

Process Synthesis Problem

A company desires to produce the chemical C, which can be manufactured either by the process II or III. Both processes use as raw material B. This chemical B can purchase elsewhere or can be manufactured through the process I, which uses A as a raw material. Given the specifications in the table below: draw the superstructure of alternatives for the production of C. Formulate a mathematical programming model and solve it to determine:

Which process should be built (II and III are exclusive)

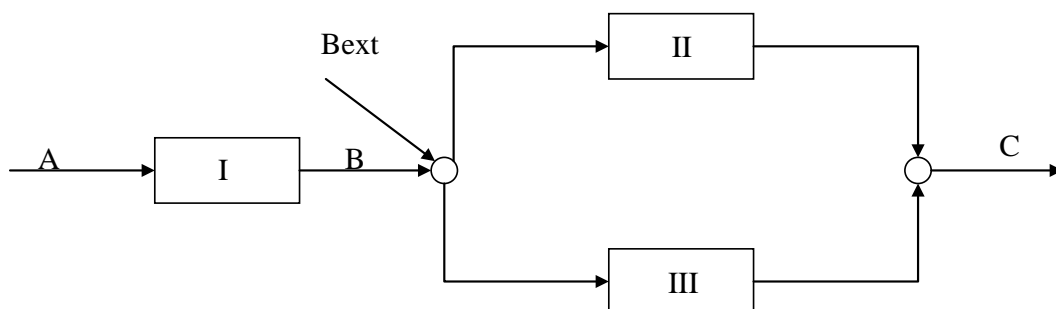
How to obtain the chemical B?

How much should be the production of chemical C?

The goal is to maximize profits. Consider the following two cases:

- 1- The maximum demand for C is 10 tons / h, with a selling price of 1800 Euros / ton.
- 2- The maximum demand for C is 15 ton / h, the sale price is 1800 Euros / ton for the first 10 ton and 1500 Euros / ton for excess.

Capital and operational costs		
	Fixed cost (Euros / h.)	Variable (Euros / ton of raw material entering the process)
Process I	1000	250
Process II	1500	400
Process III	2000	550
Prices	A	500 Euros / ton.
	B	950 Euros / ton.
Conversion	Process I	90 % from A to B
	Process II	82 % from B to C
	Process III	95 % from B to C
Maximum availability for A: 16 ton / h.		



Solve again the problem for the case where the input-output relationships for process II and III are given by the following equations:

Proceso II: $C = 6.5 \ln(1+B)$

Proceso III: $C = 7.2 \ln(1+B)$

where B y C are the mass flow rate (ton/h) for B y C, respectively.