Process Control

Please bring the following items to the competition
Pocket calculator

Safety information
Running is not permitted during the competition. Materials may not be thrown. Only the laid-out material is to be used.

Description
The process technology and measuring arrangements available in a municipal wastewater treatment plant are described in a text. The wastewater treatment plant, if required sampling points and measurement devices, are now to be depicted as rapidly as possible using magnetic cards placed on the magnetic board.
In addition, system malfunction situations are queried, which are to be answered at the correct point in the flow diagram.
Through this task the participants show their competence in process control. They are able to present the technical process, recognize and resolve problems and master difficult situations.
Along with wastewater treatment, the disposal of sewage sludge is also dealt with. Questions on energy and questions on official monitoring values and their observation also belong to the task. The task is processed as rapidly as possible without a fixed specified time and, at the end, evaluated by the jury. After the evaluation has taken place there is feedback from the jury to the team captain with advice on improvements.
In order to practice the task in a targeted fashion, the wastewater engineering training box and the book of exercises “Fit in wastewater technology” can be used.

Preparation
With malfunctions, the team captain can interrupt the preparation time at any time through an appeal to the chief referee. With an appeal all activities by the team must be stopped immediately. The preparation time is interrupted until the malfunction is rectified and the preparation time is again restarted through the command of the team captain.
The preparation time is 5 minutes. In this time:
- the task description may be read through
- the magnetic cards may be pre-sorted
- the materials may be prepared

Materials, which are not going to be needed, can be taken from the case and placed on the table. At the end of the preparation time the required materials must be put back into the training kit set box. The order of the magnetic cards and pencils is quite immaterial.
Execution
As specialist for wastewater technology, you are working in a municipal wastewater treatment plant, which is configured for 60.000 inhabitants. It consists of a screw pump lift, screen plant (rod separation 6mm), grit chamber, primary settling tank (tank vol. = 1300m^3), upstream denitrification stage, nitrification stage (sludge loading BTS = 0.15kgBOD5/kgTS*d), a circular secondary settling tank and a longitudinal secondary settling tank. The activated sludge process is operated with a dry solid matter content TSBB = 3g/l. The necessary precipitant is taken from the precipitant tank and is to be dosed

simultaneously. The treated wastewater flows at the end into the body of water (receiving waters).
The excess sludge yielded is transported via a pre-thickener, then via a mechanical sludge dewaterer and into the downstream digester and is anaerobically stabilized there. After dewatering has taken place through mechanical sludge dewatering the dewatered sludge is disposed of via agriculture or incineration. The combined power and heating plant is operated by the digester gas produced.

1. Create a flow diagram:
- A complete wastewater treatment plant
- A sludge treatment according to the aspects given in the text.

With this enter all
- the water paths in blue,
- sludge paths in black
- and all specified characteristic values from the text in red at the correct point of the flow diagram.

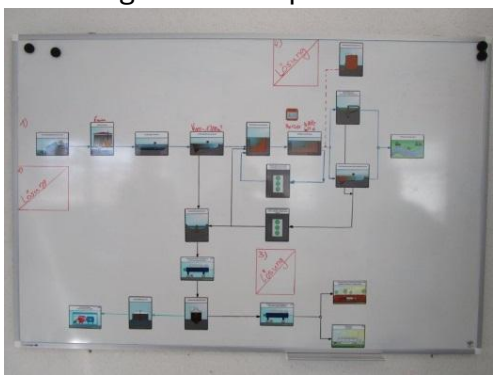
2. What inflow to the wastewater treatment plant must be reckoned with if one inhabitant produces 150l/(PT*d)?
Enter your result using the red pencil on the pictogram screw pump lift in the flow diagram.

3. The average dry substance content in the return flow sludge is:
TSRS = 7.5g/l. Calculate the return sludge ratio.
Enter your result using the red pencil on the pictogram return sludge pump in the flow diagram.

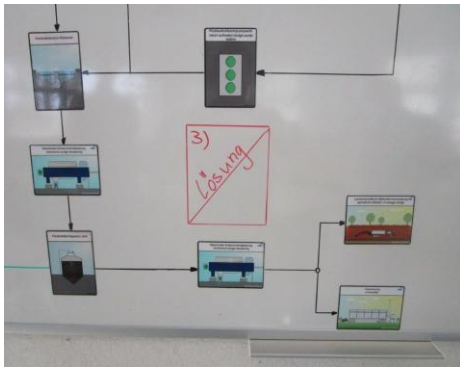
4. You wish to regulate the nitrification with the aid of an online measuring device. Mark the required measuring points and enter which parameters must be measured in order to achieve the regulation.
Enter your result using the red pencil on the pictogram nitrification stage in the flow diagram.

Information on the assessment of the task

Flow diagram with representation



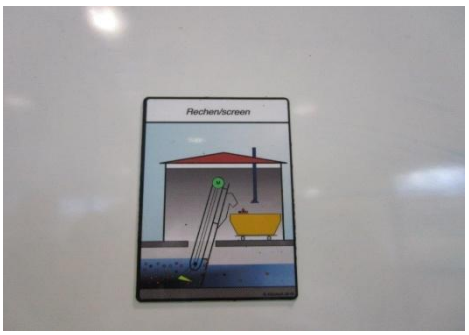
Right positions of the solutions



Correct

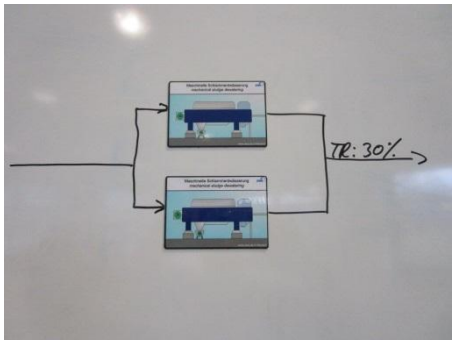
Pictogram with description from text

Incorrect

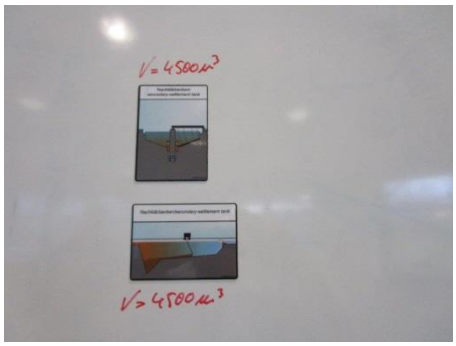


Pictogram with missing description

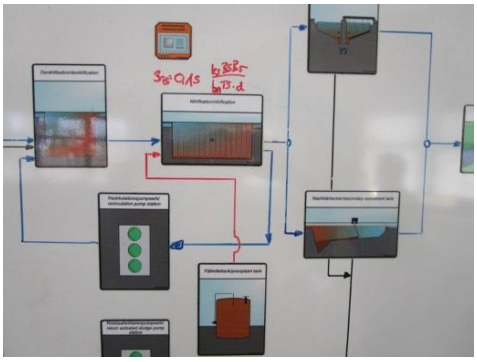
Correct



Two pictograms are to be placed

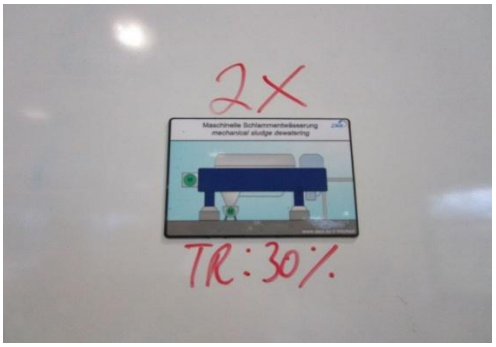


Information is to be entered in each pictogram

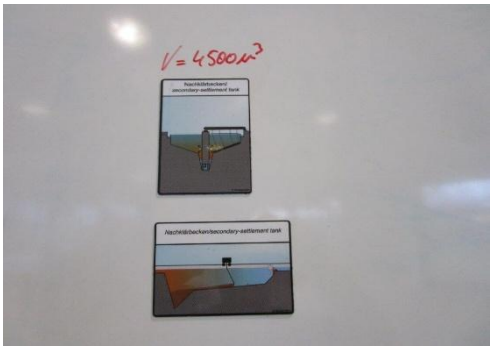


The intersection of both lines
Is to be drawn as shown above

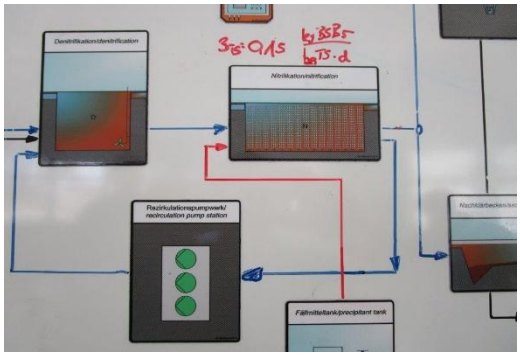
Incorrect



Representation incorrect



Representation incorrect



Representation incorrect