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Dos and Don'ts

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Course Agenda

- **A look at some issues which cause problems during the initial design stage of a project**
- **A look at some issues which cause problems during operation**
- **Entitled Dos and Don'ts but mainly DON'TS**

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Design stage - Material appreciation

- **Have material thoroughly tested not only for it's competence as a construction material but for it's toughness, abrasiveness and shaping quality.**

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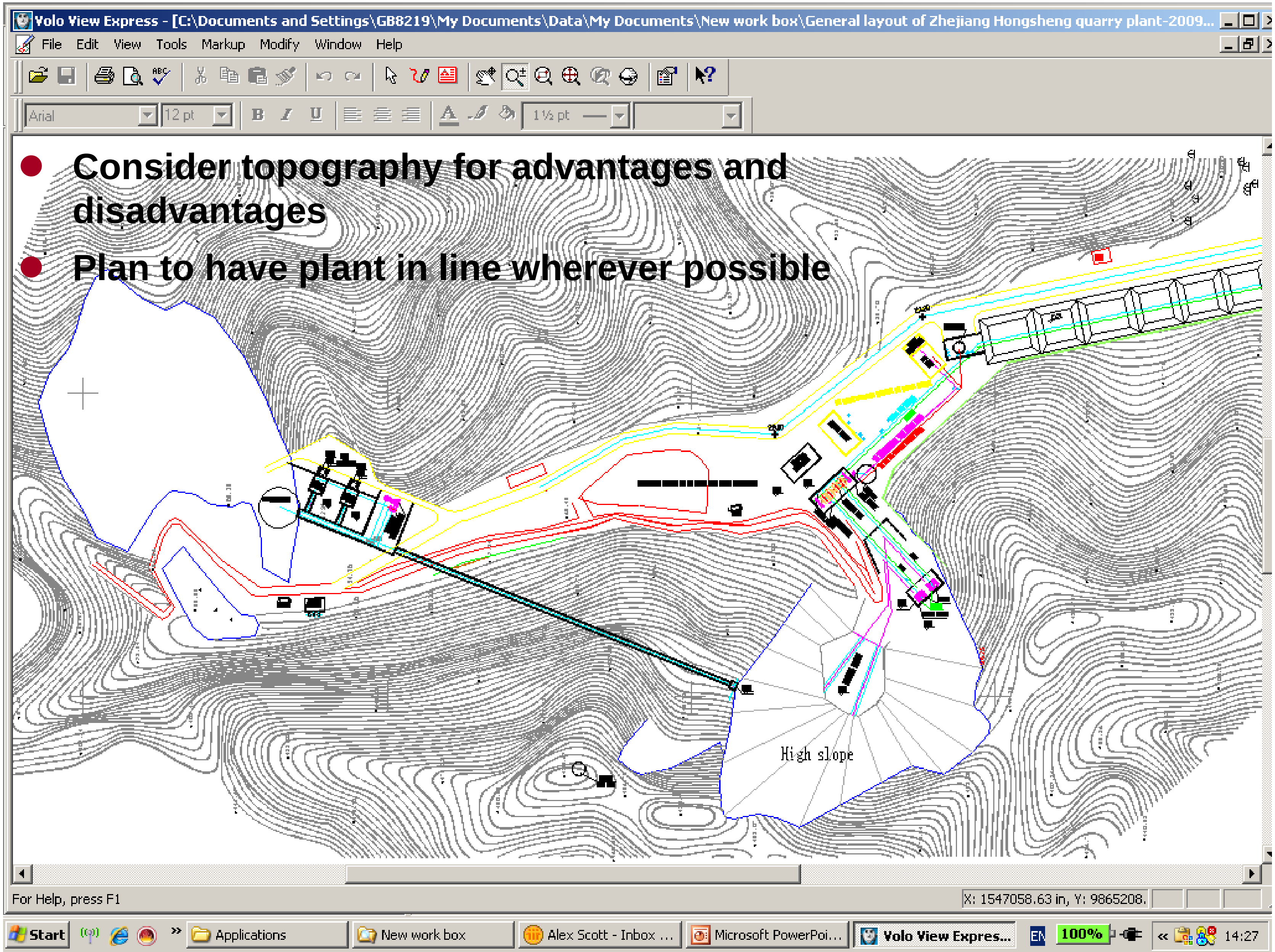
Design stage - Plant layout

- Consider topography for advantages and disadvantages
- Plan to have plant in line wherever possible



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Design Stage Surge control Don’t

- **Omit a surge bin ahead of the secondary crusher even after a surgepile. Why?**

- **Segregation in the stockpile caused by raising the primary crushed materials, results in load fluctuations to the secondary crusher.**

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Design Stage feed presentation Don't

- **Feed equipment at an angle. If a change of direction is necessary do it after the equipment process is completed, below a crusher under a screen or after an oversize chute.**

- **Crushers which have their surge bins side fed receive segregated feeds**

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Design stage Conveyors Don't

- Do Not employ narrow high speed belt conveyors when directly feeding equipment which is intended to complete a high performance process.

- Do Not employ narrow deep troughed conveyors.

All crushers and screens prefer feeds which are evenly spread across or around the feed point.

Belt width and speed

DESIGN

General

- **Always reduce material velocity especially when handling large materials**
- **Always use as many surge bins as possible---these eliminate surges but also reduce impact, slow and allow control throughout the process**
- **Include as many bin level monitors, bin level feed controllers and belt weighers as possible.**
- **Through the plant control system give the operator as much data as necessary to “drive” the process**

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Operation

Problem

- **Wherever possible eliminate high fluctuations in mass flow. All crushers prefer a steady choke feed condition.**

Effect

- **While chokes are being generated and lost the crusher performance is not optimised. As a result product will be oversized and of poor quality.**

Possible improvements, consider

- **crusher chamber profile.**
- **crusher throw if change possible.**
- **change of separation on preceding screen.**
- **setting of preceding crusher.**
- **has feeder correct control.**
- **is feeder surging because of poor throat design.**

Operation

Problem

- Control of crusher setting.

Effect

- Uncalibrated crushers cause unnecessarily coarse and poor quality product

Possible improvements, consider

- setting regime with trend analysis.
- measurement around three points of the chamber to check for uneven wear across chamber. Locate and eliminate segregation.
- cutting profile to identify if wear is uneven through the depth. Consider change of chamber profile.

Operation

Problem

- Bridging at crusher mouth.

Effect

- Appearance of choke, but restriction at the chamber mouth restricts smooth flow with some part so the chamber not choked. Look for power fluctuations, pressure fluctuations, irregular “crushing noise” .

Possible improvements, consider

- blast design if problem is at the primary.
- setting of preceding crusher
- increasing chamber profile, e.g. MC to C
- separation on preceding screen

Operation

Problem

- Incorrect chamber profile. Ensure profiles are correctly matched to feed size/grading

Effect

- Too coarse a chamber . Crushing performance is optimised when crushing is progressive through the depth of the chamber on compression crushers.

Possible improvements, consider

- Finer chamber if wear profile indicates a localised wear band low in the chamber .
- Localised wear bands high in the chamber indicate coarse single sizes. More difficult to solve—maybe change screen deck to give a longer feed fraction.

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Operation

Feed too fine

Operation

Feed too coarse

Operation

Problem

- Segregation. **Single most important factor in reducing crusher and plant performance.**
- Look for rapid power fluctuations, rapid pressure fluctuations phasing with eccentric speed, ring bounce or regular pressure relief valve activation.
- Look for uneven wear on concaves

Effect

- Poor product. Poor mechanical reliability. High COSTS.

Possible improvements, consider

- eliminating source.
- installing desegregation splitter or distributor.

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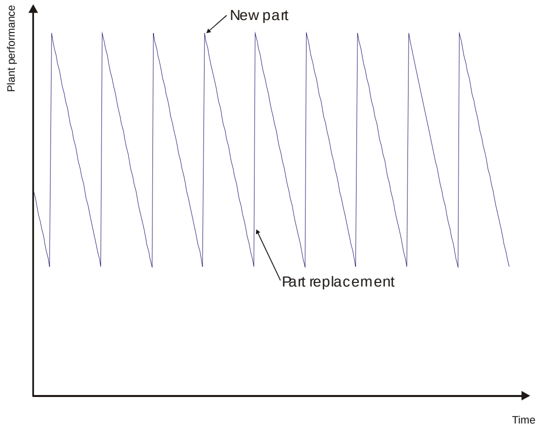
Operation

High fines content

Blocky/secondary broken rock

Operation

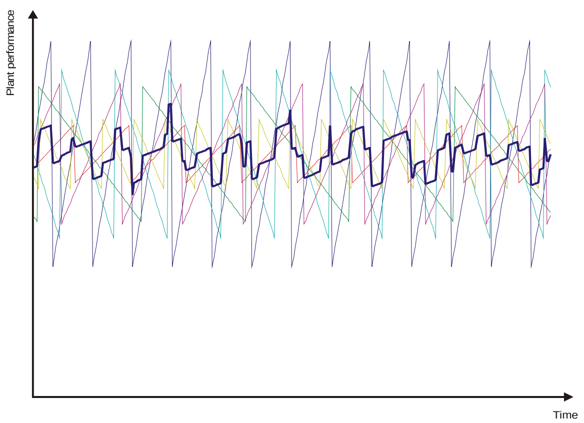


Problem

- Wear. Reliance on anecdotal information.

Effect

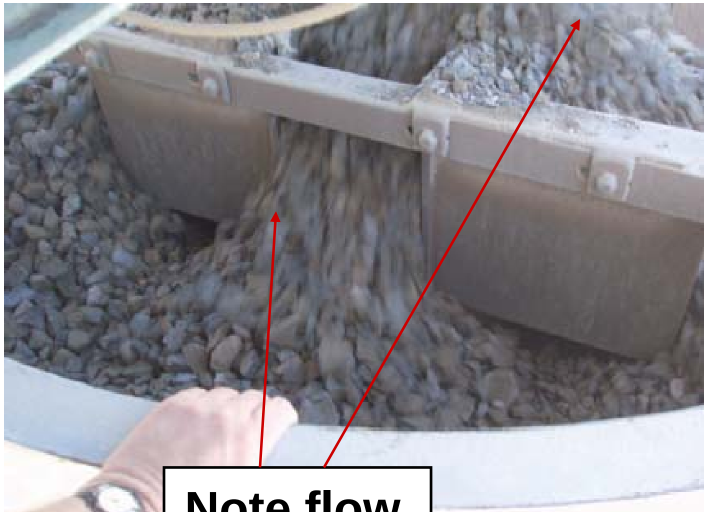
- Variation in plant performance.
- Detrimental effect on succeeding crusher.



Possible improvements, consider

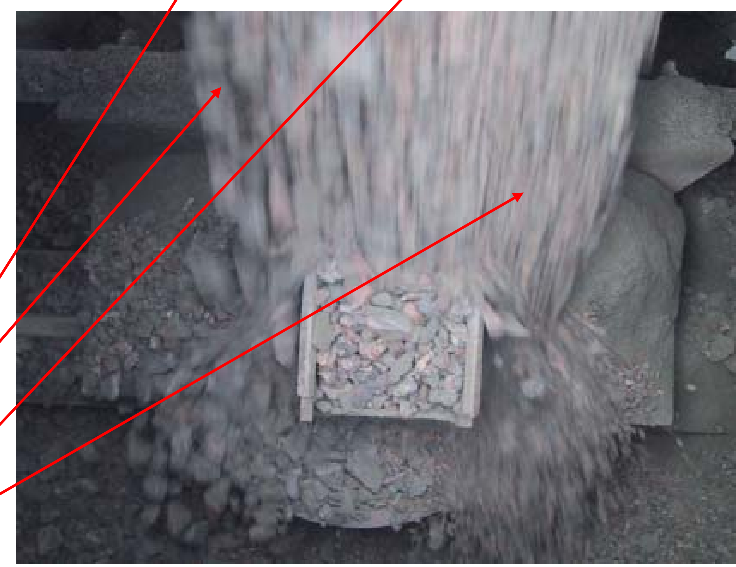
- regular recording of setting and crusher calibration.
- set up a wear monitoring programme which removes focus on cost only and relates to wear part performance i.e. cost/tonne of product.
- alternative metallurgy.

De-segregation



Horizontal segregation

Reclaim feeders from storage bins distribute different fractions unevenly across width of the belt.
Distribution box fitted to crusher cannot de-segregate nor adjust uneven volume.



Coarser & lower volume

Finer & higher volume

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Rotating feed distributors

Perhaps the only solution to horizontal segregation

Material must be concentrated and fall vertically onto the centre of the rotating plate.

There must be no horizontal component of velocity to cause a flow-rate variation.

The RFD must be sufficiently large to accommodate the largest pieces.

Prototype fitted to CH870 in Ukraine

Typical examples of RFDs-hydraulically or electrically driven

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Cost comparison

	Liner A	Liner B
Hours	87	166
Tons	103875	145311
Tons/hr	1194	875
Average setting	80mm	60mm
% oversize	47	22
Tons/hr oversize	561	193
Additional cost assuming $1/ ton	$561/ hour	$193/ hour
Wear cost (assuming $ 5000 per set)	5000/633 x 87 =$ 0.908 / ton of product	5000/682 x 166 =$ 0.442 / ton of product

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Operation

Problem

- Poor distribution of feed across screen resulting in high localised bed depth.
- look for unloaded areas at the top corner of first deck.
- look for large central pile with material taking some time to travel down screen.

Effect

- reduced sizing area on the top deck.
- delayed stratification will cause this to be exaggerated on subsequent decks.
- inability to maintain final product specification on grading limits

Possible improvements, consider

- spreader/distributor where height permits.
- feed conveyor speed

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Crusher feed problems

Take Home Message

Walk your process plant and where you identify a potential source of segregation or uneven distribution attempt a remedy.

This is probably the greatest single point of plant inefficiency and relatively small investment is likely to show some considerable improvements in:

- **plant operating costs.**
- **the ability of the plant to produce increased capacity.**
- **improved product quality.**
- **improved control allowing you to get more of what you want.**

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