Artificial Lift Solutions
Surface & Subsurface Pumps

Twin Screw Technology

We pump molten metal too
**CAN-K the Company**

Under License from CAN-K PME

**CAN-K Artificial Lift Systems Inc.** was established to focus exclusively on artificial lift solutions for the oil and gas industry. CAN-K offers a complete range of industry recognized pumps and associated products, while also offering some new leading edge technologies.

Over the years CAN-K PME has developed and patented several artificial lift technologies that have become standard industry artificial lift solutions. In the quest to lead the industry in product development, CAN-K is always looking to improve and replace existing technology, thus offering our clients new cost effective solutions for their reservoirs.

**Extensive Range of products:**

- ESTSP (Electric Submersible Twin Screw Pumps)
- TDTSP (Top Drive Twin Screw Pump)
- Electric Top Drives
- Hydraulic Top Drives
- Zero Leak Stuffing Box
- Natural gas CAN-K twin screw compressors and compressor packages
- Surface twin screw Multiphase pumps
- Subsea wet gas compression pumping systems
- Down hole twin screw natural gas compressors
- Custom positive displacement pumps and pumping systems
- Research & Development in positive displacement pumps and pumping systems both for down hole and surface

We pride ourselves to be the best in the industry for pumps and pumping systems for oil and gas sector.

**Surface Transfer Twin Screw Multiphase Pumps**

**The Technology**

CAN-K’s surface technology was originally developed by Can-K PME and is a patented technology which involves features which are not offered by our competitors. CAN-K PME which is also involved in twin screw natural gas compressor manufacturing and has used its combined knowledge of both compressor and pump know-how to develop the **Surface** Twin screw Multiphase Pumps.

**Features:**

- High pressure capability
- Custom manufactured diamond/diamond mechanical seals for high temperature
- Can run dry for long periods of time
- CAN-K manufactured stacked pad bearings which means no L10 life for the bearings
- Unequal screw design
- Remove pump without disconnecting flanges; pump installed on rails
- Proprietary screw profile; high gas capability, low slip screws; least blow hole screw profiles
- Adiabatic compression
- Slim design
- High speed capability
- Multiple intakes and connect several wells to one pump
- Pumping of crude oil/water/sand/high gas GVF of up to 98% or slugs of 100%
Tear down sand

Installation
Advantages:

- Remove back pressure from wells
- Save on capital expenditure on surface facilities
- Booster pumps
- Increase in production if the well has Sufficient PI
- Increase production in low bottom hole pressure wells with combination of down hole twin screw multiphase pump and surface transfer twin screw multiphase pumps
- Fully automated systems provided

Capacity and Pressures:

CAN-K surface twin screw multiphase pumps are generally custom manufactured.

- Pressure of up to 3500 psig (242 bar) even with low viscosities
- Capacity from 150 to 350,000 bbl/day

Subsea Multiphase Twin Screw Pumps:

- Phase - 1 study complete
General Specifications:

**Volume:**
24 m³/day to 8898 m³/day (150 to 56,000 bbl/day)

**Pressure Capability:**
Up to 3,500 psi

**Temperature Capability:**
350°C (662°F) - using subsurface hydraulic motor

**Casing Sizes:**
From 139.7mm to 339.9mm (51/2" to 133/8") casing suitability. Slim design of 3.7" diameter

**Drive:**
Electric Submersible Motor or CAN-K top drive. CAN-K top drive for high temperatures only

**Speed:**
Up to 6000 rpm

**Power:**
Up to 1200 HP (limitations on down hole motor)

**Medium:**
Multiphase

**Abrasion Protection:**
Tungsten coating/diamond composite coating/zirconia coating

**Mechanical Seals:**
CAN-K custom manufactured including diamond/diamond faces

**Screw:**
Varying materials depending upon application. Shell design

**Installation:**
Installed exactly like an ESP system and suitable for all available Standard electric submersible motors. Alternatively installed with sucker rod

**Thrust:**
Independently built in thrust section

Advantages:

- Very low shear rate and hence, least emulsion compared to ESP
- Low HP compared to centrifugal pumps (up to 40% HP savings)
- Positive displacement pump
- Handles gas
- Abrasion resistance coatings are provided on screws and housing; WC/diamond composite coatings/zirconia
- High efficiency
- Can replace existing ESP directly with existing motor and CAN-K pump
- Inherently balanced for high speed capability
- Can be installed in vertical, slanted or horizontal wells
- High Temperature capability of up to 316°C (662°F) with CAN-K top drive
ESTSP (Electric Submersible Twin Screw Pump)

TDTSP [Top drive (driven) twin screw pump]
**Unequal High Pressure Screw Designs**

- **Tear down of high temperature pump**
- **Patented thrust bearings**
- **Slim design screws**
- **End View Of Unequal Screw Design**

### High Temperature Test

<table>
<thead>
<tr>
<th>Minimum Casing Size</th>
<th>Slim size</th>
<th>Minimum Diameter</th>
<th>Volume Single Intake</th>
<th>Volume Double Intake</th>
<th>Differential Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(inches)</td>
<td>(inches)</td>
<td>(inches)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51/2</td>
<td>3.7</td>
<td>4.00</td>
<td>150 bbl/day to 4000 bbl/day</td>
<td>NA</td>
<td>900 psig</td>
</tr>
<tr>
<td>7</td>
<td>4.90</td>
<td>5.38</td>
<td>150 bbl/day to 5200 bbl/day</td>
<td>300 bbl/day to 10,400 bbl/day</td>
<td>3500 psig</td>
</tr>
<tr>
<td>95/8</td>
<td>NA</td>
<td>7.75/6.75</td>
<td>1000 bbl/day to 17,500 bbl/day</td>
<td>2000 bbl/day to 35,000 bbl/day</td>
<td>3500 psig</td>
</tr>
<tr>
<td>133/8</td>
<td>11.00</td>
<td>12.50</td>
<td>4000 bbl/day to 56,000 bbl/day</td>
<td>custom designed only</td>
<td>3500 psig</td>
</tr>
</tbody>
</table>

**Notes:**
1. Due to improvement in design all parameters are subject to change without notice.
2. Contact CAN-K for variations in sizes or other details not listed.
3. Custom designed pumps are offered for major projects.
4. Maximum HP - 1200
5. Maximum Pressure - 3500 PSIG
Twin Screw Technology

Tear Down Of Pump After High Sand Offshore Installation
Advantages and Disadvantages of ESTSP/TDTSP (CAN-K’s pumps) versus ESP, PC Pumps and Gas lift.

<table>
<thead>
<tr>
<th>ESP</th>
<th>ESTSP/TDTSP</th>
<th>PC</th>
<th>Gas Lift</th>
<th>Beam Pumps</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrifugal pump</td>
<td>Positive displacement pump</td>
<td>Positive displacement pump</td>
<td>NA</td>
<td>Positive Displacement Pumps</td>
<td>PC pumps have elastomer and CAN-K pumps is all steel</td>
</tr>
<tr>
<td>High intake pressure required</td>
<td>Extreme low intake pressure requirement and can also go to vacuum</td>
<td>Low intake pressure requirement</td>
<td>NA</td>
<td>Low intake pressure recommended</td>
<td></td>
</tr>
<tr>
<td>Very high shear</td>
<td>Very low shear</td>
<td>Very low shear</td>
<td>Very high shear</td>
<td>Low shear</td>
<td></td>
</tr>
<tr>
<td>High emulsion</td>
<td>Nil to minimal emulsion</td>
<td>Low emulsion</td>
<td>Extremely high emulsion</td>
<td>Low emulsion</td>
<td></td>
</tr>
<tr>
<td>Asphaltenes will break out</td>
<td>Asphaltenes will not break out</td>
<td>Asphaltenes will react with elastomer</td>
<td>Asphaltenes will break out</td>
<td>Asphaltenes will clog movement.</td>
<td></td>
</tr>
<tr>
<td>Cannot handle scale</td>
<td>Good tolerance to scale</td>
<td>Satisfactory to scales</td>
<td>Mixed version on scale build up</td>
<td>Scale will clog movement and damage pump</td>
<td></td>
</tr>
<tr>
<td>High hp requirement</td>
<td>Extremely low hp requirement when in heavy oil</td>
<td>More than twin screw pump</td>
<td>Very high hp requirement</td>
<td>Low hp requirement</td>
<td></td>
</tr>
<tr>
<td>Low maintenance</td>
<td>Low maintenance</td>
<td>High maintenance</td>
<td>Low maintenance other than wear</td>
<td>Very high maintenance</td>
<td></td>
</tr>
<tr>
<td>Handles light to medium viscosity</td>
<td>Handles low and high viscosity medium well</td>
<td>Handles high viscous medium only</td>
<td>Handles low viscous medium</td>
<td>Handles consistent low viscosity</td>
<td>Variations in viscosity in beam pumps will create severe fluctuations</td>
</tr>
<tr>
<td>Huge expenditure in anti emulsifying chemicals and environment issues</td>
<td>No expenditure. Zero to minimal emulsions</td>
<td>No expenditure. Zero to minimal emulsions</td>
<td>Very high emulsions and huge expenditure on chemicals</td>
<td>Low emulsions</td>
<td></td>
</tr>
<tr>
<td>Must choke on surface and major emulsions due to choking</td>
<td>No choking required</td>
<td>No choking required</td>
<td>NA</td>
<td>No choking required</td>
<td></td>
</tr>
<tr>
<td>Not suitable with high gas</td>
<td>Multiphase and handles gas</td>
<td>Gas reacts with elastomer</td>
<td>Handles gas</td>
<td>Not suitable for flashing or variations in phases</td>
<td></td>
</tr>
<tr>
<td>High pressure capability</td>
<td>High pressure capability</td>
<td>Low pressure capability</td>
<td>Very expensive for high pressure capability</td>
<td>Sufficient pressure capability</td>
<td>Beam pumps could damage rods if pressure requirements keep changing during the stroke</td>
</tr>
<tr>
<td>Handles up to 56,000 bbl/day down hole</td>
<td>Handles up to 56,000 bbl/day down hole</td>
<td>Handles only around 12,000 bbl/day</td>
<td>Handles mid range</td>
<td>Handles low capacity</td>
<td></td>
</tr>
<tr>
<td>Can be run only by submersible motors</td>
<td>Can be run by submersible or surface systems</td>
<td>Can be run by surface and submersible systems</td>
<td>NA</td>
<td>Sucker rod only</td>
<td></td>
</tr>
<tr>
<td>There is BEP and fixed range</td>
<td>No BEP</td>
<td>No BEP</td>
<td>NA</td>
<td>Strokes per minute are the only adjustments available</td>
<td></td>
</tr>
<tr>
<td>Speed, Capacity and Pressures are intertwined.</td>
<td>Speed determines only capacity and not connected with pressures</td>
<td>Speed determines only capacity and not connected with pressures</td>
<td>SPM are the adjustments available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up thrust and down thrust issues</td>
<td>No up and down thrust issues</td>
<td>No up and down thrust</td>
<td>NA</td>
<td>Major sucker rod breakage due to thrust and intake pressure adjustments</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>When run on rods there is no axial load-free floating, rods and centralized.</td>
<td>Severe axial loading and tubing wear</td>
<td>Handles gas well</td>
<td>Changes in phase while pumping stroke could damage rods and pumps</td>
<td></td>
</tr>
<tr>
<td>Will gas lock</td>
<td>Will not gas lock.</td>
<td>Gas will react burning the stator and swelling it</td>
<td>Handles gas well</td>
<td>Changes in phase while pumping stroke could damage rods and pumps</td>
<td></td>
</tr>
<tr>
<td>Pumps during complete operation</td>
<td>Pumps during the complete operation</td>
<td>Pumps during the complete operation</td>
<td>NA</td>
<td>Idles during intake filling time</td>
<td></td>
</tr>
<tr>
<td>Handles only up to the temperature of the motor +218 deg C maximum-motor temperature.</td>
<td>Handles up to 280 deg C with surface motors. Testing on going for up to 315 deg Celsius. DASS motor (hydraulic motor) is being bench tested to take above 350 deg C for Huff &amp; Puff applications.</td>
<td>Handles below 150 deg C</td>
<td>Handles up to 210 deg C with major cooling systems and not competitive</td>
<td>Handles High temperatures</td>
<td></td>
</tr>
<tr>
<td>Old and proven technology for more than 60 years</td>
<td>New technology. Identities of new applications are on going.</td>
<td>Old proven technology for more than 25 years</td>
<td>Old and proven technology for more than 30 years or more</td>
<td>Old and proven technology</td>
<td></td>
</tr>
<tr>
<td>Manufactured in mass and very competitive in pricing</td>
<td>Expensive when manufactured one off. Volume discount offered.</td>
<td>Lower capital cost</td>
<td>Overall equipment is expensive</td>
<td>Competitive pricing</td>
<td></td>
</tr>
</tbody>
</table>
Electric Top Drive:

• Up to 400 HP

• High Heat Dissipation disc braking system

• High Speed capability of up to 800 RPM

• Thrust Capability of 33,400 to 130,000 lbs

• Ratio of 4:1 belt drive or other sheave combinations

• Direct motor mounted as optional

• Maximum polished rod torque of 3750 ft. lb

• Custom manufactured sucker rods of up to 7000 ft. lbs

Hydraulic Top Drive:

• Maximum speed 500 rpm

• Maximum HP of 140 HP

• Maximum polished rod torque of 2100 ft lb

• Well Head drive with direct hydraulic motor/geared motor/sheave type

• Thrust loading 20,200 lbs (higher capacity on request)