LABORATORY PLANNING GUIDE

L65 Water Treatment Laboratory

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Covered subjects according to the curriculum

Major topics of learning content:

- familiarisation with precipitation and flocculation
  * effect of the pH value on precipitation
  * creation of a stable operating state
  * determination of the required metering quantities (precipitant, coagulant, flocculant)
- functional principle of a lamella separator
- familiarisation with anaerobic water treatment
  * effects of temperature and pH value on anaerobic degradation
  * functional principle of a UASB reactor
  * comparison of single stage and dual stage operation mode
  * monitoring and optimisation of the operating conditions
  * identification of the following influencing factors: sludge loading, volumetric loading and flow velocity in the UASB reactor
- fundamental principle of softening and desalination by ion exchange
  * identification of the different modes of operation of cation and anion exchangers
  * combined use of cation and anion exchangers for desalination
  * exchanging capacities and regeneration
- fundamental principle of the activated sludge process
  * functional principle of nitrification and pre-denitrification
  * creation of a stable operating state
  * identification of the relevant influencing factors
  * efficiency of the pre-denitrification
- fundamental principle of depth filtration by sand filters
  * observation of the pressure conditions in a filter bed
  * determination of pressure losses
  * plotting of Micheau diagrams
  * principle of backwash
- fundamental principle of separation of solids from suspensions in a sedimentation tank
  * efficiency of the separation process dependent on solid concentration of suspension, flow rate and position of baffle plate
  * investigation of flow conditions dependent on flow rate and position of baffle plate
**Main concept**
The laboratory is designed for accommodation of 24 students + 2 laboratory staff:
- 2 - 4 students form a team and work together at a workstation / training system
- 6 different workstations
- All workstations are floor standing
- 3 of the workstations are equipped with a PC
- Each workstation is equipped with a manual containing technical information, basic theory, experiment instructions, evaluation help and safety advice.
- Student teams are scheduled to change workstations from lab session to lab session in order to perform the entire range of experiments within the course duration.
- Average time per experiment: 90 to 120 minutes.

2 workstations for laboratory staff (with PC and internet access)
1 printer for common use
1 cupboard for small parts, consumables, tools, paper etc.

**Initial training provided for laboratory personnel**
To be conducted immediately after installation and commissioning of the equipment.

General topics to be covered for any of the educational systems:
- Basic familiarization with the system.
- Functions and components.
- Overall system configuration aspects.
- Start-up and operational aspects.
- Conduction experiments, including evaluation and calculation.
- Using the system with and without the software (where applicable).
- Trouble shooting and maintenance aspects.
- Hands-on, practical familiarization aspects.
- Seminar participants with the delivered system.
- Details of the manuals.
- Safe operation and preventive maintenance.

**Requirements / Utilities**

**Power supply:**
- 230 V / 50 Hz / 1 phase – at least 15 power sockets
- 400 V / 50 Hz / 3 phases – at least 2 power sockets

**Water:**
- 5 x cold water
- 5 x drain

**Laboratory computer network:**
- 2 internet connections for staff
- 3 internet connections for students

**Location:**
- Laboratory space min 84 m²
- This laboratory should be installed on the ground floor
Schedule of requirements

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>Precipitation and flocculation</td>
<td>1 pcs.</td>
</tr>
<tr>
<td>Item 2</td>
<td>Anaerobic water treatment</td>
<td>1 pcs.</td>
</tr>
<tr>
<td>Item 3</td>
<td>Ion exchange</td>
<td>1 pcs.</td>
</tr>
<tr>
<td>Item 4</td>
<td>Activated sludge process</td>
<td>1 pcs.</td>
</tr>
<tr>
<td>Item 5</td>
<td>Depth filtration</td>
<td>1 pcs.</td>
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<tr>
<td>Item 6</td>
<td>Separation in sedimentation tanks</td>
<td>1 pcs.</td>
</tr>
</tbody>
</table>

Laboratory drawing