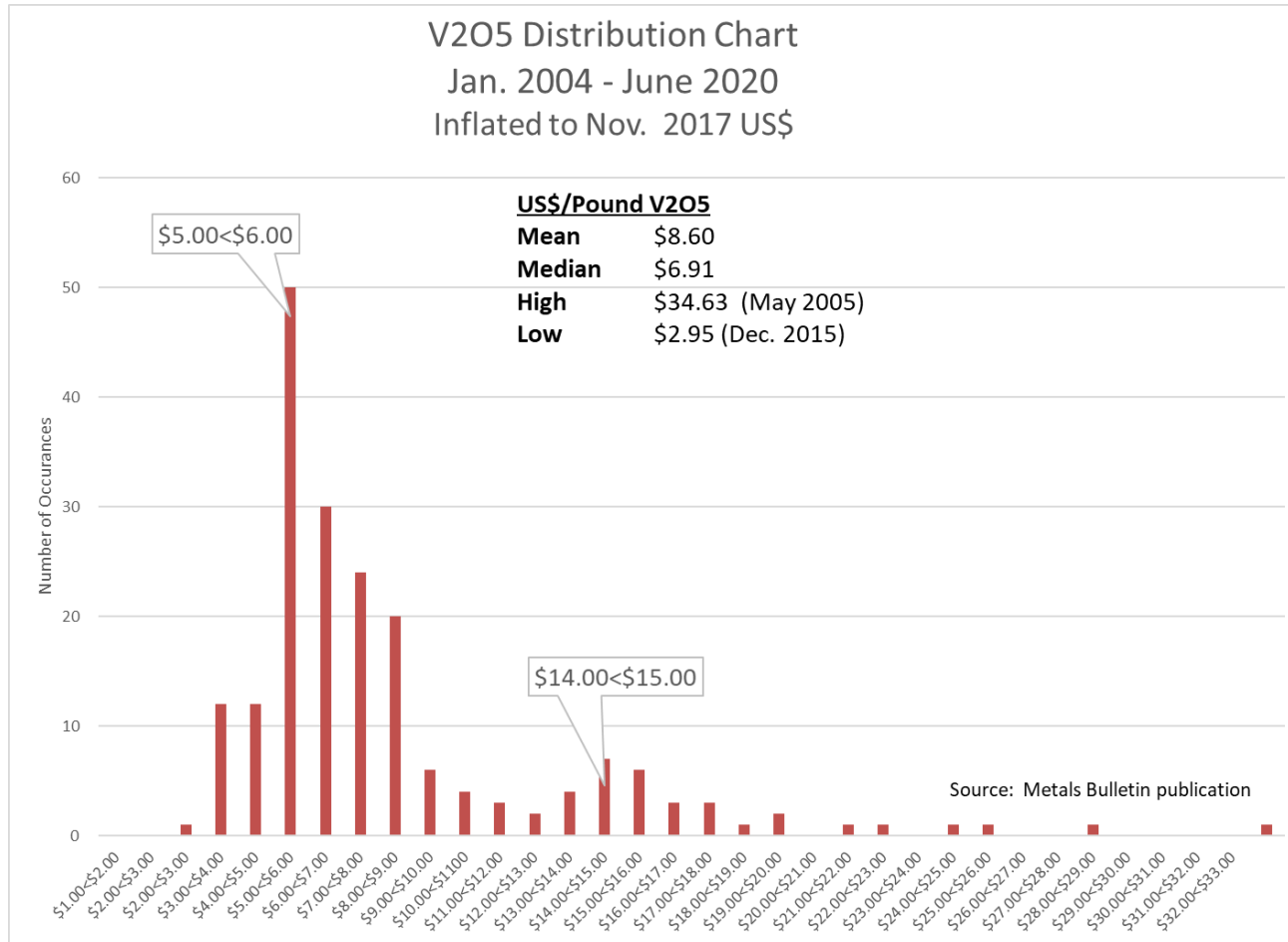
对于钒金属来说，这是一个全新的主要市场

Projected Annual Demand in 2050 for Energy Technologies as a Percentage of 2018 Production Levels under 2DS



钒价波动很大

平均价格比通常价格高很多



资料来源：英国金属通报，TTP Squared公司。

世界钒市场增长强劲

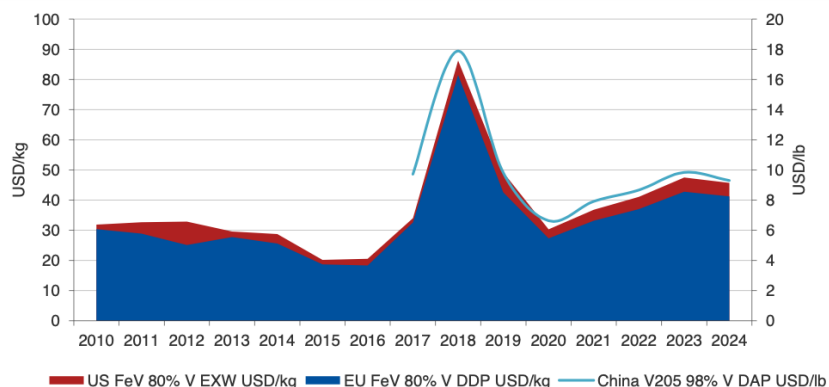
全球每年都需要像巴拉索斯坎迪克一期工程这样的新项目，才能满足需求

Table 2 Vanadium demand by end-use 2018-2030, tonnes V

	2018	2019	2020	2022	2024	2026	2028	2030	2019-2030 CAGR	Delta 2019- 2030
Steel	88,918	91,423	91,705	98,957	104,592	110,010	115,304	121,243	2.6%	29,820
Batteries	1,505	1,804	2,638	4,946	6,403	13,206	26,155	34,060	30.6%	32,256
Aerospace	4,171	4,044	4,420	4,821	5,263	5,764	6,175	6,614	4.6%	2,570
Chemicals	4,498	4,563	4,664	4,912	5,129	5,367	5,620	5,889	2.3%	1,326
Total	99,092	101,834	103,426	113,636	121,387	134,347	153,254	167,806	4.6%	65,972

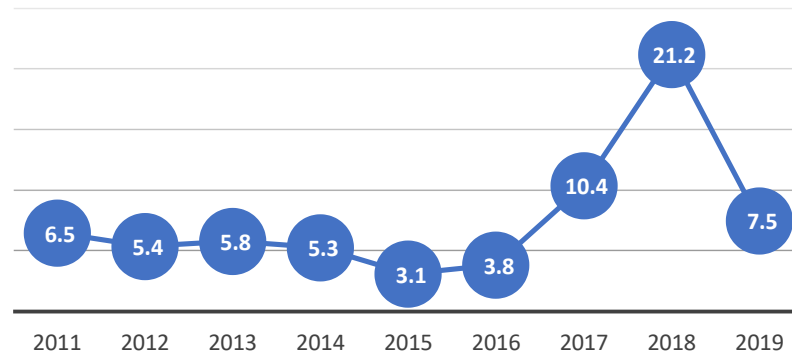
CRU

Figure 4 Medium term vanadium pricing 2010-2024, nominal \$/kg & \$/lb



CRU

**五氧化二钒价格，美元/磅，金属通报中间价平均值
荷兰鹿特丹**



目前拥有两项业务

A: 现有的选矿业务

B: 巴拉索斯坎迪克项目

两项业务

两项业务位于同一地点运营：

A、 现有业务

- 处理外购二次材料，回收五氧化二钒
- 现有产能700吨/年
- 目前正在将五氧化二钒产能扩大到1500吨/年
- 拥有150名员工

B、 巴拉索斯坎迪克项目

- 一座拥有经济潜力的巨大矿床
- 正在将现有研究深度提高至西方银行级标准
- 净现值20亿美元
- 有望成为世界上成本最低的生产项目
- 具有成为世界最大生产商的潜力



现有业务

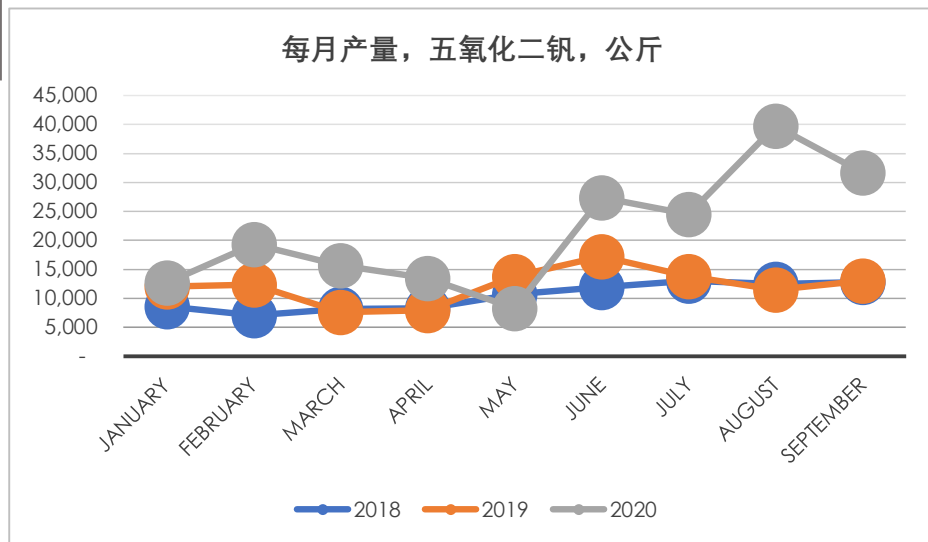
现有选矿厂——现状



- 拥有湿法冶金生产线和火法冶金生产线
- 钒和钼均可以回收
- 目前的合并生产能力约为每月60吨五氧化二钒，计划在2021年期间，增至每月125吨
- 道路交通良好
- 距离现场70公里建有Shieli高速公路和铁路
- 已经并网供电，并连接到相邻的高压输电线路路上

现有生产状况

现有工艺生产产品为五氧化二钒:



- 对外购的精矿和二次物料进行处理，以偏钒酸铵（AMV）的形式提取五氧化二钒
- 目前，产能已达到每月60吨，而且还在不断增长
- 目前正在安装一台转换设备，将AMV转换为五氧化二钒，大约在2020年12月完成安装工作
- 计划在2021年安装电弧炉，将产能提高到每月125吨

现有选矿厂：湿法冶金生产线



现有选矿厂：火法冶金生产线

烘炉



试验室

铁合金实验室设备齐全，技术力量雄厚

技术总监A A Fofanov先生是世界上最重要的钒专家之一



巴拉索斯坎迪克矿床

巴拉索斯坎迪克矿床：拥有独特的矿石类型——钒石 英岩



巴拉索斯坎迪克项目——为什么与其他生产商和项目相比拥有巨大的成本优势？

最重要的是，它并非钒钛磁铁矿（“TVM”）矿床

为什么这一点如此重要：

- 无需高温焙烧
- 无需对矿石进行预选
- 拥有更高的回收率
- 可产出有价值的副产品



- 可将资本和运营成本降低约60%
- 可将运营成本降低约60%
- 注定要成为世界上成本最低的生产项目



巴拉索斯坎迪克项目——拥有的其他优势

地质条件有利

- 地表已经露头，可以露天矿开采，
- 矿床规模巨大
- 总资源量加上勘探潜力，高达1.26亿吨（取估计范围的中间值）
- 地质边界品位明显，剥采比低

现有基础设施和运输线路

- 从Shieli镇到现场有道路可通（70公里）
- Shieli镇位于连接西欧和中国东海岸的高速公路和铁路线上
- 现场附近的高压（110千伏）输电线路——现在正在连接
- 水陆交通俱备

环境与社会

- 矿石和回收利用作业的所有成分都可以作为产品进行出售
- 现场不存放永久性废弃物或尾矿
- 不扰动耕地
- 现场距离最近的居民点16公里，不会有人搬迁或受到干扰

巴拉索斯坎迪克项目——经济效益

这些成本优势将使该项目注定要成为世界上成本最低、利润最高的钒生产项目

世界上成本最低的生产项目

- 巴拉索斯坎迪克项目的预测生产现金成本：
 - 预计1.54美元/磅（成本分摊到各个产品）
 - 如果计入副产品收入的话，成本为负（1.2美元/磅）

相比而言：

- 仅次于成本最低的生产商——铁合金资源公司（Ferro-Alloy Resources）的3.48美元/磅水平

特殊财务统计指标（第一阶段和第二阶段工程合并）

- 净现值20亿美元（10%折现率，税后现金流）
- 经营利润率79%（为特许权出售或产品融资提供了充足的空间）
- 内部收益率89%
- 年经营现金流税后每年4.3亿美元（仅第一阶段开始每年就达1.03亿美元）



开发计划

开发计划

当前	将现有运营规模扩大至1500吨/年， 并对巴拉索斯坎迪克项目进行可行性 研究	进行中
第一 阶段	每年开采和加工100万吨矿石 产量5600吨/年 (由现有业务、债务和其他非股权来源提供建设资金)	资本支出 1亿美元
第二 阶段	将处理能力扩大至每年400万吨矿石 产量增至22400吨/年 (由项目收益提供建设资金)	资本支出 2.25亿美元

五氧化二钒 (V2O5) 产量数字，以吨计

- 第1阶段的建设资金将由现有业务的收益加上债务、特许权出售和产品融资方式（有限或无需发行股票）提供帮助
- 第2阶段的建设资金将来自第1阶段的经营收入



附录

哈萨克斯坦

拥有具吸引力的经营环境

- 属于中等偏上收入国家（世界银行）
- 2019年顺利过渡到新总统（世界银行）
- 其营商便利度在191个经济体中排名第25位（世界银行2020报告）
- 所得税10%，利得税20%
- 无需政府免费股权或本地所有权
- 根据国际惯例，2018年更新了底土使用法

政府大力支持

- 与政府签订有投资激励协议
- 选矿业务的主要激励措施：
 - 2026年前税率为0%
 - 2024年前免征矿产税



Minister arriving on site

附录： 有价副产品

有价副产品是作为单一选矿工艺的一部分而产出的

碳硅混合物

富集后用于制造炭黑，用于橡胶制造（全球市场价值120亿美元），可将碳硅混合物压块，制成硅铁冶炼的理想原料

铀/钼

黄饼精矿作为核反应燃料。Kazatomprom拥有在哈萨克斯坦购买铀产品的法定优先权

明矾

可以在中国销售或分解成氧化铝和化肥

稀土精矿

由于市场低迷，该副产品目前排除在基本方案之外，但未来有潜力

产品名称	每吨矿石预计收入 (美元/吨)
钒 (V2O5) @7.50美元/磅	93
碳硅混合物	26
铀	3
铝/钾	10
钼	4

附录：董事会和管理层

团队经验丰富、能力明显

董事会

尼古拉斯·布里根 (Nicholas Bridgen)，首席执行官
注册会计师，居住在哈萨克斯坦，会说俄语。在力拓集团 (Rio Tinto group) 担任各种职务14年，在前苏联经营的公司拥有26年董事会级别的工作经验，包括担任Hambleton矿业公司的首席执行官。

安德烈·库兹涅佐夫 (Andrey Kuznetsov)，运营总监
工程师，数理逻辑博士，母语为俄语，会说英语。曾在中央青年委员会负责科学部、康塔克研究与开发部和TOO Firma Balausa公司。拥有十多项钒处理技术专利。

克里斯·托马斯 (Chris Thomas)，非执行董事
日本I&S BBDO董事长，曾任BBDO美洲以及亚洲、中东和非洲分公司的首席执行官。

詹姆斯·图里安 (James Turian)，非执行董事
拥有会计和信托管理背景，证券协会投资管理资格分会 (IAQ) 特许会员和董事协会会员。You公司会计总监。

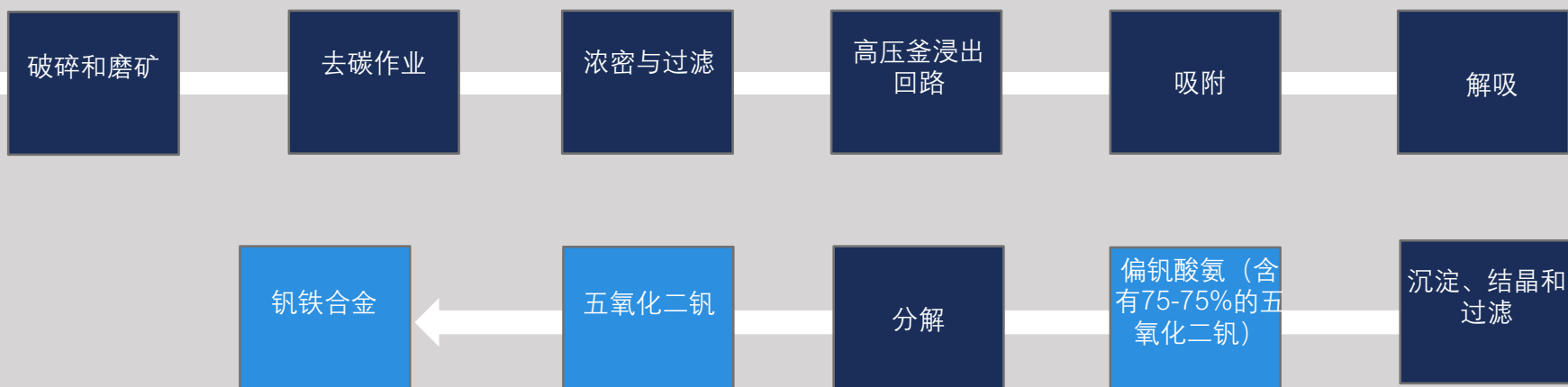
管理层

亚历山达·福法诺夫 (Alexandar Fofanov)，技术总监
化学工程师，钒提取工艺博士。曾经在莫斯科中央冶金研究所任职，也曾任图拉钒业公司 (Tula Vanadium) 的总经理和埃夫拉兹集团 (Evraz Group) 钒业技术总监。

奥列格·舒勒波夫 (Oleg Shulepov)，生产总监
机械工程师，职业生涯主要在图拉钒业公司和埃夫拉兹集团工作，最近担任项目管理部总经理。

附录：简化工艺流程

处理能力达15000吨/年中试装置的工艺流程图



附录：巴拉索斯坎迪克矿床

资源和潜力

仅对一个矿体按照JORC规范进行了资源估算

矿体	类别 (JORC 2012年)	吨位 (百万吨)	五氧化二钒 (%)	五氧化二钒 (吨)
矿体1	原生矿控制资源 ¹	21.4	0.67	143,380
矿体1	氧化矿推断资源 ²	1.3	0.89	11,570
矿体1	原生矿推断资源 ¹	1.6	0.67	10,720
合计		24.3	0.68	165,670
矿体2-矿体5	勘探目标 ³	85.5	0.68	581,400
合计		109.8	0.68	747,070

1. 氧化矿以1.7的体积密度计算

2. 原生矿以2.4的体积密度计算

3. 根据铁合金资源公司 (FAR) 独立地质学家估计的范围所得出的平均值。GBM CPR, 2018年11月12日

4. 基于矿体1控制资源量得出的储量 (JORC 2012年规范) 仅为2300万吨。此外, 上表中推断的原生矿材料位于规划露天矿的轮廓内。

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