

Figure 1. Topology of the system LABI



Figure 2. Photo of DE5 equipment

The basic process will use some demo of biological activated sludge processes in long term. The dissolved oxygen concentration, the pH value, the ORP value, the turbidity and electrical conductivity

are mean monitoring parameters. The control parameters are temperature, the pH value, temperature, pH and aeration intensity. The all parameters have a key factor for micro organism activity. This demo process is one from general bioprocesses used in the praxis.

### 3. DESCRIBING OF DEMO BIOCHEMICAL PROCESSES IN DE5

The simple aerobic process is suitable for DE5. The fermentor is tanked about 10 litres of active sludge. The right mix of substructure and the bio medium are the ingredients. The mix of substructure contents light resolvable glucose (it is a energy source) and the Hykol (hydrolyzate of collagen, it is a source of nitrogen and amino acid). The sludge with the ingredients is mixed, tempered and intensive aerated.

The micro organism consumes the dissolved oxygen and substructure. It is controlled according to the sensor LDO by its grow. The scheme is in Fig.3. The waste materials (organic acids and nitrogen base) arise during the reaction. It is controlled via sensor of pH. The effectiveness of enzymes and activity of micro organisms is changed according to pH value. Therefore the pH is controlled for optimal level with batching of acid and or alkali. The metabolic processes of micro organisms influence the parameter of ORP eventually conductivity of liquid. It is controlled by sensors of ORP and conductivity.

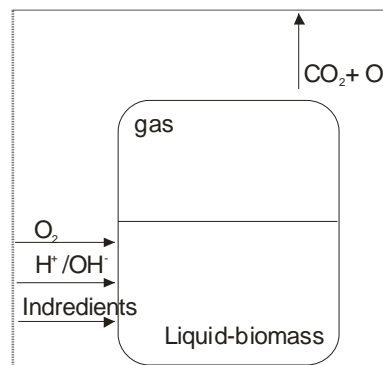


Figure 3: The scheme of aerobic processes in the DE5

The micro organisms' bloom is visualized via a measurement the bio mass production. The measurement is done to take off periodically some samples of sludge and it is done via the determination of content of dissolved organic carbon (DOC). The measurement of turbidity gives information in the bio mass production too. The both value (DOC and turbidity) are compared very easy.

### 4. THE MEASUREMENT, CONTROL SYSTEM OF EXPERIMENT DE5

A demo technological process of the biological waste-water treatment and water-soluble organic materials in water aerobic environment is used for a basic operation of fermenter. The main criteria are the substrate kinetic, the dissolved oxygen concentration, and the pH value eventually oxidant-reducing potential (ORP). The pH value of environment conditions a microbial activity. The conductivity measurement of water environment gives information in electrolyte content, most often the inorganic salts. The sensors for measurement of turbidity serve for a content supervision of suspended materials (concretely activated sludge) and for quality classification of outlet.

There are proposed the loops for basic operation of experiment DE5:

- of the measurement:
  - o (3a) temperature T1 (0-100°C),
  - o (22) level L (0-0,35m),
  - o (21) pressure into fermenter (0-160 kPa)
  - o (8) pH (1-14 pH),
  - o (7) conductivity, (200  $\mu$ S/m - 2 S/m),
  - o (9) dissolved oxygen (0-50 mg/l),
  - o (11) turbidity, 0-10000 NTU
  - o (10) ORP (-700 mV to 1000 mV),

- (19) rotation (0-1000 n/min)
- (5) present of yeast.
- of control and actuators:
  - motor M1 (19)
  - heating E1
  - input of air aerate(H1/4)
  - dosing through peristaltic pump (2a, 2b, 2c, 2d)
  - output of gas phase (13)
  - output of liquid phase (17).

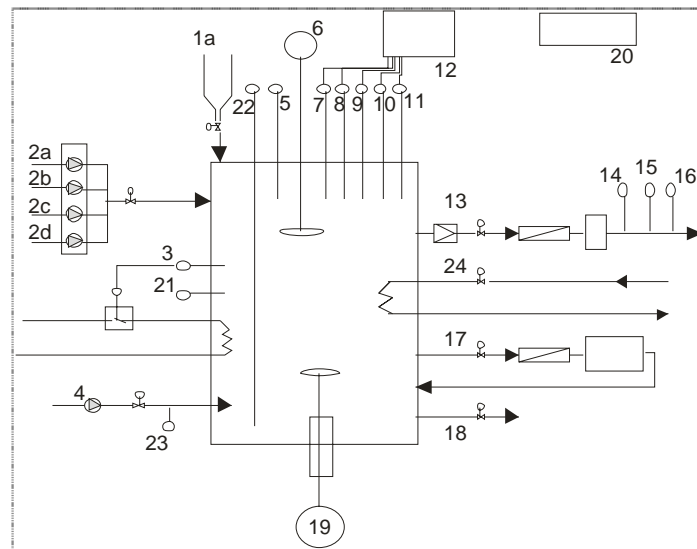


Figure 4: The automation loops of DE5

The automation system has the basic functions:

- measurement and acquisition of data in set time period
- archiving the measured data
- remote access via the Internet,
- local control and visualization of processes.

The in-line measured data is accessed via WEB. The visualization is in the monitor of system and archiving is in special files. The in-line measurement of concentration of methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>) in gas part of fermenter is prepared. Thereafter some technological complicated anaerobic processes are processing in the future.

## 5. CONCLUSION

The DE5 experiment equipment has very eminent position in LABI. It is a chemical process which offers a study and education of specific biochemistry. It stands next mechanical, electrical and thermal processes of the other experiments. The large contribution is the access via Internet. The access is for remote control, visualizing, archiving of data is used by a long time processes.

## 6. REFERENCES

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## 7. ACKNOWLEDGEMENT

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