Mobile plant comparison

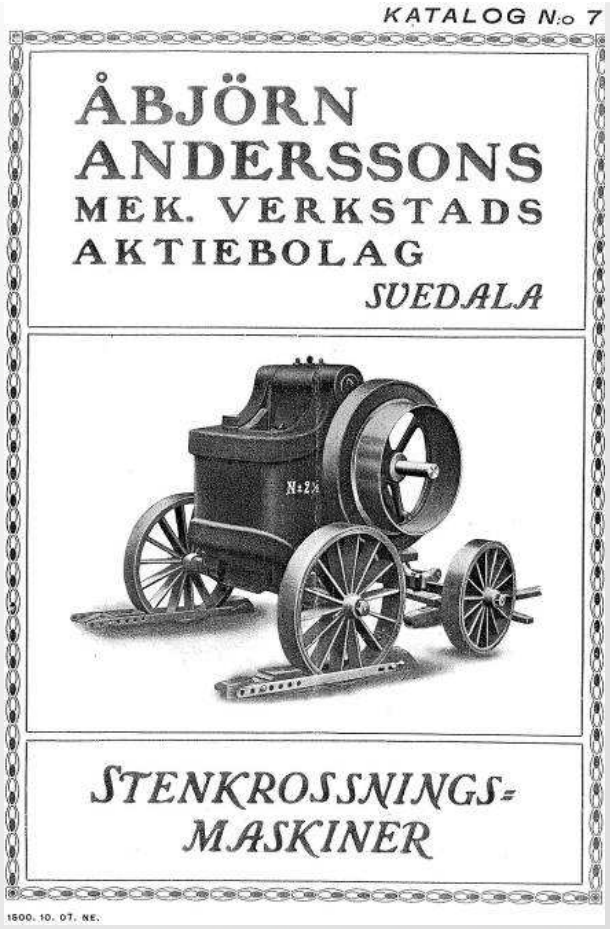
Peter Delbrant

QUARRY ACADEMY

Improving Processes. Instilling Expertise.

ORICA VOLVO SANDVIK

1897-1907



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1950-1979

1980’s

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1987

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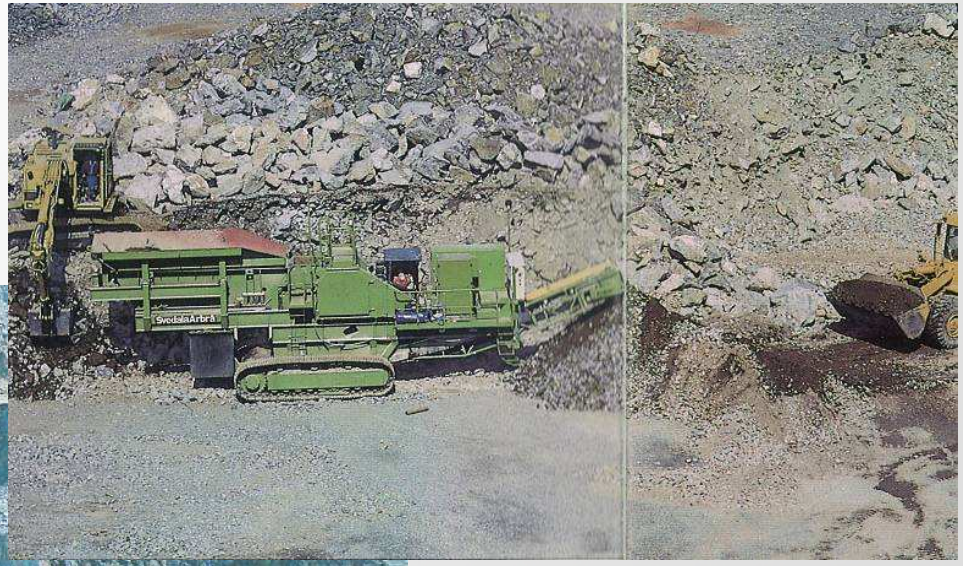
1988 - 1992



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2012

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Comparison mobile plant

Train or alternative setup

Added value?

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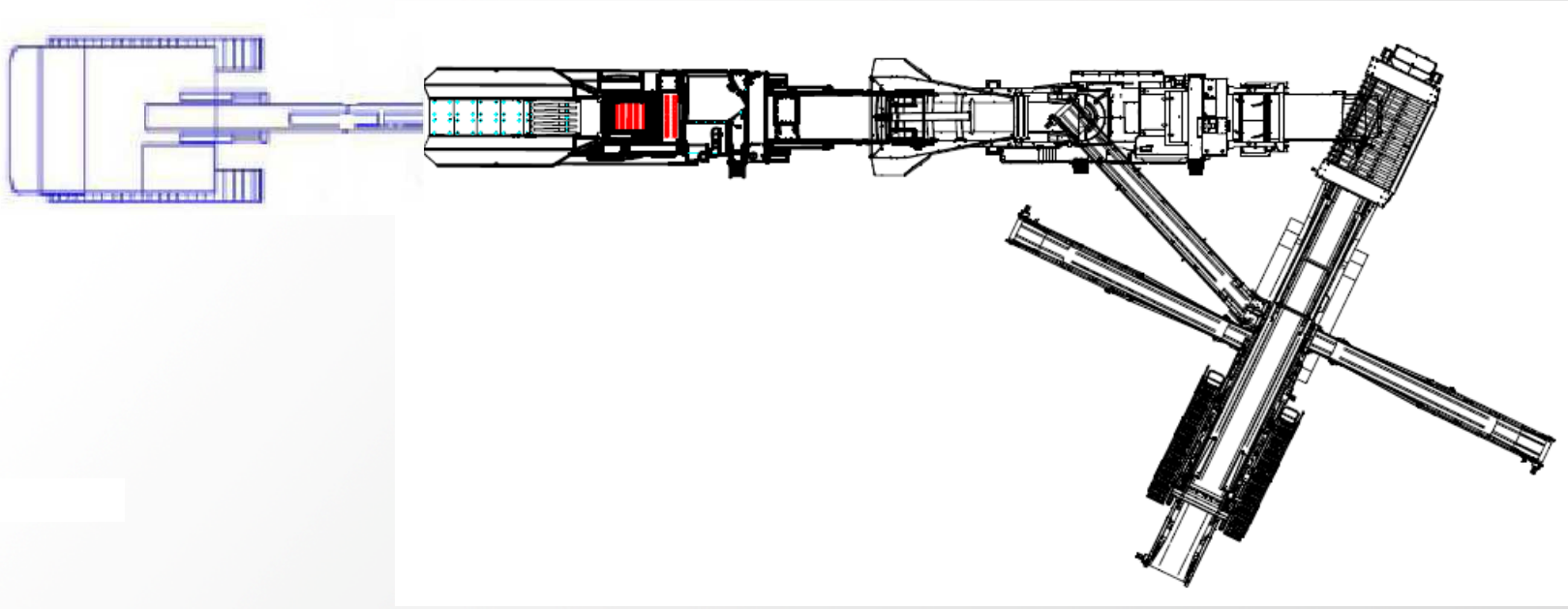
Ordinary train setup

Three connected tracked units



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VS

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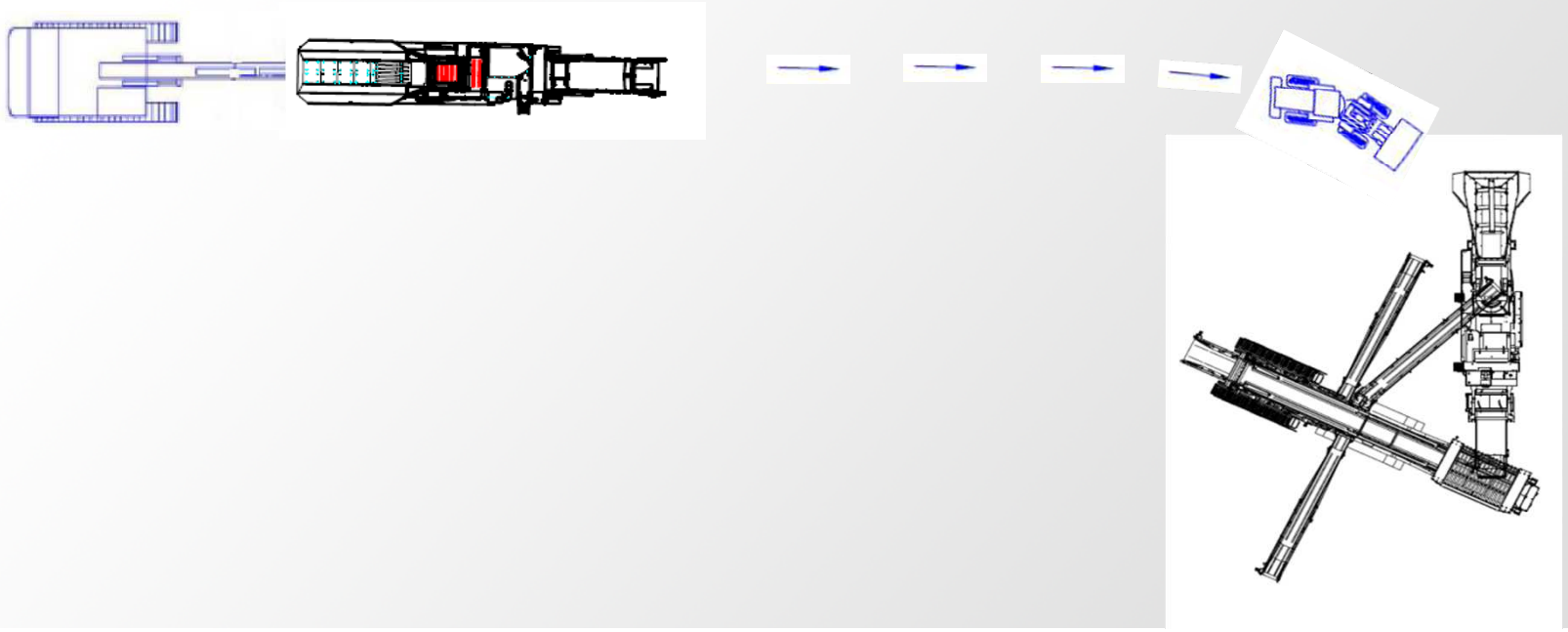
Alternative setup

Primary unit on shot pile. Secondary and screen unit in fixed location



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Utilization

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Mobile units

Utilization

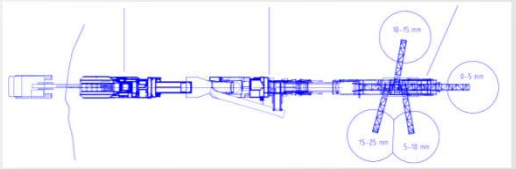
Utilization (availabilty) = Production time – unplanned stops

Nominal (design) capacity x Utilization = Average production Metric (tons/hr)

- Primary unit – Utilization approx 90%
- Secondary unit – Utilization approx 95%
- Screening unit – Utilization approx 95%

Primary units are most likely to be affected by operational balance between primary and secondary crushing. Plus the occasional oversize rock requiring management or bridging on feeder or crusher mouth, etc.

Mobile units
Utilization – train setup



When units are in serial connection setup (as in trains)
the total utilization is equal to the multiplication of each units utilization.

Total utilization train = 90% x 95% x 95% = 81.5%

- Primary unit – Utilization approx 90%
- Secondary unit – Utilization approx 95%
- Screening unit – Utilization approx 95%

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Mobile units

Production – train setup

The nominal capacity of end products is 234 mtph.

Total utilization train = 81.5%

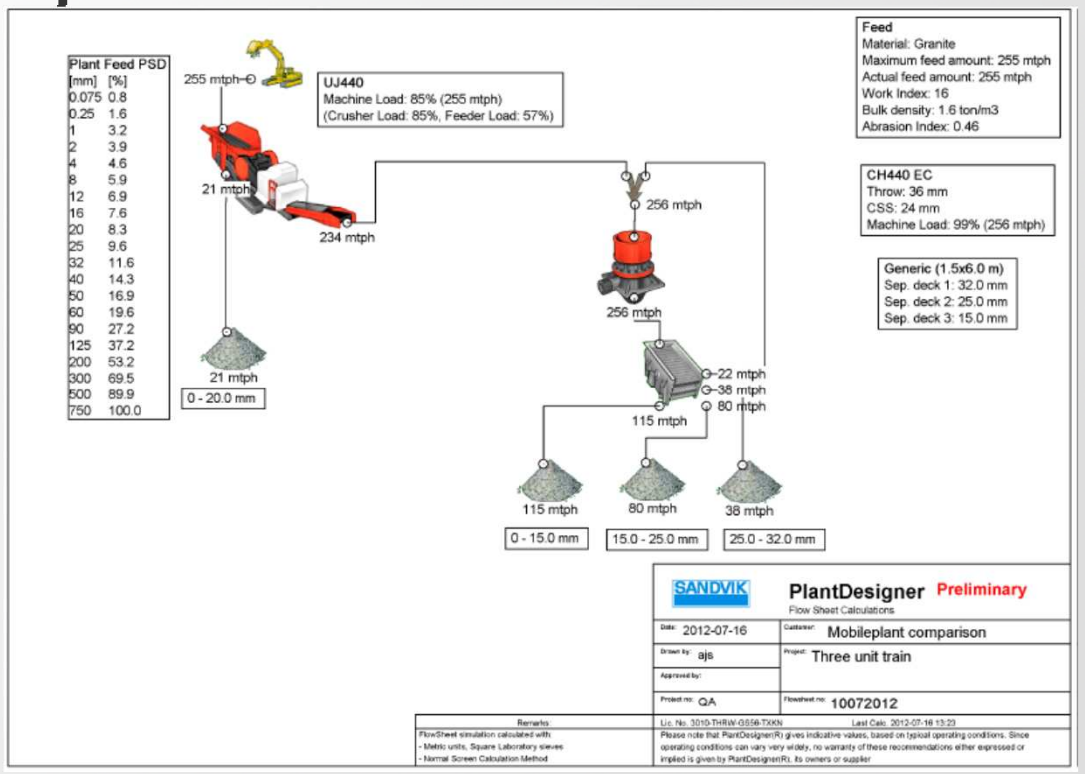
234 x 81.5 = 191 mtph

Average production = 191mtph

Note

Primary loading : 85% at 234mtph

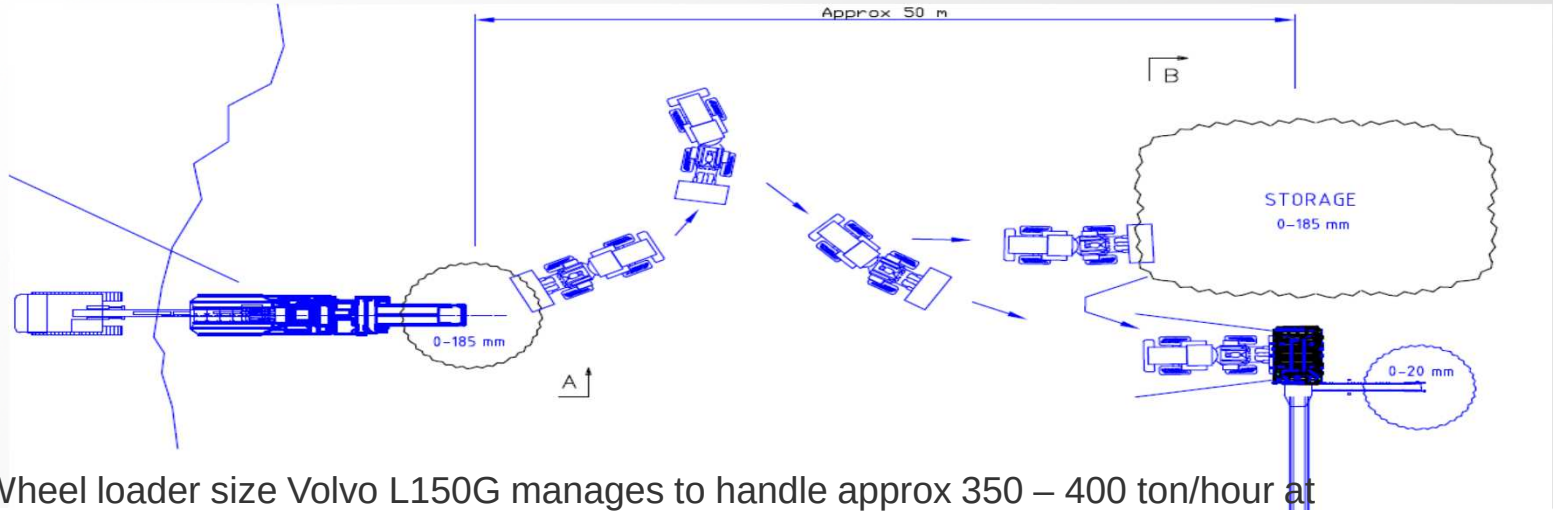
Secondary loading: 99% at 234mtph



Mobile units

Alternative setup

Instead of direct feed into the next unit (as in trains) a wheel loader takes care of the loading between primary and secondary unit.
The wheel loader will also take care of any over-production material and store it near by the secondary unit.



Wheel loader size Volvo L150G manages to handle approx 350 – 400 ton/hour at 50-70 m distance.

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Mobile units

Utilization – alternative setup

When primary unit stands alone the serial connection is broken. In this case the total utilization is set by either the primary unit in stand alone or the serial connection between the secondary unit and the screening unit.
Primary unit alone = 90%

In this case the secondary + screen has similar utilization.

Total utilization train = 95% x 95% = 90.25%

- Primary unit – Utilization approx 90%
- Secondary unit – Utilization approx 95%
- Screening unit – Utilization approx 95%

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Mobile units

Production – alternative setup

The nominal capacity of end products is 234 mtph.

Total utilization alternative arrangement = 90%

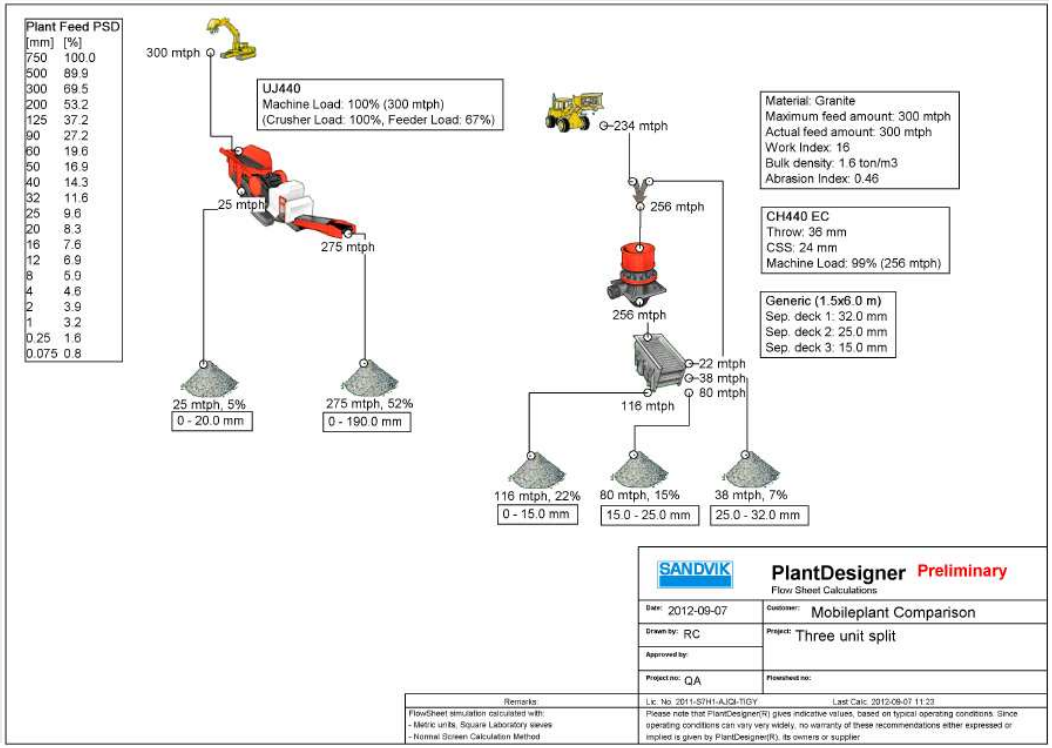
234 x 0.90 = 210 mtph

Average production = 210 mtph

Note

Primary loading : 100% at 275mtph

Secondary loading: 99% at 234mtph



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Moving Equipment on site

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Mobile units

Moving the equipment on site

When using train setup there will be two types of cost added each time the equipment is moved to different blast areas around the site.

- Loss of production due to the time needed for moving on the site.
- Loss of products when relocating/clearing stockpiles.

Mobile units

Moving the equipment on site – Train setup

- Loss of production due to the time needed for moving on the site

  All units must be moved at the same time.
  That means that the production will stop during the moving time.

Example

If moving time is 1.5 hours the production loss is:
1,5 hours x 191 mtph = 287 mtph.

If train moves every 16th hour the loss of production/hour is:
287 / 16 = 18 mtph

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Mobile units

Moving the equipment on site – Train setup

- Loss of products when relocating stockpiles

  At each moving of the train some products will be left in the ”old” stockpiles.

Example

Assume in each stockpile that 10 m^3 will be left. There are 3 end product stockpiles.

10 m^3 x 3 x 1,6 ton/m^3 = 48 Metric tons.

If train moves every 16th hour the loss of production/hour is:
48 / 16 = 3mtph

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Mobile units

Moving the equipment on site – Alternative setup

- Loss of production due to the time needed for moving on the site

Only the primary crusher will be moved.

Example

If moving time is 0.5 hours the loss will theoretically be:
0.5 hours x 210mtph /16 = 7 mtph

But there is sufficient overproduction by the primary to cancel any effect on the secondary plant.
275 at 90% loading = 248
234 at 90% loading = 210
Difference = 38mtph

Mobile units

Moving the equipment on site – Alternative setup

- Loss of products when relocating the stockpiles

The secondary and screening unit will be placed at the same place for a long time and therefore the entire product mass can be collected.

No product loss!

Summary

A costings are indicative for comparison purposes

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Mobile units

Train setup VS Alternative setup - Summary

	Train setup	Alternative setup
Production 100%	234 tons/hr	234 tons/hr
Production after utilisation	191 tons/hr	210 tons/hr
Loss of production (movement)	-18 tons/hr	0 tons/hr
Loss of product	- 3 tons/hr	0 tons/hr
Real production	170 tons/hr	210 tons/hr
Average product value	€5/ tons	€5/ tons
Value	€850 /hr	€1050 /hr
Added cost wheel loader	0 /hr	- €80 /hr
Sum	€850 /hr	€970 /hr
Difference		+ €120 /hr
Annual production hours		2 000 hrs
Annual savings		€240 000

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Mobile units

Train setup VS Alternative setup - Summary

Additional crusher and screen	Train setup	Alternative setup
Production 100%	234 tons/hr	234 tons/hr
Production after utilisation(0.73)	171 tons/hr	210 tons/hr
Loss of production (4 movements)	-27 tons/hr	0 tons/hr
Loss of product	- 5 tons/hr	0 tons/hr
Real production	139 tons/hr	210 tons/hr
Average product value	€5/ tons	€5/ tons
Value	€695 /hr	€1050 /hr
Added cost wheel loader	0 /hr	- €80 /hr
Sum	€695 /hr	€970 /hr
Difference		+ €275/hr
Annual production hours		2 000 hrs
Annual savings		€550 000

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Mobile units

Alternative setup

This example uses wheel mounted secondary and final screening unit.

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Mobile units
Alternative setup

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