Lab #6 – Crushing Simulation

Name: _____ Grade: _____ Feedback:

Group Name: _____

Pledge: "On my honor as a Virginia Tech student, I have neither given nor received unauthorized assistance on this assignment." Initial_____

By participating in this class, all students agree to abide by the Virginia Tech Wellness principles:

https://ready.vt.edu/well.html

If you answer yes to any questions in the Hokie Health survey (questions can be posted in the syllabus), you must not attend class in person. Notify me by email and contact Schiffert Health Center for testing and quarantine protocol.

Introduction

Computer packages for simulating all or part of a mineral processing plant have become quite common in recent years. These packages are used for a variety of purposes including the design of new plants and the simulation of existing plants to make improvements or modifications in the design. One such program, AggFlow, was developed specifically for simulating aggregate flowsheets. This user-friendly software package is widely regarded as the industry standard platform for optimizing aggregate plant production. As shown in Figure 1, this simulator allows users to “build” a crushing plant on a computer screen, choose different equipment types and settings, monitor flow rates and gradations at desired points, and then simulate running the plant operation. According to the manufacturer, it is common for the program simulations to exceed 95% accuracy, although results are completely dependent upon the data put into the system. By taking actual field samples and inputting data into the program using "Sample Buckets," it is possible to replicate plant performance with even better accuracy.

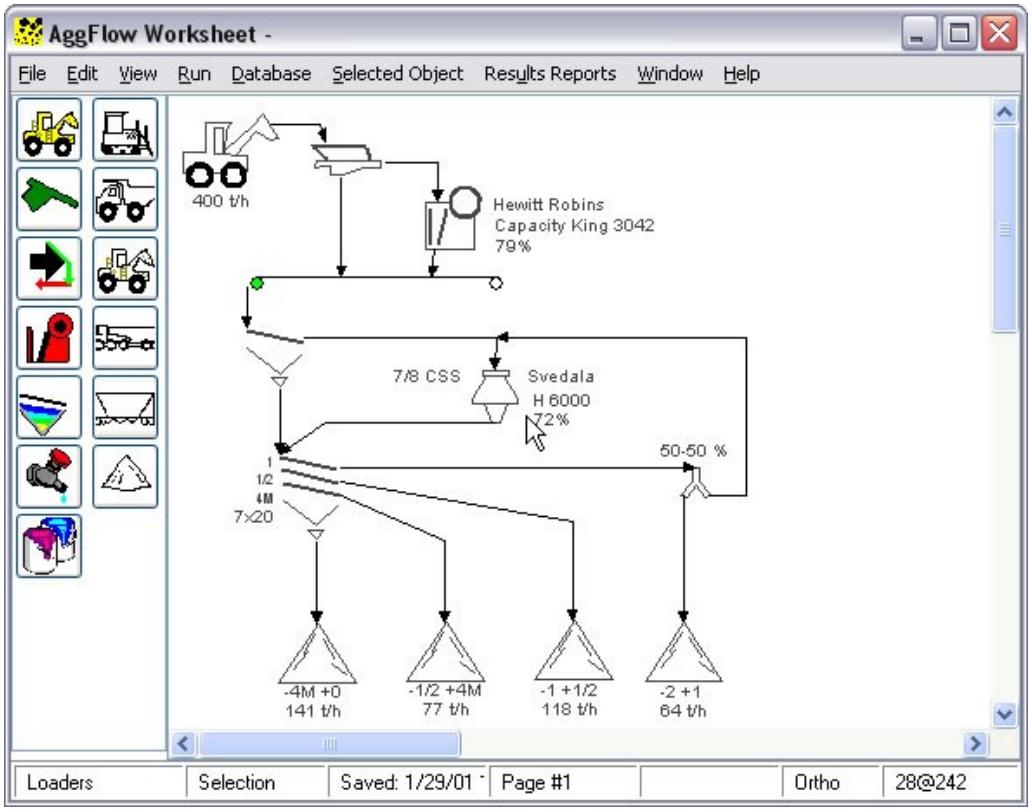

Figure 1. Screenshot from AggFlow.

In this laboratory exercise, you will be asked to use the AggFlow tool to design a three-stage crushing circuit for reducing run-of-mine copper ore (similar to the ore mined at the Morenci Mine) to a size suitable for feed to a rod mill.
Helpful Equations

None for this laboratory exercise.

Procedure

1. The laboratory instructor will provide you with instructions on how to open and run the AggFlow software package. You can also independently access instructional materials and software tutorials from the developer's website at www.aggflow.com.

2. Once you have opened the program, you should construct a three-stage crushing circuit that can be used to run-of-mine copper ore down to a size suitable as feed for a rod mill. Your crushing circuit should be configured as follows:

   - Haul Truck with feed specification of "Quarry Shot – Hard Rock."
   - Haul Truck goes to a 3' x 8' Vibrating Scalper (opening size to be determined).
   - Oversize from scalper goes to a Nordberg (C old) C200B Jaw Crusher (CSS to be determined).
   - Undersize from the scalper joins the jaw crusher product and goes to a Surge Pile (found under "Transport Equipment," depicted with a black arrow).
   - Output from the Surge Pile goes to a 6' x 12' Double Deck Inclined Screen (deck opening sizes to be determined).

- Oversize from the top two decks goes to a Nordberg Symons 7’ Standard Head Cone Crusher with a medium liner, “S/M” (CSS to be determined).
- Undersize from the screen joins the cone crusher product and goes to a second Surge Pile.
- Output from the Surge Pile goes to 50:50 Splitter.
- Output from the splitter is passed to two 6’ x 16’ Double Deck Inclined Screens (deck opening sizes to be determined).
- Oversize from the top two decks of each screen goes to a Nordberg Symons 7’ Short Head Cone Crusher with a medium liner, “SH/M” (CSS to be determined).
- Undersize from the screens joins the cone crusher product and goes to final product pile.

3. Apply a custom generic specification for your final product pile. This product should be 100% passing 1,” 80% to 100% passing 3/4”, and 0% to 100% all finer sizes. This size represents a suitable feed for a rod mill.

4. Work back through your flowsheet and adjust the equipment specifications (i.e. screen opening sizes and all crusher closed-side settings) needed to maximize throughput, without any equipment appearing in red (which means an error condition). *Hint: after running a simulation without error, AggFlow can maximize capacity for the current configuration. To access this feature, right click on the initial haul truck and click “Maximize Stage Production.”*

Data Records & Calculations

Once you have optimized the plant, print out a hardcopy of the following items and attach them to this exercise.

- Attachment 1: A hardcopy of the AggFlow flowsheet after you have achieved the highest throughput possible (set Monitors on crushers to display Manufacturer, Model, Settings and TPH; set Monitors on screens to display Model, Screen Size and Settings).

- Attachment 2: A hardcopy of the size distribution table and plot for your final product showing that you have met the required specifications.

Discussion Questions

1. What is the maximum capacity of the circuit you have designed? How many 250 TPH rod mills can your crushing plant feed?

2. What equipment limits the capacity of the circuit and why?

3. What modifications would you recommend to the circuit? How could you use your simulation to provide a capital justification for the change?

Conclusions

1. What was the objective of this laboratory exercise?

2. What were your major findings?

3. What important fundamental concepts did you learn from the exercise?