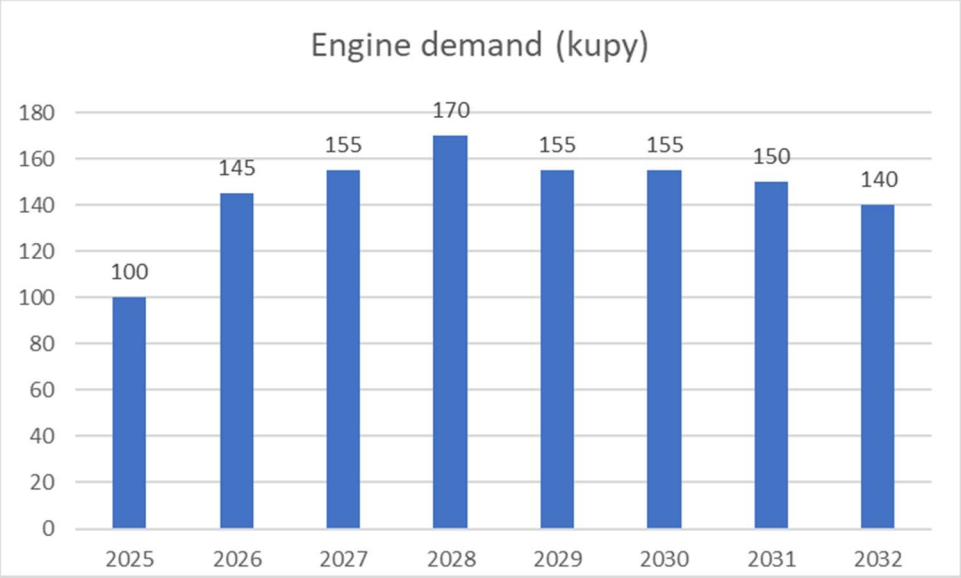
Final test Automotive evolution 2024

A) Case study

In a new project, it is required to assembly an engine.

Volumes: as per the picture below (k engine/year)



Production pattern: 230 days/year; 3 shifts/day; 7.5 hour/ shift

Question #1: *Define:*

- *the* ***production capacity target****,*
- *the* ***production rate (jph)****)*
- *tthe* ***cycle time*** *(s) for a synchronous line considering* ***95%*** *efficiency.*

SOLUTION: It seems not convenient to dimension the system on the peak 170k. ***155k seems the good compromise*** *since is saturated for 3 years and almost perfectly for other 3. A small extra-time in 2028 (10% =+15k) can cover the peak in case it is confirmed.*

*Production rate hourly is Target capacity/number of hours per year. The number is 7.5*3*230=5175 hs/y so Production rate=155000/5175=****30jph***

Cycle time is the inverse of production rate increased to compensate the inefficiencies so ***CT is shorter****=eff/jph=0,95/30. In seconds CT=3600*0,95/30=****114s***

Question #2 *Evaluate the* ***variable transformation cost*** *of the group plus the* ***Break-even point NOT DISCOUNTED (volume)*** *of Manual vs Automatic and recommend the best solution****.***

Manpower tariff: 30 €/h variable cost, all included.

Number of operators in the line: 30 per shift

Investment: Consider the possibility to reuse a manual palletized line. The cost of the retooling for all the line is 7000 k€. A new fully automatic line would cost 14000 K€. Expenditure: 40% first year, 60% SOP year. The variable transformation cost for Automatic is 5€/engine.

- Calculate the breakeven point (in years) considering a full saturation

SOLUTION:

Variable cost per unit= total cost/target capacity= (30 people * 30 €/h*5175 hours) divided by 155000= **30€/unit** where total cost/year is 4.7 M€.

For Automatic the total cost per year is = 4.7*5/30= 0,77 M€

Break even point in years is the value y for which INV(1)+ Total Cost (1)*y=INV(2) * Total Cost(2) so 7+4,7*y= 14+0,77*y . WE can evaluate y= 7/(4,7-0,77)= **1,8 years**

***Question #3**: Evaluate the **Business Case** and compare the results vs previous result*

		Formulas	2024	2025	2026	2027	2028	2029	2030	2031	2032	total
INPUT												
Volumes	kupy		0	100	100	100	100	100	100	100	100	800
Major investment	M€		5,60	8,40								14,00
Automatic cost (€)	10											
Minor investment	M€		2,80	4,20								7,00
Manual cost	100											
WACC	15%											
OUTPUT												
Actualization at 2024		=(1-WACC)**(n-1)	1,18	1,00	0,85	0,72	0,61	0,52	0,44	0,38	0,32	6,03
Actualized investment		=ACT*Make Inv	6,59	8,40	0,00	0,00	0,00	0,00	0,00	0,00	0,00	14,99
Actualized total costs		=Cost*Vol*ACT	0,00	1,00	0,85	0,72	0,61	0,52	0,44	0,38	0,32	4,85
Actualized VT		=ACT*VT	3,29	4,20	0,00	0,00	0,00	0,00	0,00	0,00	0,00	7,49
Actualized prices		=Price*Vol*ACT	0,00	10,00	8,50	7,23	6,14	5,22	4,44	3,77	3,21	48,50
Delta Discounted cash flow		=ACT(Vt+Price-Inv-Cost)	-3,29	4,80	7,65	6,50	5,53	4,70	3,99	3,39	2,89	36,16
NPV		=Cumulated DCF	-3,29	1,51	9,16	15,66	21,19	25,88	29,88	33,27	36,16	
Total actualized investment		=Cumulated INV	3,29	7,49	7,49	7,49	7,49	7,49	7,49	7,49	7,49	
Profitability	**482%**	=Cum DCF/Cum Inv										

B) Manufacturing technology evolution

Question #4:

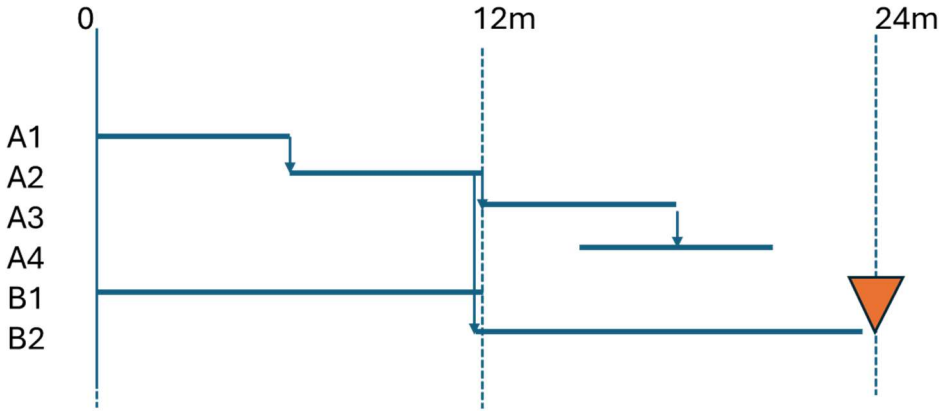
In a New plant there is 2 main lines that must be implemented with a complex process.

The line A is made by #4 activities A1,A2,A3 and A4. A2 can start only when A1 is concluded. A3 can start only when A2 is concluded but A4 can start when A3 is 50% done. All are 6 months long.

The line B is made by #2 activities. B1 and B2 are both one year long but B2 ca start only after A2 end.

Which is the Start of production? Can you do a Gantt diagram to support your answer?

SOLUTION: Start of production is when all activities are completed so SOP= after 24months



***Question #5**:*

- Which are the main Taylor's guidelines?

  The management must participate to the production

  Precise analysis and not "rule of thumb"

  Collection of data is essential to know the process

  An optimized organization takes to a better efficiency with cost reduction

  The production phases must be regulated by a precise guideline called "process cycle".

Which are the asynchronous assembly line advantages vs synchronous the made Unions support it in the 70s?

Longer and various activities with a majot professional satisfaction and skill evolution

Kitting with a better ergonomics in line supply

Possibility to have a break without conditions or replacements

There is a conflict between Taylor's theory and asynchronous? If the parallel is not exaggerated (i.e 10 people) not since the skill level required is not too large