Revitalization of Rivers, Ponds, and Lakes

Highly Concentrated and Thin Layer Dredging Technology using Mud Suction and Pneumatic Transport Systems

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Member, Japan Dredging & Pneumatic Transport Association
Oyanagi Construction Co., Ltd. Mr. Masayuki Hiura, Environmental Conservation division

URL http://n-oyanagi.com/
Issues in Conventional Technologies: Pump dredging is most popular and suited for large scale dredging. It vacuums mud at the bottom and transports through pipes; but since it vacuums water together, it would discharge large amount of excess water in the end, also causing water contamination.

Environmental Protection Type Dredging Methods: A high density (consists over 60% mud) dredging method which can overcome the issues above. By using special mud vacuum devices with negative pressure it can consecutively collect high density mud into the tank. (NETIS:HR-100010-A)

Realities in Environmental contamination: Most damaging to the environment is the sludge surface. We co-developed a GCG Dredging method and technology which allows dredging only thin layers of the surface, without causing any secondary contamination. (NETIS:QSA-090005-A)
Sucking mud by negative pressure

Excavating by rotary blades having water stoppage effect

Depth of Dredging 0.9m～6.0m

NETIS:HR-100010-A
Highly Concentrated and Thin Layer Dredging Technology using Mud Suction and Pneumatic Transport Systems
Monitors the depth and angle of the Vacuum Mouth; depth of dredging completed location is shown by 25mm in different colors

NETIS:QSK-090005-A
GCS900 Dredging guidance systems
Effectively used in environmental construction in various city rivers in Japan; meeting diverse needs for improvement of cities.

1968年弁天潟公園整備（新潟県）から2012年9月現在まで約400,000m³の実績があります

TOKYO足立区・毛長川河床掘削工事（2012）

KYOTO舞鶴港・府民公募型安全整備工事（2011）

OKAYAMA・百間川沖元浚渫他工事（2011）

TOKYO目黒区・目黒川しゅんせつ工事（2012）
Rivers in Tokyo by using the **Mud Suction and Pneumatic Transport Systems**
A Combination of Pneumatic Transport System and Negative pressure dredging technology

1. Transports dredged mud/soil by pneumatic pressure through a pipeline
   (maximum transport ability: Longest distance = 3,466 m, Highest height = 52 m)

2. Will dredge only thin layers of sludge horizontally

3. The negative pressure vacuum system will not mix the bottom of the river/lake and will prevent turbid

4. Will dredge high density sludge with suction of less water (*proved 80% mud ratio)

5. Transportation of mud is done by dedicated pipeline; will prevent environmental damage (odor, transport)

6. Intake of effluent water is small; the work can be done in a small area, and sundrying of mud is possible

7. An environmentally feasible dredging which enable less barrier for materializing the work

- The dredge barge can be knocked down and transported by truck to the site; and be reassembled
- The pipeline generates less effluent water and dredge transportation by a pipeline assures less restriction to location sites
- Low structure (height: 1.20 m, highest from bottom: 3.26 m) and easy to work and pass under bridges
1. Excavate by vacuum mouth
2. Vacuum by negative pressure facility
3. Store mud in tank
4. Pneumatic transport of mud

_negative pressure vacuuming and pneumatic transport system Flow_
Dredging work is possible in any conditions

a) in areas where certain depth is secured (0.9m) → mud suction pneumatic transport barge type
b) in shallow water e.g. lakes, marshes → mud suction pneumatic transport amphibious type
c) in locations where pneumatic transport onsite is not possible → longer distance transport with reloading barges
Mud suction method made possible to work under low bridges

Work using mud suction floating boats (barges)

Work using mud suction pneumatic transport equipment
Dredge boats can be knocked down, transported and assembled/deassembled by cranes at the site.

50~60t ラフテレーンクレーンでの組み立て作業
（東京都北区石神井川）

The dredging barge will be divided into 15 parts and delivered by truck.
Possible to work in narrow city rivers

(Barges can be detached and re-assembled, moving up and down the river)
## Dredging and Pneumatic Transport Abilities (per hour)

<table>
<thead>
<tr>
<th>Method</th>
<th>Machine Type</th>
<th>Clay ①</th>
<th>Clay ②</th>
<th>Viscous Soil</th>
<th>Sand Soil</th>
<th>Sand</th>
<th>Floating Sludge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic transport</td>
<td>T1-40型</td>
<td>23</td>
<td>27</td>
<td>39</td>
<td>34</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>systems</td>
<td>T2-70型</td>
<td>33</td>
<td>40</td>
<td>56</td>
<td>50</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>T2-100型</td>
<td>43</td>
<td>53</td>
<td>74</td>
<td>66</td>
<td>41</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>T2-150型</td>
<td>60</td>
<td>80</td>
<td>110</td>
<td>100</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>T2-200型</td>
<td>119</td>
<td>143</td>
<td>200</td>
<td>178</td>
<td>108</td>
<td>0</td>
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<tr>
<td>Pumping transport</td>
<td>吸引圧送機</td>
<td>16</td>
<td>20</td>
<td>35</td>
<td>25</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>systems</td>
<td>吸引圧送船</td>
<td>30</td>
<td>35</td>
<td>50</td>
<td>45</td>
<td>0</td>
<td>60</td>
</tr>
</tbody>
</table>

- **1時間当たりの標準作業能力**: $Q$
- 粘土 ① 粘土 ② 粘性土 砂質土 砂 浮泥
- 浴漬対象土砂
- 浴漬能力(m³/h)
- T1-40型
- T2-70型
- T2-100型
- T2-150型
- T2-200型
- 吸引圧送機
- 吸引圧送船
Comparison of mud content in different dredging (tested in Niigata 2012,1,25)
(Mud content: ratio of sediment included in the mud mixed water when dredged.)

浚渫土砂の簡易土質試験/見掛け含泥率（24h放置）
泥比重（マッドバランス）/含水比/水分量（水分計）

鳥屋野潟での見掛け含泥率の平均値=74.3％

Water ratio 390.8%
135.9%

Water content at bottom

<table>
<thead>
<tr>
<th>Mudd content in different dredging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud suction boat dredging</td>
</tr>
<tr>
<td>Mud ratio 74.3%</td>
</tr>
<tr>
<td>Mud/Sand 10m³/水 125m³ →水を 490m³ 運搬</td>
</tr>
<tr>
<td>Pumping boat dredging</td>
</tr>
<tr>
<td>Mud ratio max=20%</td>
</tr>
<tr>
<td>Mud/Sand 22m³/水 113m³ →水を 478m³ 運搬</td>
</tr>
</tbody>
</table>

吸引船浚渫・圧送時の状態（含泥率=74.3％）

地山（底泥）土量 100m³ 当りの土砂と水の割合

10 | 90m³ |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>water</td>
<td>100m³</td>
</tr>
<tr>
<td>35m³</td>
<td></td>
</tr>
</tbody>
</table>

含水比 40%
thank you for your kind attention

For more information:
Oyanagi Construction Co. Ltd.
〒951-8052 新潟市中央区下大川前通ノ町2230－33
小柳建設株式会社 新潟支店 環境保全事業部
樋浦 雅行 ma-hiura@n-oyanagi.co.jp
Tel:025-223-8001,fax:025-223-8005, 携帯090-5996-5562