

EXAM

Production, Maintenance and Quality development (PPU404)

Date: 2015-06-02

Time: 14.10-19.30

Exam: TEN 1

Utilities: Calculator, dictionary

Responsible teacher: Antti Salonen, tel (016-163606), mobile 0709-378469

Max score: 30 p

Pass (Swedish, 3 – ECTS, E): 15p

ECTS, D: 18p

Swedish, 4: 20p

ECTS, C: 21p

ECTS, B: 24p

Swedish, 5: 25p

ECTS, A: 27p

Good Luck!

Q 1:

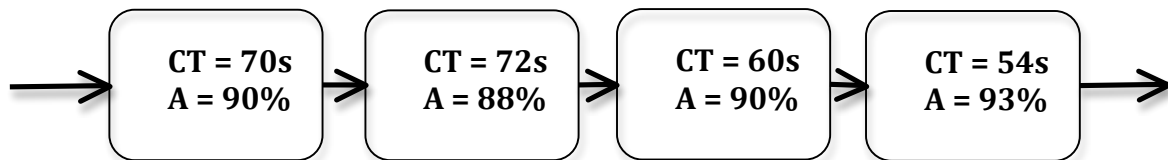
Give an example of when FMEA is an infeasible method.

(3 P.)

Q 2:

What's the average capacity (components per hour) of the production line below?

(4 P.)



CT = Cycle time, A = Availability

Q 3:

Explain the basic workflow in the SMED method.

(5 P.)

Q 4:

Which are the two root causes for “Improvements in vain”?

(3 P.)

Q 5:

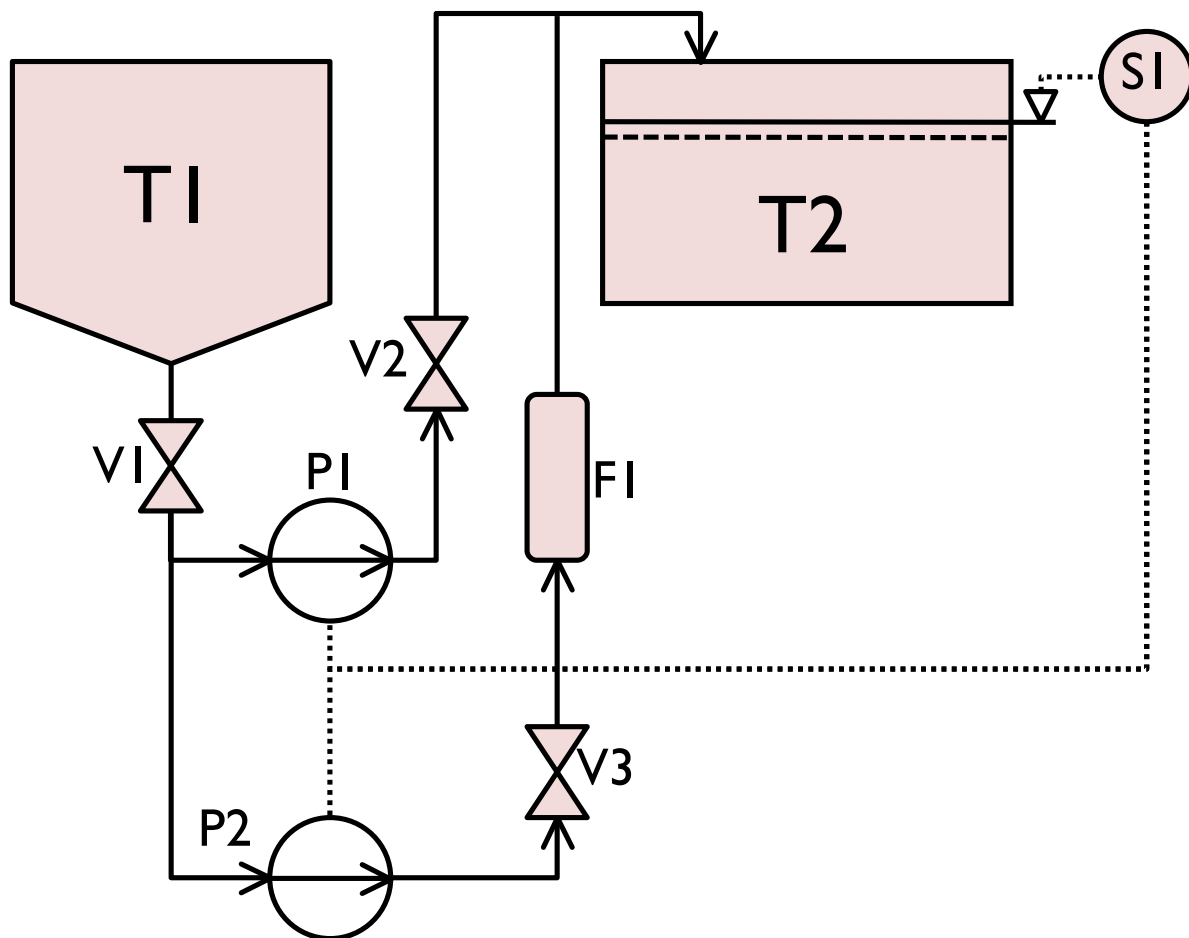
The system that is shown below keep the fluid level in tank T2 at a certain level. In order to function the system need to fulfill the following conditions:

1. The level sensor S1 has to be functional
2. V1 has to be open
3. Either P1 has to be working and V2 open, **or**:
4. P2 has to be working and V3 has to be open and the filter, F1 shall not be clogged.
5. Also, there has to be fluid in tank T1

Draw a Fault tree for the top event: "Low level in T2".

Base the Fault tree only on the above mentioned circumstances.

(5 P.)



Q 6:

Acme engineering is about to start producing a new product with an estimated life cycle of 25 years. In order to produce it, the company needs to buy a new machine and two alternatives have been selected. Both alternatives are expected to run 4300 h/y. The data of the two alternatives is found below:

| Data | Machine X | Machine Y |
|------------------|-----------|-----------|
| Acquisition cost | 135000 € | 87000 € |
| Maintenance cost | 10800 €/y | ??? |
| Life length | 30 y | 35 y |
| MTBF | 380 h | 320 h |
| MTTR | 2 h | 3 h |
| Cost of downtime | 500 €/h | 500 €/h |
| Operations cost | 45000 €/y | 48000 €/y |

Calculate what yearly maintenance cost Machine Y could have and still be an interesting alternative to Machine X.

(5 P.)

$$LCC = C_A + t_C(C_O + C_M + C_{DT})$$

C_A : Acquisition cost

t_C : time of comparison

C_O : Operations cost

C_M : Maintenance cost

C_{DT} : Downtime cost

Q 7:

Reflect shortly upon your main learnings from the industrial project that you have been involved with in this course. Note that there are no right or wrong answers here as long as you describe some learnings from the project.

(5 P.)