Linear Optimization of Film Charting

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When jumbo rolls of film are produced in a wide sheet to fill several orders for rolls of film in narrow widths, there will be an optimum way of charting these jumbo rolls in slitting to maximize yield. Linear optimization is a standard technique to calculate optimum charting patterns for a given set of constraints. An exact solution requires that all possible combinations be examined to determine the maximum. A less exact approach, but requiring less calculation time, uses a "Monte Carlo" technique, in which random charting patterns are examined for maximum yield.

In the past, either of these approaches required a large computer and their application was limited to large companies.

Now personal computers are available with the capacity to do these calculations in a reasonable time. The linear optimization program can be written in BASIC and the speed of execution can be improved by compiling the programs. A typical problem involves finding a charting pattern to give the best possible yield for a set of roll widths and numbers of rolls as specified in orders to be filled from a given production run or lot. The constraints normally involve the total width per chart, the number of rolls that can be slit across the web, the expected yield (wide rolls can normally be reslit) and the minimum number of rolls that must be slit before the slitting pattern can be changed.

I have written an example program and I would be glad to share it with anyone. I chose a problem in which a 4.1 meter wide film was to be produced in jumbo rolls and slit to fill orders for up to ten roll widths and corresponding numbers of rolls. The constraints used were: the sum of the slit widths must not exceed 4.1 m. less a slit trim of 12cm.; no more than 7 rolls could be slit in any chart (because of chuck limitations in slitting); a minimum number of setups for any one chart was taken as 21 (changing setups in slitting requires downtime); slitting yield was taken as 80% and it was assumed that wide reject slit rolls can be reclaimed into narrow product rolls. Random combinations of roll widths were chosen to meet these constraints. Usually a useful charting pattern was obtained in times ranging from 1 to about 30 minutes on an IBM compatible PC computer, depending on the number of roll widths in the order. Increasing the number of trial calculations that are made when using the "Monte Carlo" approach, increases the chance of finding a charting pattern with a high yield.

If you wish to try the program, please send a diskette, with a stamped return envelope to:

- Kenneth L. Knox, 327 Meadow Lane, Circleville, OH 43113.

See also:

- Basic film calculations
- Technical developments

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