

Rock Tests

原矿试验

Rock Tests 原矿试验

Types of Tests 试验类型

• Tests on mechanical properties 试验设备及测试

- Los Angeles 洛杉矶指数
- Work Index 功指数
- Abrasion Index 磨蚀指数
- Dynamic Fragmentation 动能碎裂性
- Crushability 可碎性
- Abrasiveness 磨蚀性



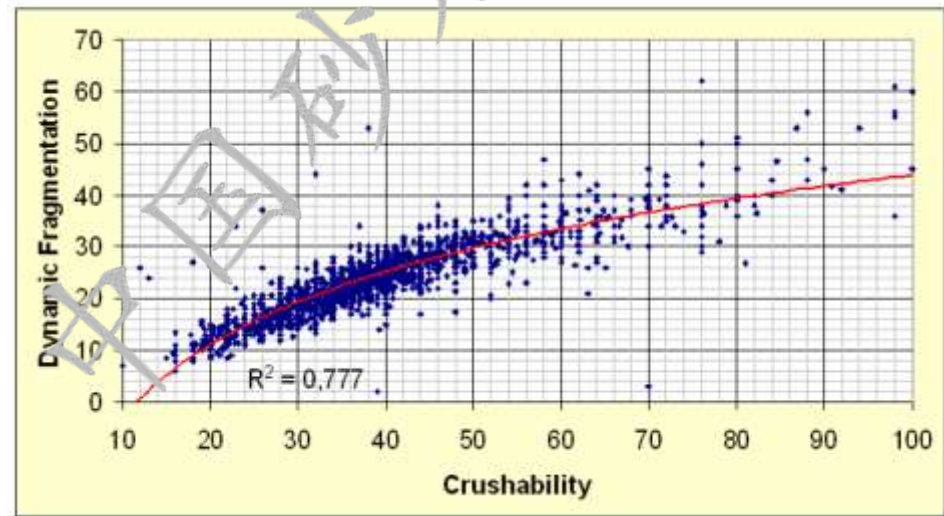
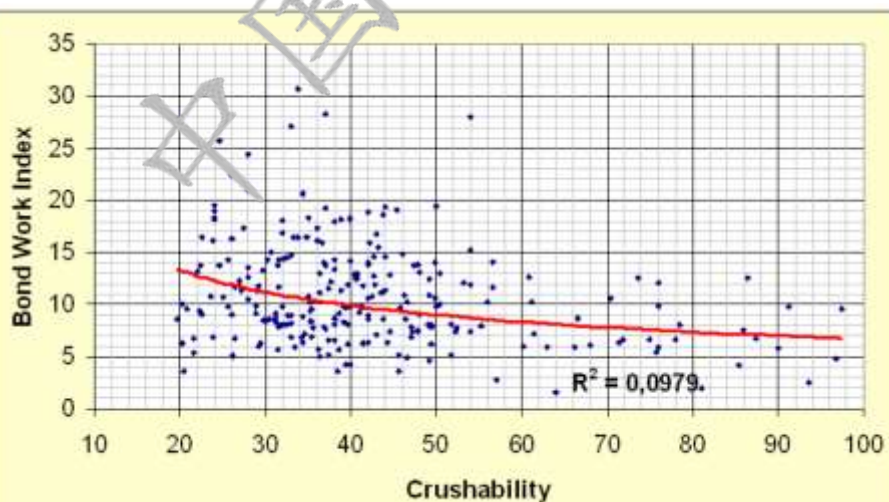
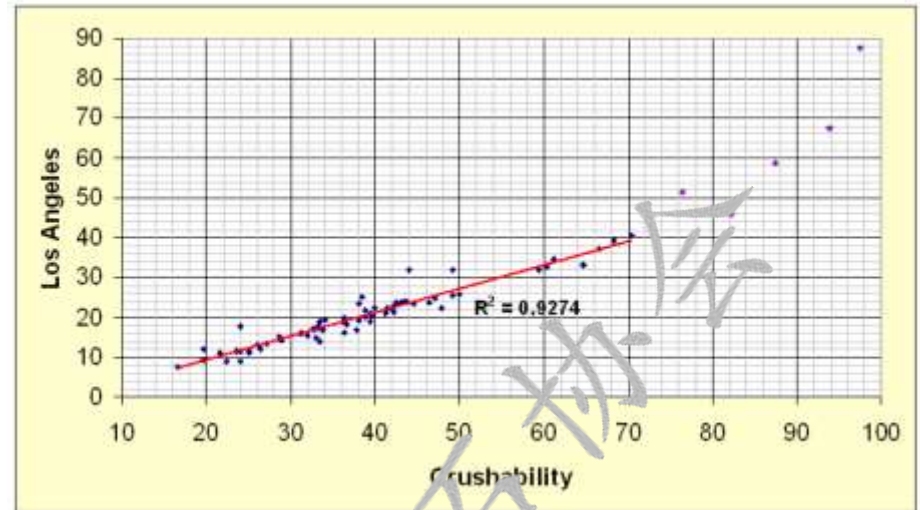
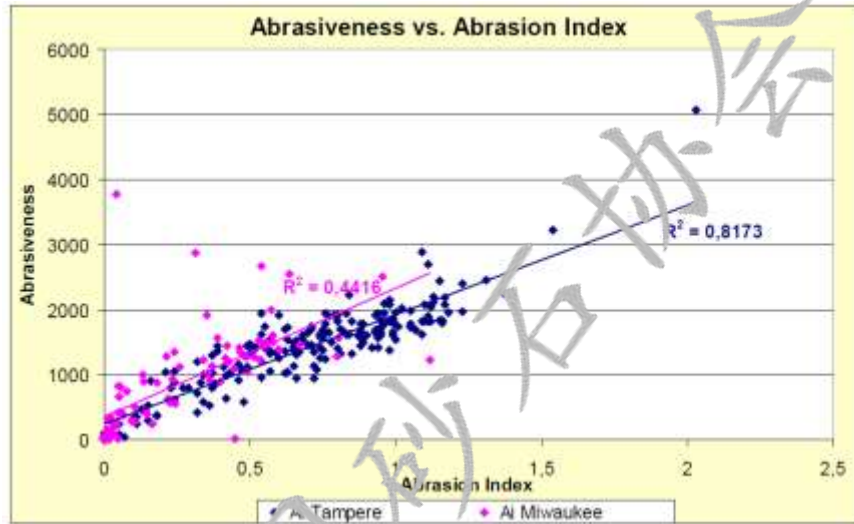
Paddle before test



Paddle after test

Type of Rock Tests

试验类型



Type of Rock Tests 试验类型

Summary – Correlations 概述——各试验的相关性

- Some rock tests have more or less good correlation:

各试验之间的关联性

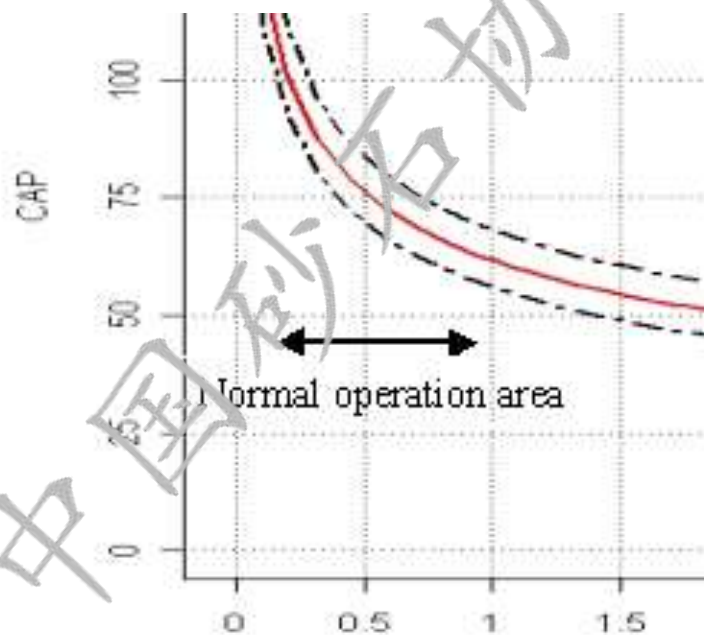
- Abrasion Index / Abrasiveness (Tampere) : $R^2 = 0,82$ 磨蚀指数 / 磨蚀性 (美卓芬兰)
 - Abrasion Index / Abrasiveness (Milwaukee) : $R^2 = 0,44$ 磨蚀指数 / 磨蚀性 (美卓美国)
 - Crushability / Dynamic Fragmentation : $R^2 = 0,78$ 可碎性 / 动能碎裂性
 - Crushability / Los Angeles $R^2 = 0,93$ 可碎性 / 洛杉矶指数
 - Crushability / Bond Work Index $R^2 = 0,10$ 可碎性 / 邦德功指数
- because of their different procedures (different wearing phenomenon, different method of breakage, ...) and so, we can easily suppose it's partly caused by the different behaviour of each type of rock

由于试验的流程有差异，不同的磨损表现，不同的碎裂方式，所以可得出的结论是，因岩石本身的物理性质而产生了部分影响

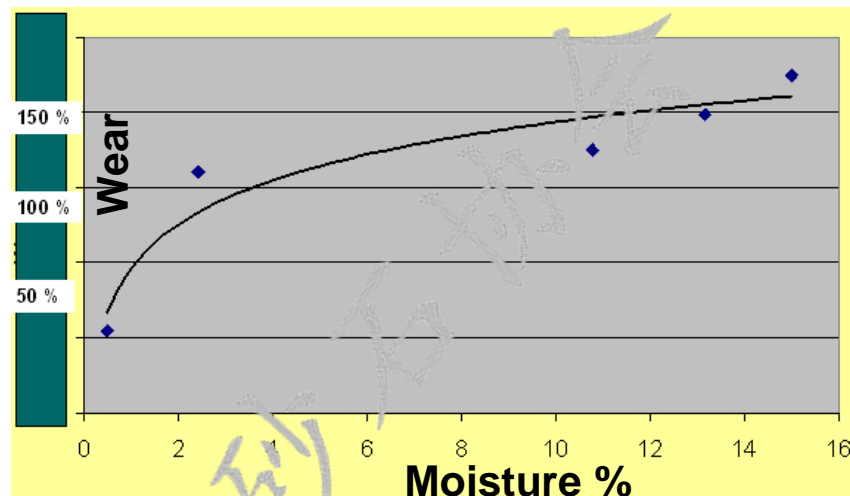
Abrasiveness 磨蚀性

Moisture
含水率

Capacity 产能



Wear 磨损



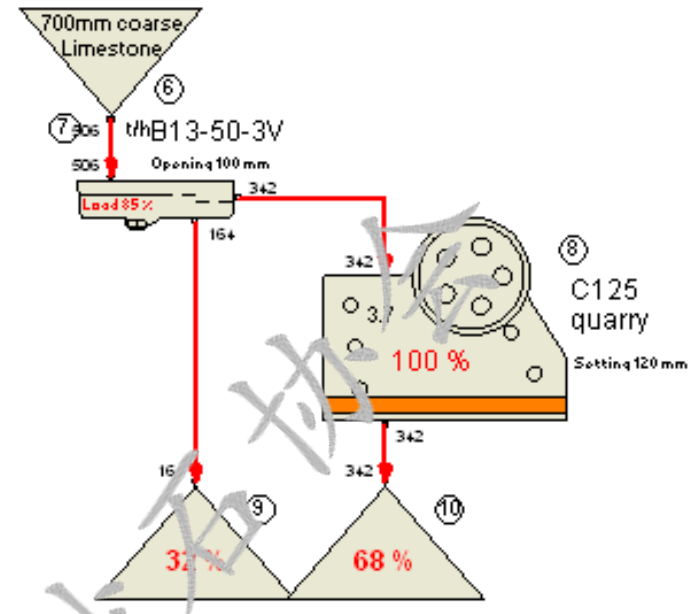
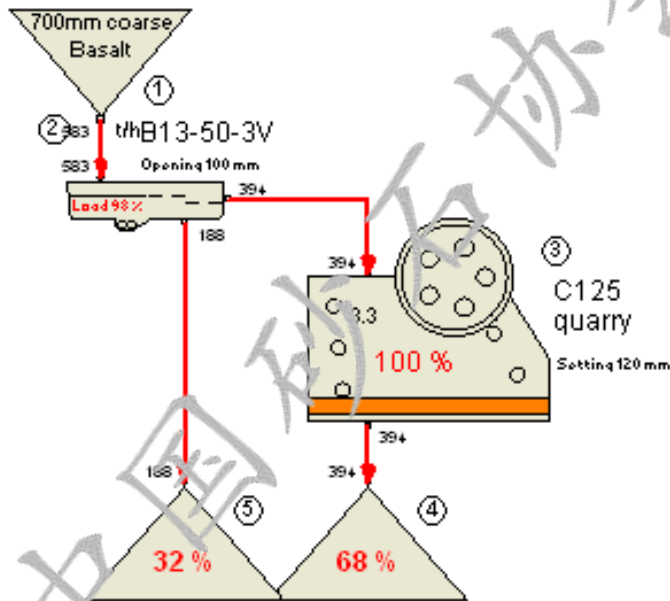
Cone crusher (圆锥式破碎机), 1000mm,
C.S.S (闭边排矿口), 12 mm

Hardness effect on crusher 物料硬度对破碎机的影响

Crushability or Los Angeles Index

可碎性或洛杉矶指数

设备设定相同时

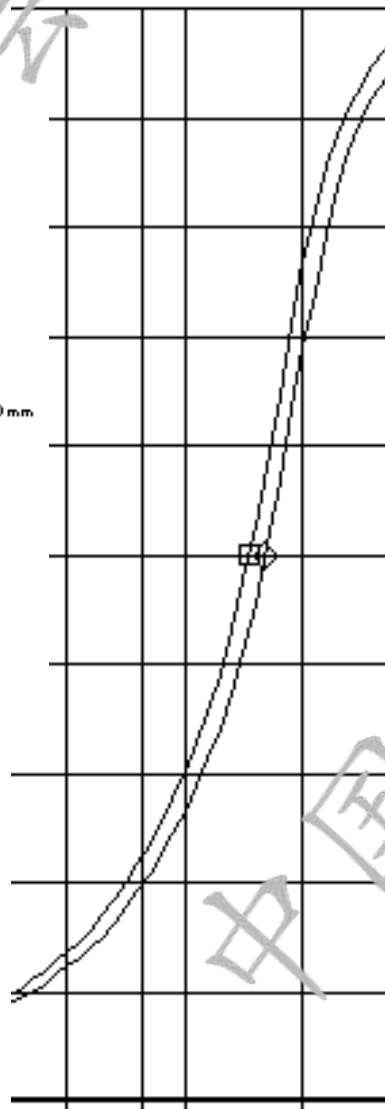


Basalt (玄武岩)

Specific gravity	2.9t/m ³
Crushability	26
Crusher throughput	394 tons
Average Power	168 kW

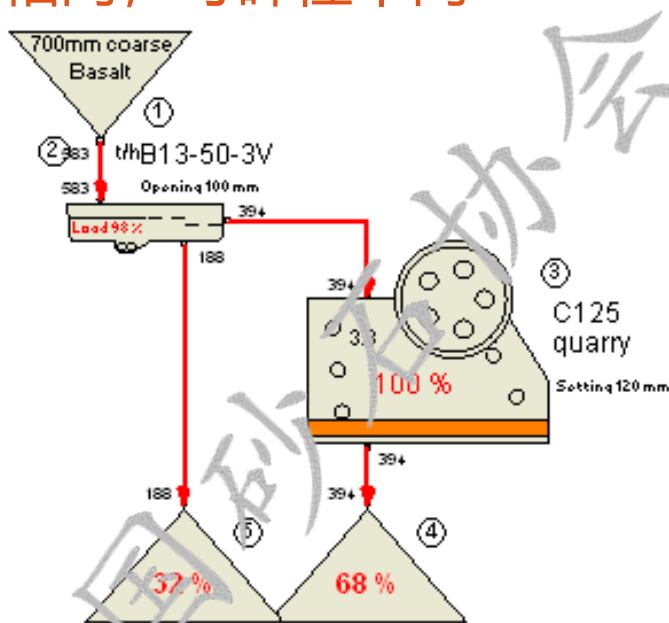
Limestone (石灰岩)

Specific gravity	2.5
Crushability	40
Crusher throughput	342 tons
Average Power	145 kW



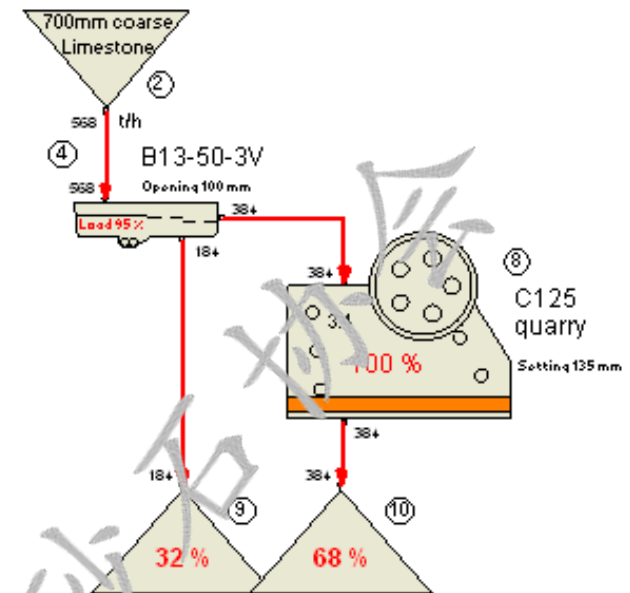
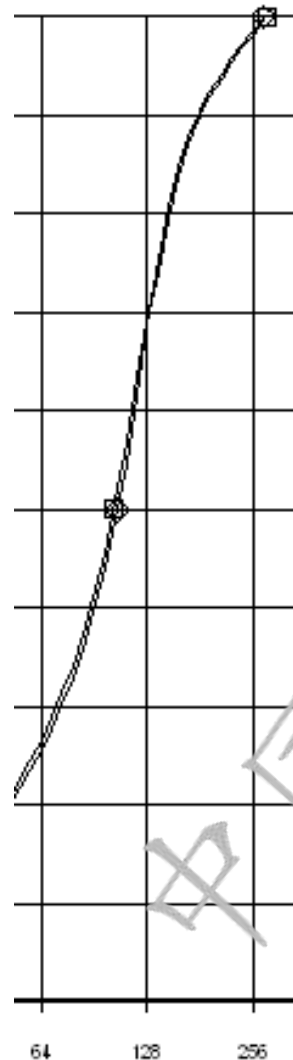
Hardness effect on crusher 物料硬度对破碎机的影响

Crushability different, same product
产品相同，可碎性不同



Basalt (玄武岩)

Specific gravity	2.9
Crushability	26
Crusher throughput	394 tons
Average Power	168 kW



Limestone (石灰岩)

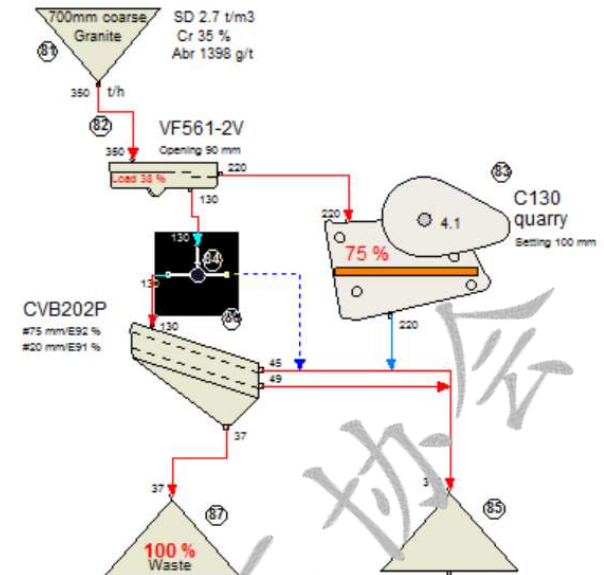
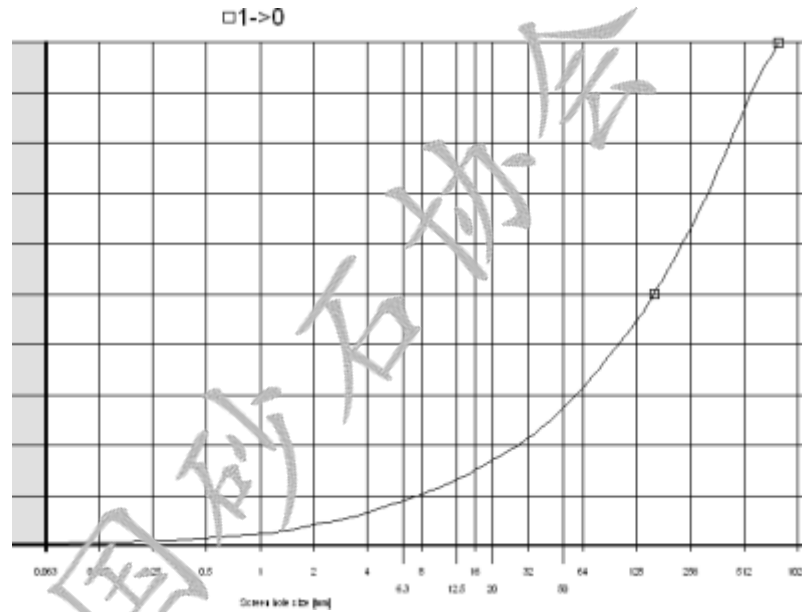
Specific gravity	2.5
Crushability	40
Crusher throughput	385 tons
Average Power	137 kW

High Performance Aggregates Process Design

高品质骨料生产线的设计流程

High Performance Aggregates 高品质骨料成产线

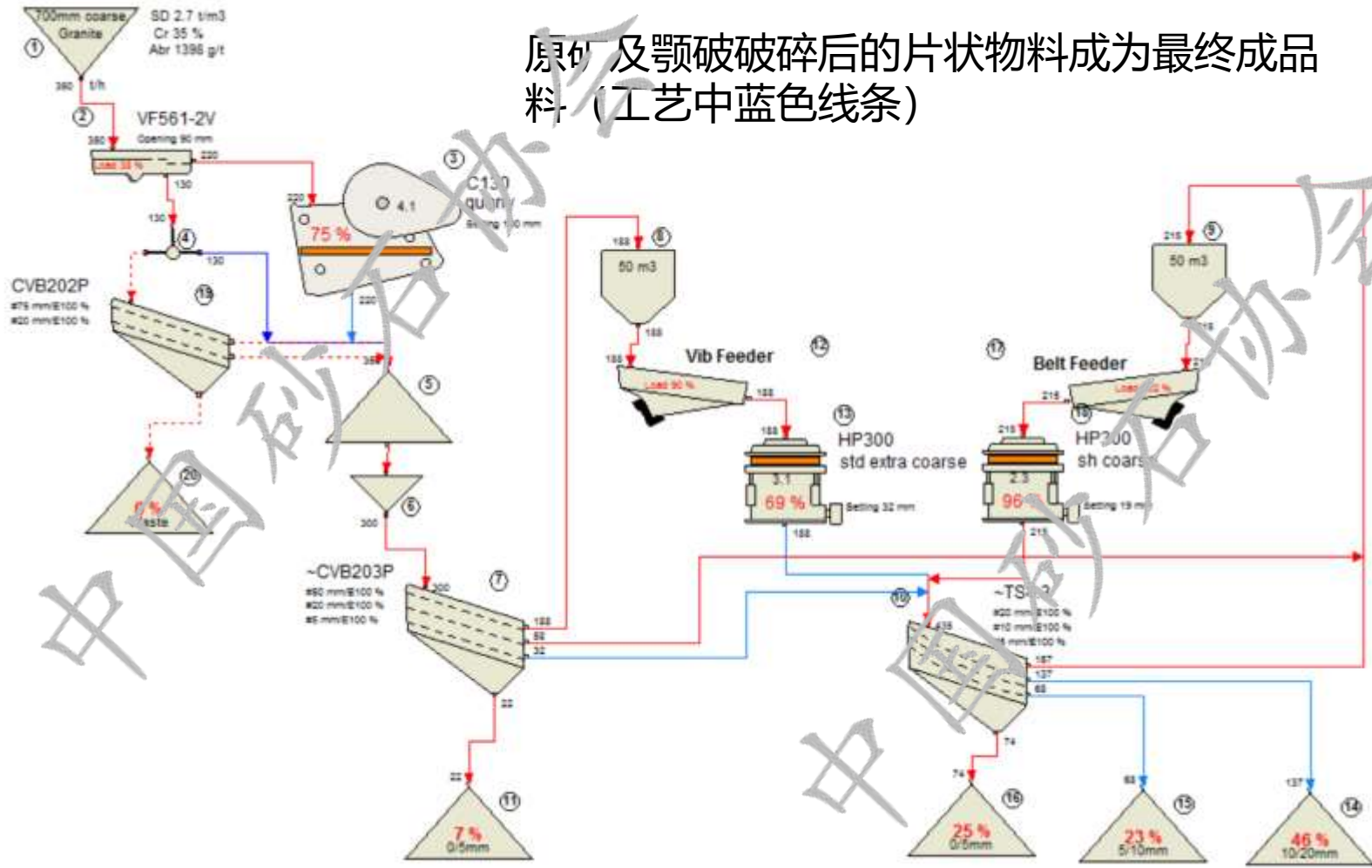
Feed gradation 给料级配



High Performance Aggregates 高品质骨料成产线

Chasing Yield not Quality 产量重于质量的骨料生产工艺

原矿及颞破破碎后的片状物料成为最终成品料 (工艺中蓝色线条)

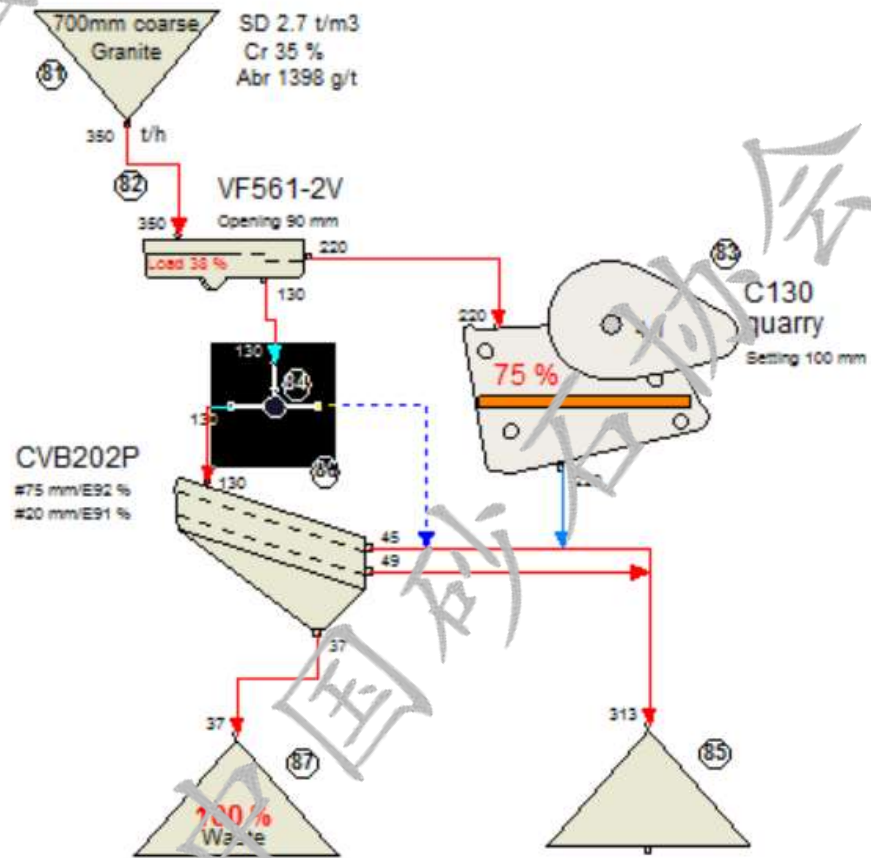


Flaky particles from the feed and jaw get mixed into the final product (blue line)

High Performance Aggregates 高品质骨料生产线

Scalping before primary crusher – Improves Quality

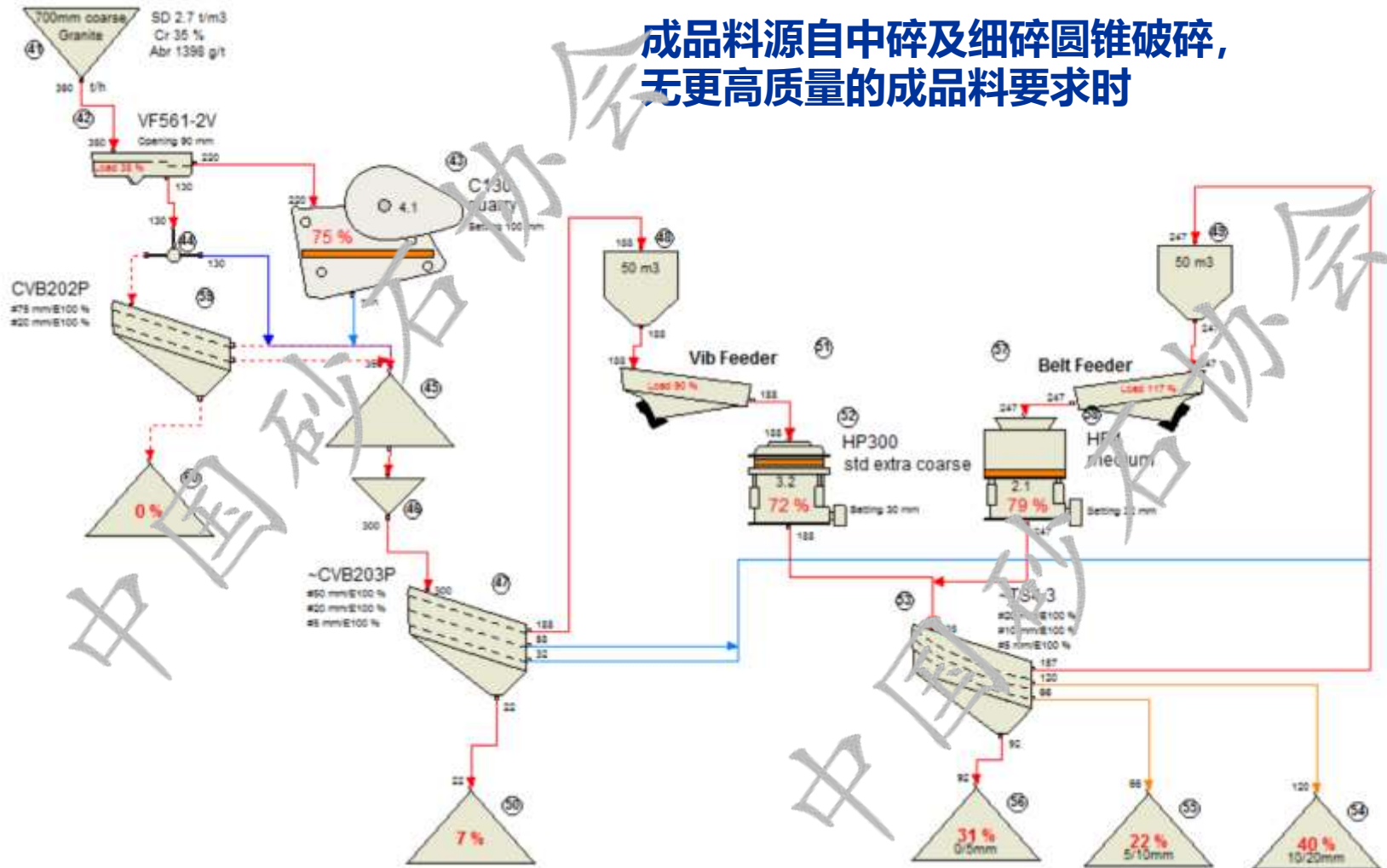
提高质量——粗碎前增加粗料筛



High Performance Aggregates 高品质骨料生产线

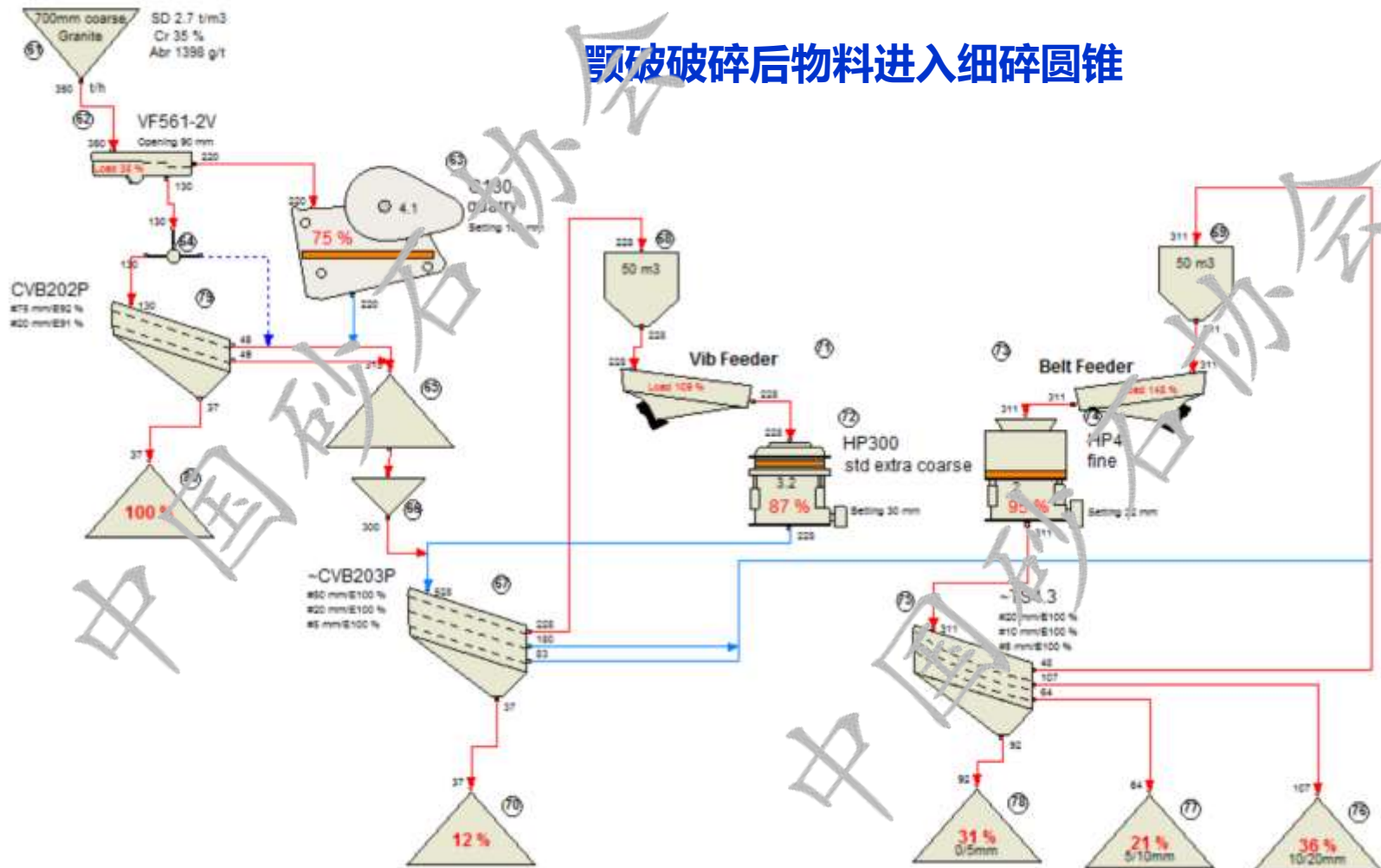
Normal Quality 常规质量的骨料生产工艺

成品料源自中碎及细碎圆锥破碎，
无更高质量的成品料要求时



High Performance Aggregates 高性能骨料生产线

Best Quality 高质量的骨料生产工艺



Process Design 流程设计

Crusher Selection High Performance Aggregates

高品质骨料生产线的破碎机选型

- Crusher type, crushing stage and ability for cubical products
破碎机类型，破碎工序段和成品料粒形的关系

Machine	Primary	Secondary	Tertiary
Jaw crusher	Bad	Bad	N.A.
Pri. Gyratory	Bad	N.A.	N.A.
Hori. Impactor	Good	Good	Good
Vert. Impactor	N.A.	N.A.	Good
Cone Crusher	N.A.	Medium	Good

How hard is to fill quality requirements?

高品质成品骨料的生产难度

- Degree of difficulty to achieve needed quality of end product depends on:

-Crushability of rock type

- Quality requirement itself

QUALITY REQUIREMENT FOR END PRODUCT

	Low	Medium	High
Easy	Easy	Easy	Medium
Medium	Easy	Medium	Difficult
Difficult	Medium	Difficult	Difficult

CRUSHABILITY

Process Design 工艺生产流程

Product shape, size 10/20 mm 成品料粒形10/20mm



Flakiness index (针片状) 31.3 %

Reasons for bad shape:

- wrong plant layout (工艺流程不合理)
- difficult rock (物料较难处理)



Flakiness index 1.2 %

Reasons for good shape:

- correct plant layout
- normal rock



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