

Exercise 8 - Multi-item lot sizing

Inventory Management

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Economic lot scheduling

In a chemical plant, a batch production process with 8 different products exists. All products are extruded on the same machine with different speeds. The following table contains the relevant product specific parameters.

	1	2	3	4	5	6	7	8
c_i^{sh}	0.310	0.210	0.020	0.600	0.740	0.070	0.17	0.430
c_i^{or}	465.000	966.000	904.000	28.000	963.000	474.000	672.00	107.000
y_i	50.000	43.000	94.000	66.000	45.000	56.000	27.00	52.000
p_i	1087.000	1063.000	2096.000	1651.000	983.000	1608.000	148.00	312.000
s_i	0.097	0.114	0.012	0.049	0.003	0.164	0.19	0.172

1. Determine the product-specific utilization rate and the total utilization of the machine. Can a feasible schedule be found?
2. Determine the independent and common cycle solution. What are the associated total costs? Is the independent solution feasible?
3. Try to find a better solution by the power-of-2 heuristic.

Joint replenishment problem

An automobile manufacturer is supplied with 8 materials from a particular supplier. The supplier charges fixed transport and handling cost of 300 Euro every time an order for at least one of the 8 offered materials is issued. Beyond that the, each material has a fixed demand rate, holding cost rate and handling cost summarized in the following table.

	1	2	3	4	5	6	7	8
c_i^{sh}	0.28	0.02	0.01	0.33	0.23	0.08	0.13	0.18
c_i^{or}	329.00	688.00	284.00	485.00	895.00	121.00	328.00	105.00
y_i	66.00	17.00	35.00	56.00	97.00	87.00	37.00	39.00

1. Calculate the holding cost multipliers and individual optimal cycle times for each material. Order the products increasingly w.r.t. cycle time.
2. Use the basic period heuristic to find a solution for the replenishment problem (round to integers). Determine also the order quantities of each product.
3. Try to find another solution by rounding ordering frequencies to powers of 2 (instead of integers). Can the solution from 2. be improved?