FILTERING-AND-ADSORPTION TECHNOLOGY FOR INTEGRATED TREATMENT OF INDUSTRIAL SEWAGE

**Description**
The sewage treatment process employs multilayer adsorbing filters based on adsorbents of two types: an ultrafine powder of oxide-hydroxide aluminum phases and a high-capacity fibrous adsorbent (consisting of activated natural materials and synthetic polymers). In this filter design, the ultrafine adsorbent acts as a coagulator of microemulsions of organic compounds in aqueous media and adsorbs admixtures of heavy metals and other substances, and the fibrous collector absorbs and concentrates pollutants.

**Sewage contaminants**

<table>
<thead>
<tr>
<th>Sewage contaminants</th>
<th>Concentration in sewage, mg/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum products:</td>
<td></td>
</tr>
<tr>
<td>suspended</td>
<td>(8-10)*10³</td>
</tr>
<tr>
<td>emulsified</td>
<td>300</td>
</tr>
<tr>
<td>dissolved</td>
<td>20-50</td>
</tr>
<tr>
<td>Lead</td>
<td>&gt; 1.0</td>
</tr>
<tr>
<td>Phenols</td>
<td>~0.2</td>
</tr>
<tr>
<td>Surfactants</td>
<td>up to 7.5</td>
</tr>
<tr>
<td></td>
<td>Initial</td>
</tr>
<tr>
<td></td>
<td>suspended</td>
</tr>
</tbody>
</table>

**Technical specifications**
- Initial contaminant concentration:
  - suspended up to 10⁴ mg/liter
  - dissolved and emulsified up to 3500 mg/liter
- Productivity of filter set up to 5 m³/hr
- Filter life before regeneration 900 - 1000 m³
- Number of regeneration cycles before adsorbent replacement not less than 20
- Adsorbent regeneration by live steam at 105-125°C is performed without secondary environmental pollution once or twice a month
- Adsorbent life before total regeneration one year
- Installation weight 2 tons
- Process area 5 x 6 m

Fig. 1. Interior design of commercial adsorbing filters

Fig. 2. Appearance of commercial adsorbing filters
Technical appraisal and economic benefits
- Capability of removing complex pollution (organic, inorganic, and mechanical impurities).
- Versatile technology adaptation for treating sewage with quantitative and qualitative changes in contaminant composition.

Application areas
Integrated fine purification of industrial sewage from petroleum products, products of organic synthesis, and heavy metals, including chromium compounds.

Development stage
The commercial plant at the Tomsk Petroleum Storage Depot has been operating since 1995. A set of equipment has been produced jointly with the Yurga Engineering Plant to treat sewage from the Pilot Merchant-Coke Plant of the Anshan Research Institute of Thermal Energy (Anshan, Liaoning Prov., China).

Patent situation
Patents are granted in the Russian Federation (two patents in 1996 and two patents in 1997); know-how is available.

Commercial offers
License agreement; know-how transfer, joint production, sales of finished products.

Estimated cost
The cost of the baseline configuration of the filtering-and-adsorption installation is US$ 12,000

Contacts
Cand.Sc. Ida A. Savinova, Scientific Secretary
Institute of Petroleum Chemistry, Siberian Branch of the Russian Academy of Sciences
3, Akademichesky Prosp., Tomsk, 634021, Russia
Phone: (382-2) 258623, 258558
Fax: (382-2) 258457
E-mail: canc@ipc.tsc.ru
Web-site: www.ipc.tsc.ru