

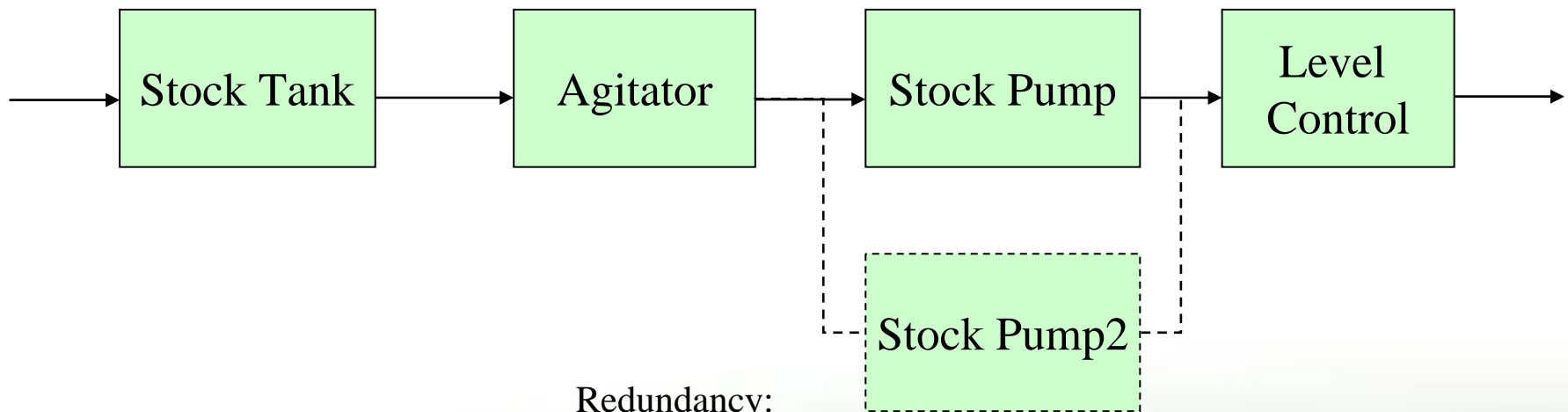
Reliability Modeling, Procedure: How to Optimize System Availability

1. Establish and document a system (e.g. process) reliability model
2. Establish a failure data base
3. Identify reliability (availability) improvement opportunities
4. Assess the impacts of reliability improvement on production output and maintenance costs
5. Prepare an availability improvement plan

Reliability Model

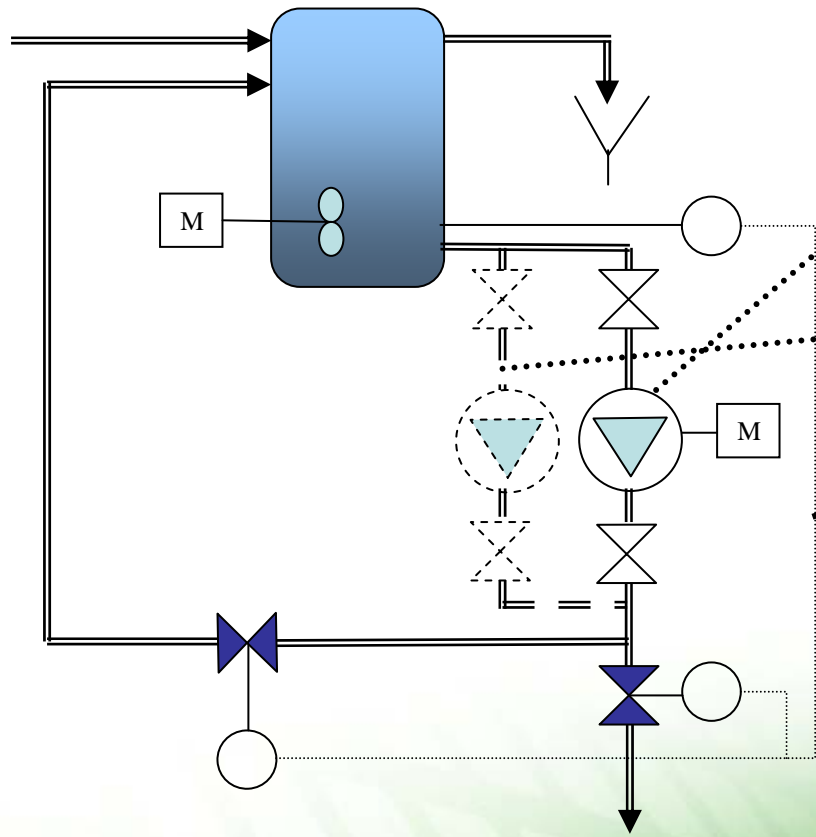
Functional Block Diagram ('Success Logic')

- prepare a block diagram
- get reliability data for each block
- use modeling software for calculations
- add cost parameters to results



Redundancy:
 $2 \times 100\%$ or $2 \times 50\%$ or $3 \times 33\% \dots ???$

Process Availability Improvement, select options



Option 1: Base Case

Option 2: Better Stock pump,
reliability is 50% higher

Option 3: Backup pump added?

Option 4: Backup pump and
improved reliability of level control

Input Options into Reliability Model

Compare Improvement Options:

Costs vs. savings

	Process Downtime (hrs/yr)	Capital Costs (€ added to base case)	Production losses (tons/yr)	Value of improvement (€/yr)
Option 1: Base Case	24,3	Base case	810	Base case
Option 2: Better pump	17,0	10.000	567	48.600
Option 3: Redundancy	10,7	60.000	357	90.600
Option 4: Redund + ctrl	6,2	80.000	207	120.600

Which improvement would you choose?