

Rewinder Trim Loss Minimization Using Microsoft Excel Spreadsheets

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ABSTRACT

It is a common practice for the mills to use computers for accounting and other purposes. But, for the purpose of process analysis and control, the computerisation has a long way to cover. It is also easier to use various methods available for the data analysis instead of writing separate programs for each job, e.g. there is no use in investing a lot of time to write a program for trim loss minimization while we can make use of microsoft Excel spreadsheets for the same. This paper presents a spreadsheet for the same.

INTRODUCTION

With the increasing use of computers, many programs are available for making the work of computation very easy. The present program has also been written in other high level languages e.g. BASIC, Fortran etc. A such program has also been published in an earlier IPPTA issue.

The biggest problem with most user developed programs is that these programe are difficult to write, need a lot of programming work to be done if some slight change is to be made and there are a few people in the industry who are familier with the use of tools available for computation as well as the process side of papermaking. A big communication gap exists between the programmers and the process people.

SOLVER

To solve a common TRIM LOSS MINIMIZATION problem, a function named SOLVER provided as a tool with MicroSoft Excel was used. To understand the program. We must understand the nomenclature first-

- The Columns in the spreadsheet (table) are designated as alphabets, e.g. A, B, C...

- The rows are designated by numbers, 1, 2, 3,...
- Every component of the spreadsheet is designated by the column heading followed by the row number. e.g. A3, B7, 119 etc.

The mill wills to produce reels of 81.5, 75, 60, 56 and 50 cm. The available deckle with the paper machine is 305 cm. Now, we can make combinations such as-

81.5+81.5+81.5+56
 75+75+75+75
 60+60+60+60+60
 75+56+56+56+56

:
:
:
etc.

This work has been done manually as many combinations as indicated by the computer programs

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were rejected by the rewinder operator indicating that too small reels at the sides result in creasing of paper. After the combinations are entered the first column indicates the reading of utilised deckle in a particular

set. For example, a 81.5+81.5+81.5+56 set will utilise 300.5 cm deckle out of the available one (See Table 1). In case, by mistake, someone enters 2 in the cell E3 in place of 1, the deckle used will

Table -1 Spreadsheet for Trim Loss Minimization

	A	B	C	D	E	F	G	H	I
1									
2	Used Deckle	91.5	75	50	55	50	0	0	Sets
3	300.5	3	0	0	1	0	0	0	12
4	300	0	0	5	0	0	0	0	8
5	300	0	4	0	0	0	0	0	0
6	280	0	0	0	5	0	0	0	0
7	300	0	0	0	0	6	0	0	9
8	300	0	2	0	0	3	0	0	2
9	299	0	1	0	4	0	0	0	13
10	290	2	1	1	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18									
19	Made	36	17	40	64	60	0	0	
20	Reqd	35	17	40	66	55	0	0	
21									
22									
23									
24									
25									
26	Finished deckle of The Machine				305				
27	Deckle Utilised:				13193				
28	Deckle Available:				13420				
29	Trim Losses:				1.69%				

be 356.5 cm., which being to higher than available deckle indicates to some typing error.

CALCULATIONS

To calculate the value of used deckle, following formulae have been used-

$$A3 = \text{SUMPRODUCT} (B2:H2, B3:H3)$$

$$A4 = \text{SUMPRODUCT} (B2:H2, B4:H4)$$

$$A5 = \text{SUMPRODUCT} (B2:H2, B5:H5)$$

$$A17 = \text{SUMPRODUCT} (B2:H2, B17:H17)$$

After the required reels to be made are entered in the cells B20 to H20, and the Finished deckle of the machine is given to E26, Deckle utilised can be calculated by multiplying the deckle used in a set multiplied by the total number of sets and summing this to all of the sets, i.e.

$$\text{Deckle utilised} = \text{SUMPRODUCT} (A3:A17, 13:117)$$

For the total sets, similarly, if we multiply the deckle of the machine to the total of sets made, we get the deckle available-

$$\text{Deckle Available} = \text{SUM} (13:117)*E26$$

Using these two data we can calculate the trimming losses in percentage as under-

$$\text{Trim Losses} = (E28-E27)/E28* 100\%$$

The next work to be done now is to declare the targets for optimization work. The following declarations are to be made.

- Set Target Cell E26
- Equal to Min.
- By Changing Cell 13:117

The constraints for the optimization process are-

- B19 = B20
- C19 = C20
- D19 = D20
- E19 = E20

$$- F19 = F20$$

$$G19 = G20$$

$$- H19 = H20$$

$$- B19 = C20$$

$$- 13:117 = \text{INTEGERS}$$

$$- 13:117 \geq 0$$

The following options were given to the computer-

- Maximum Time 100 Seconds
- Iterations 9999
- Precision 0.1
- Tolerance 1%
- Scaling Method Automatic

After selecting these values, the solve button is clicked. Within a few seconds, the SOLVER informs that the optimization has been done, or not done, as the OK button is clicked we can see the optimum results for each set in the cells 13 to 117. For an ease in operation these cells can be in integer format.

LIMITATIONS OF PROPOSED METHOD

The proposed method as well as other work done in this area so far¹², has the limitation that this can only be used for reel orders. Sheet orders optimization is a difficult task and beyond the scope of this paper. The reason is that the mills use mainly three type of sheet cutters- Duplex Cutter, Simplex Cutter and Baby Cutter. These three have different cutting characteristics. While the first two cut the sheets directly from the tambour roll, the third one uses the reels made from rewriter which can be cut in any of the two sizes of the sheet. It is the need of the time to develop mathematical models for trim loss minimization for sheet orders and to develop simple and handy methods for different type of cutters.

CONCLUSION

By using spreadsheets, the trim loss minimization can be done very easily. In case one desires to produce extra reels of a particular size, after the computed sets are made, one or two sets of suitable combination

can be made.

Minimization." IPPTA 5 (1): March 1993.

REFERENCES

1. Singhal D.K., "A New Method for Trim Loss

2. Singh, S.P. etal, "Trim Loss Minimization in Finishing House." IPPTA 1 (3): Sept. 1989.

ANNOUNCEMENT

Gujarat Paper Maker's Association, Ahmedabad is going to hold a Seminar on the subject of "POLLUTION CONTROL IN PAPER MILLS" on Saturday, the 29th. January, 2000 at Ahmedabad. Those interested to participate in the Seminar may kindly contact the following address:

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