The Ziebel "MagLev" downhole pump

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Solution background

Henning Hansen investigated the possibility of installing a pump system in a flexible subsea to surface production riser for an operator in Southern Europe in 2005. This riser has an internal Teflon coating which could not be damaged by anchors, slips and similar.

No electrical subsurface technology except jet pumping were found that was applicable...
IP status

- Norwegian patent no. 2006/126886
- PCT patent application issued in a number of countries, worldwide
- Additional applications filed
- Describes the use of magnetic levitation to
  - rotate a turbine type pump
  - move one or several pistons up/down to pump liquids
  - transport tools over shorter or longer distances in a wellbore
What it is

a) A new downhole electrical pump having very few parts where all moveable and wear-parts can be replaced for service or well intervention access below pump without having to pull the production tubing

b) A pump solution where the pump can rotate or reciprocate

c) A scalable pump solution - From a through tubing deployed low volume gas well dewatering pump to a high volume oil production pump for subsea wells

d) A pump solution where light well intervention equipment will facilitate pump retrieval and installation in subsea wells
What’s MagLev?

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.
Check/flapper valve pump is not new
Pushing fluids by a swab-cup device
The development target

Build and successfully install and operate a new downhole pump incorporating;

- Electromagnetic drive, based on “the power of MagLev” - A linear motor
- Reliability and few and simple components
- Tolerant to scale, by continuous scale scraping pistons, avoidance of recessions in flow path, low friction flow exposed surfaces and material selection (Also, there is evidence that magnetic fields in many cases prevents scale.)
- Easy retrieve-ability for repair or wellbore access below pump
- No critical seals between pump module and fixed well completion
- Competitively priced, high efficiency, easy to install and replace
1st phase target

• Pump shall be able to be run to depths up to 4 000 meters (13 000 feet)

• Operating temperature is required to be as high as possible, with upper limit target to be at least 120°C (248°F)

• Target is to have a tool of a maximum outer diameter of 2” (50.8 mm) - Preferably max. 1.8”

• Volume to be pumped per day is 10-120 BBL/day (1 590 - 20 000 liters/day)

• Low power consumption target (e.g. 240V and 2500W)

• From surface adjustable speed
Applications

1. Gas well dewatering
   a) Through tubing deployed. Spooled by umbilical in/out of well
   b) Tubing deployed. Traveling pistons can be wireline retrieved

2. To produce lower producing oil wells - Without having to run tubing

3. As a temporary lift pump in wells where ESP has failed

4. To kick start worked over wells

5. As a within subsea riser deployed pump

6. As a subsea through tubing deployed pump
More technothalk

What is the compression ratio of the pump?
The pump will be used to pump water first.
Compression ratio is usually used in engines where air and fuel mix is compressed before sparking. We don’t have much gas in our cylinder so we don’t think it applies. Compression ratio is the ratio of the air/fuel mix at max volume to the volume when fully compressed.

How close can the valves come together?
Depending on design but can be almost touching.

What is the maximum stroke length?
Depending on design as the stroke length will depend on the required lifting rate, frequency of stroke and OD. But in theory no limits...
First prototype to be deployed offshore end of 2008

Questions?
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