SESA Mill Data Acquisition and Analysis System

ANALYSIS SOFTWARE FOR SHAPE STRUCTURAL & BAR MILLS

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1. **Introduction**

The SDAS software package is an analytical tool that highlights specific mill process parameters and allows examining of the setup data for each billet rolled. Mill operators and rollers can assess causes of cobbles, improve mill setup practices (compare existing setups to actual), and predict equipment deterioration.

The SDAS software structure (configuration) is shown in Figure 1. The OPC based interface collects real-time data (Process data) from the mill control PLC. This data is processed, and stored in a relational database on a billet by billet basis. The mill performance application can retrieve the stored parameters for further analysis in preformatted reports and charts. Changes between mill setup and actual parameters can be viewed by selecting either a single billet in a campaign, or by selecting up to 20 billets. Averages, minimum and maximum values can be compiled for a group of selected billets.

![Figure 1 SDAS software structure diagram](image)
2. **Mill Performance Analysis of Schedule and Process Parameters**

Process parameters are gathered and stored in the SDAS relational database. This data is organized by product ID on a billet by billet basis, to allow comparison of multiple billets. Setup and actual data is stored for all stands and shears.

A VBA application (designed using MS-Access2000) has been developed to parse the data stored in this database, generate setup reports, and compare actual and scheduled parameters. This application can retrieve the stored parameters based on specific search criteria including date rolled, product ID or Heat #, and allow the operator or roller to print the data in preformatted reports and charts. Changes between mill setup and actual parameters can be viewed by selecting either a single billet in a campaign, or by selecting up to 20 billets. Averages, minimum and maximum values can be compiled for a group of selected billets.
3 SDAS Mill Performance.

The SDAS mill performance and analysis application consists of three main screens: Search, Report and Analysis described below. These screens can be accessed from the application startup or Main screen shown above in Fig 2.

3.1 Search Screen

The mill performance search screen allows users to parse the data in the database and display a list of billets based on a search criteria. Once the list is displayed the operator can pick a specific billet in a campaign for generating the setup report. By selecting more than one or multiple billets he can compare speeds and tension changes from billet to billet. The search screen contains a list box of search results (displayed on the right hand side). Once the search criteria has been selected then clicking on the find button will populate the list with the result of the query. If no search criteria are selected, clicking on the Find button will populate the list with all the billets contained in the data. Scroll buttons will help navigate through the list.

If more than one billet is selected then the comparison can be performed. The Analysis button below the search list results becomes active. If only one billet is selected, then the rolled billet summary report can be generated. Selecting Analysis would display the results with the selected billets. Similarly with only one billet selected, clicking the Report button would open the Report screen, described below.
3.2. SDAS Mill Performance – Setup Analysis screen

The mill performance report allows users to display either the actual or scheduled data, and compare the difference between these values. This report displays the setup analysis stored for the selected billet. The report displays scheduled shear configuration and lengths, and stand configuration and setup. The Stand configuration and setup values include:

A. Stand Selected
B. Groove In
C. Reduction Ratio
D. Speed Fpm
E. Stand RPM
F. Area In2
G. Tension PSI
H. Loop Height In.
I. Load (%)

By selecting Actual the actual values for the above variables are displayed. By selecting Setup the scheduled values are displayed. Difference calculates the absolute difference between the two and highlights the fields in cyan.
3.3 SDAS Mill Performance - Data Analysis Screen

The mill performance data analysis allows users to display either the actual or scheduled data, by process variable for the selected billets. Data for up to 20 billets can be displayed. The data is populated in columns by stand number and in rows by the selected billet. Trends or changes in process variables during a campaign can be highlighted and printed. The average and min-max and difference values are displayed at the bottom of the form. These are tabulated for each stand. The variables that can be displayed are

A. Speed FPM
B. RPM
C. Reduction Ratio
D. Area in2
E. Tension PSI
F. Height In
G. Gap In
H. Roll Diameter In.
I. Work Roll Diameter In.
J. Stand Load %

Selecting Setup or Actual toggles between the Scheduled Data or actual data. Once the billet results are tabulated for the chosen variable, they can be displayed in the form of a graph. Clicking the graph button opens the analysis graph report screen, described below.
3.4 SDAS Mill Performance - Data Analysis Graph Screen

The mill performance data graphs display the data in the form of bar graphs. The variables that can be plotted are either scheduled or actual and are selected in the Analysis screen. They are as follows:

A. Speed FPM
B. RPM
C. Reduction Ratio
D. Area in²
E. Tension PSI
F. Height In
G. Gap In
H. Roll Diameter In.
I. Work Roll Diameter In.
J. Stand Load %

Changing trends in current or reduction factors can be attributed to problems. Also variations in Loop height and tension can be plotted.

Individual graphs are displayed for each stand, with the X axis representing each selected billet, and the Y axis the magnitude. In the graph below we can see the decreasing change or trend in Load of Stand 1 and Stand 2 for the 6 selected Billets. In the case where the mill is stable, this may be attributed to change in furnace temperature.