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# Process Synthesis

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 be purchased 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?
* What is the production of chemical C?

The goal is to maximize the profit. 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 the excess.

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|  | **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. | | | | | |

