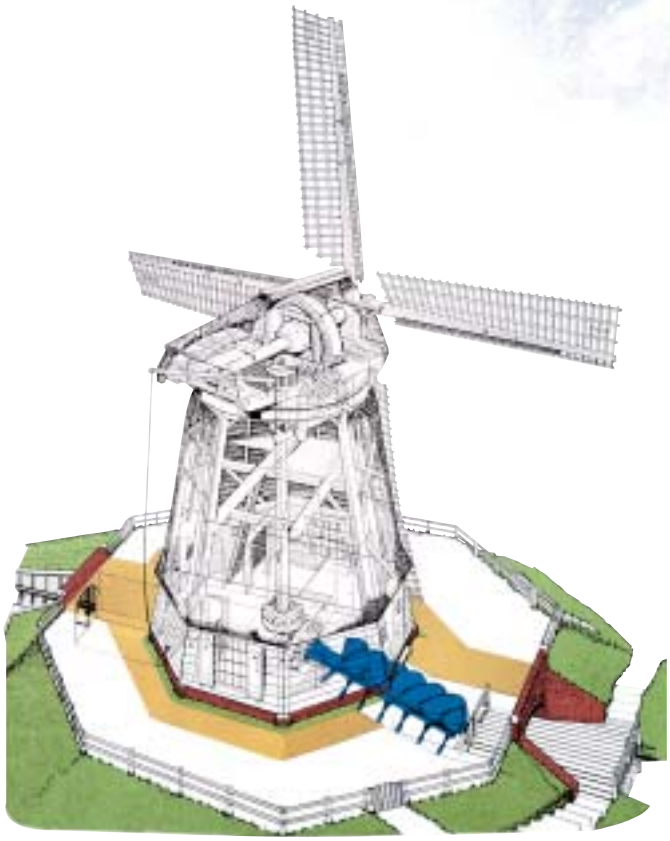
SCREW PUMPS

Spaans Babcock

General Information

Several centuries BC, Archimedes the Greek philosopher, developed a turning spirally wound tube to raise water to a higher level for irrigation purposes. Over 100 years ago, this method of raising water was adapted by the Dutch to reclaim land using windmills as the drive system.

Founded in 1895, Spaans Babcock adapted Archimedes' original wound tube concept and produced their first screw pump from wood. Although today electric motor drives have taken over from windmills and steel from wood, the basic external screw design developed by Spaans over a century ago has stood the test of time and is today the industry accepted standard worldwide.



Applications

In recent years the demand for screw pumps has increased. Originally designed as a straight forward pump to maintain water levels in the Dutch polders, today the screw pump is recognized as an ideal device in the water management industry having a wide variety of applications providing solutions for:

- inlet and final effluent pumping in sewage treatment plants
- inter-stage pumping in sewage treatment plants
- return and waste sludge pumping in sewage treatment plants
- irrigation
- drainage
- stormwater control
- industrial process water
- horizontal flushing pump

Type

Concrete Trough

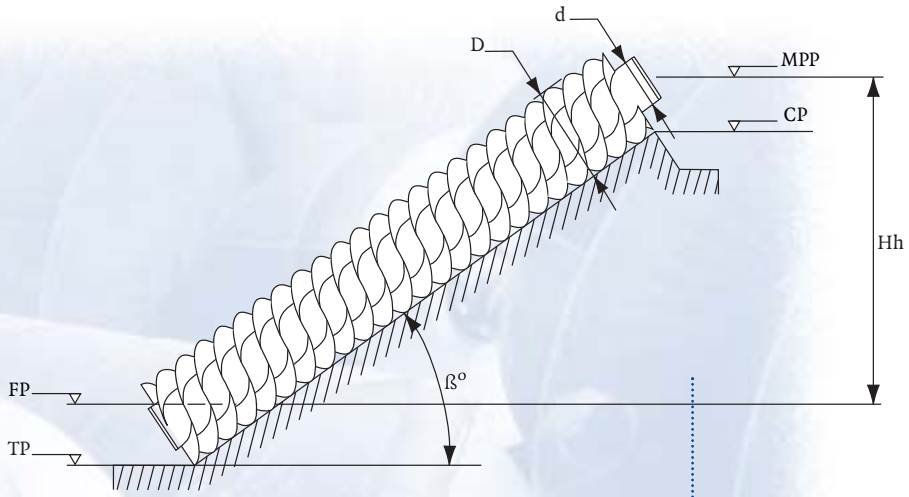
Concrete Trough
The concrete trough is the classic design. The civil engineering contractor first builds a trough roughly 3 inches (70 mm) larger than the outer diameter of the screw pump. After installation of the screw, the bearings and drive baseplates are grouted in place. The required trough is obtained by slowly rotating the screw pump which is fitted with a temporary screed bar and applying a concrete screed until the correct trough profile has been achieved.

Steel Trough Liner
In certain circumstances the construction of a screeded concrete trough is not always practical, so a prefabricated steel trough liner can be provided. Anchors are attached to the back side of the steel liner and after final positioning, mass concrete is applied behind the steel liner. Both the concrete trough and steel trough liner options require the provision of a separate drive base.

Steel Trough Liner

Encased Screw Pump

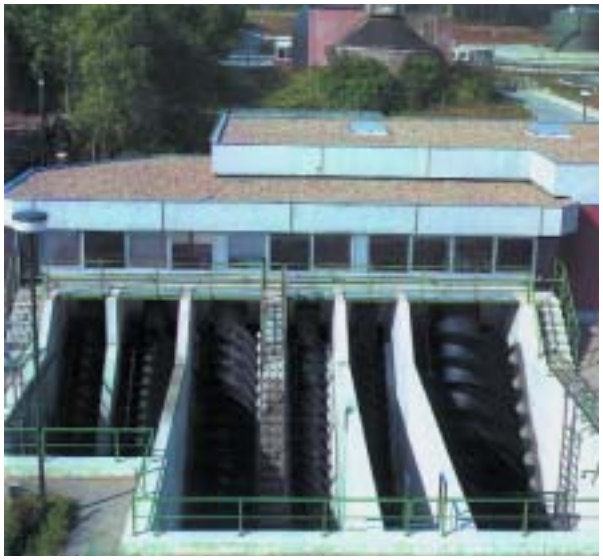
Encased Screw Pump
This design contains not only a screw and steel trough but includes supports for the lower bearing, upper bearing and drive systems. The extensions for these create the water inlet and a discharge section which together form a prefabricated pumping station requiring the minimum of civil construction and providing scope for significant overall cost savings.



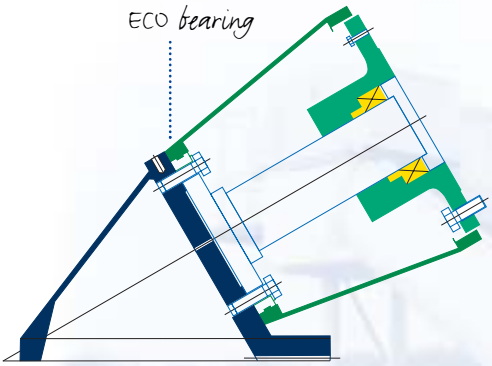
Basic design of a screw pump

Terminology

FP	Fill Point - Inlet Water Elevation, Screw Pump Capacity = 100 %	Hh	Maximum Head or Lift Difference of MPP-FP
TP	Touch Point, Screw Pump Capacity = 0 %	D	Outside Diameter of Screw
CP	Chute Point, Invert of Trough at Discharge	d	Diameter of Torque Tube
MPP	Maximum Pumping Point, Maximum Discharge Level Over Chute Point	ß	Inclination Angle (Variable between 22° and 38° Depends on required capacity and head)



Optional Equipment



ECO bearing

ECO Bearing

In a world becoming ever more conscious of the need to protect the environment in which we live, we consider this bearing has an important part to play. The sealed for life roller bearing is environmentally friendly being completely enclosed preventing the leakage of lubricant into the pumped liquid. The ECO bearing is fully interchangeable with conventional bearings.

Horizontal Flushing Installation

This application is used when water systems i.e. canals in urban areas are polluted, contaminated with algae, suffer from oxygen deficiency, etc. To combat the objectionable odors associated with large bodies of standing water which would otherwise become stagnant if not circulated. The horizontal screw pump is an ideal solution for low head circulation pump applications.

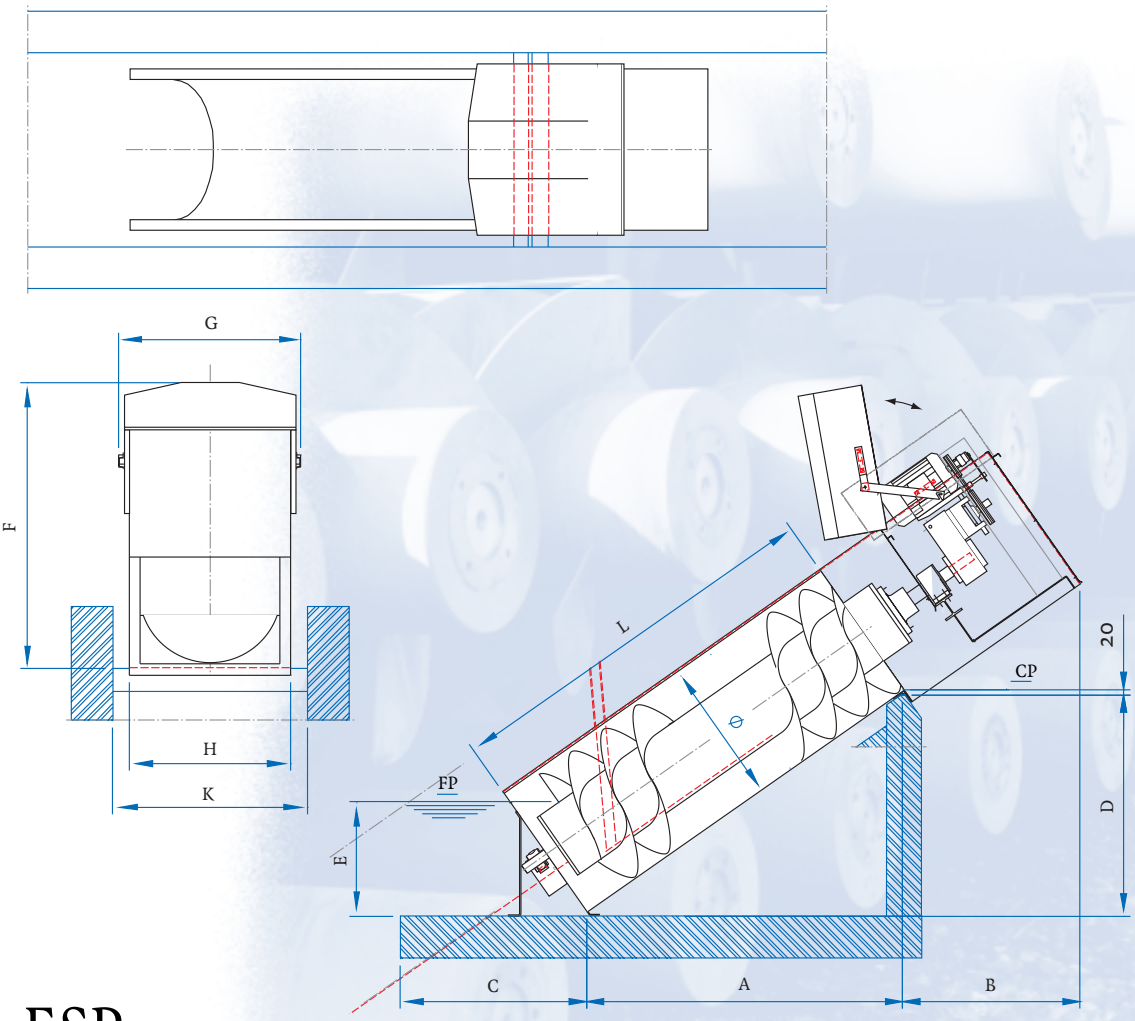
Horizontal Flushing Installation

Two stage pumping station

Multiple Stages

When high heads are required screw pumps arranged in series could be the solution.

Optional Encased Screw Pump

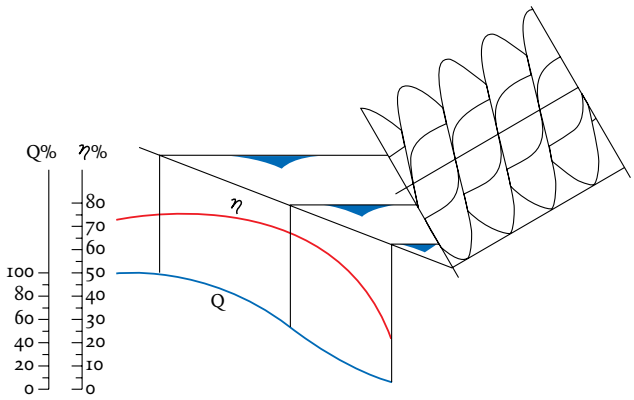


ESP

The Encased Screw Pump, ESP, is a completely assembled, self-contained screw pump. A steel trough holds the lower bearing at the bottom and upper bearing and drive system at the top. The unit is delivered fully assembled and is easy and quick to lift into place. This eliminates the need for a structural concrete trough and screeding-in-place. There is no limit on size or capacity beyond the normal screw pump. Various drive enclosures can be provided.

High Efficiency

The average efficiency (η) of a screw pump installation operating at maximum capacity is a minimum of 75 %. The graph illustrates a loss of only 10 % efficiency when the screw operates within the range of 100 % down to 33 % of the design capacity. This flat efficiency curve results in significant energy cost savings in combination with variable inlet flow conditions as experienced at a wastewater treatment facility.



Screw Pump vs Centrifugal Pump

The most important difference between both the pump types is the way they operate.

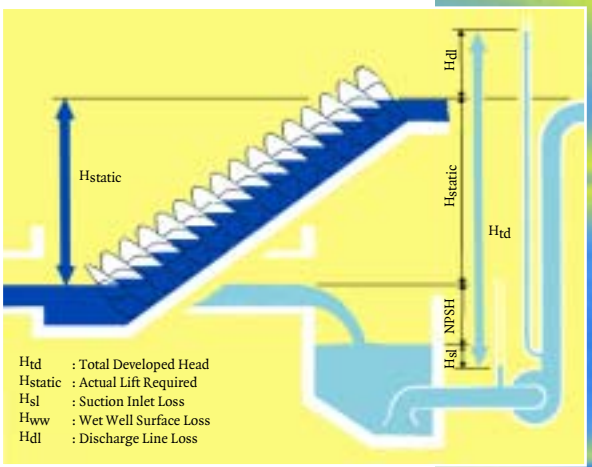
A screw pump is ideally suited to handle water containing organic material and inorganic solid particles and operates without the requirement of pre-screening.

In order to effectively pump waste water a centrifugal pump impeller must be able to pass solids of not less than 4 inches (100 mm) in order to prevent clogging. Provision of open passage impellers dramatically increases system losses and reduces operating efficiency frequently to as low as 45%, resulting in higher running costs. To avoid clogging a screen has to be built before the pump against high building and maintenance costs.

The static head or lift of the screw pump is MPP-FP. A wet well is not required.

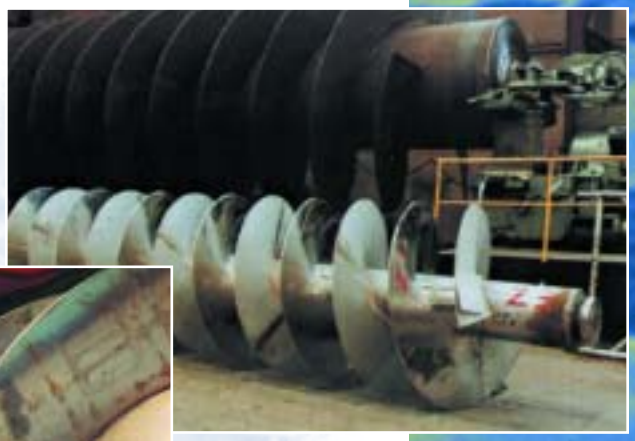
For a centrifugal pump, a wet well is required to be deep enough to provide the NPSH. In addition, there are also pump inlet and discharge losses to be overcome resulting in a large total head.

In most cases the difference between the lift of the screw pump and the total head of the centrifugal pump is significant, requiring a larger size motor.



Materials

Screw pump bodies are usually fabricated from steel tubes with flights made from formed steel plate. Stainless Steel screw pumps can be supplied if severe corrosion is expected.



Special designs have been developed in the past to cater for handling the following:

- high sand content water
- heavily contaminated water
- sea water
- high and low pH values

Screw Pump Capacity Table

Diameter		Inclination Angle 30°		35°		38°	
inch	mm	mgd	l/s	mgd	l/s	mgd	l/s
16	400	0.5	24	0.4	18	0.4	16
20	500	0.9	39	0.7	31	0.6	28
24	600	1.4	62	1.1	48	1.0	42
28	700	2.1	90	1.6	68	1.4	61
31	800	3.4	148	2.6	116	2.3	100
35	900	4.4	192	3.5	152	2.9	128
39	1000	5.7	250	4.5	195	3.8	166
43	1100	7.1	310	5.6	245	4.7	207
47	1200	8.7	380	6.8	300	5.7	250
55	1400	12	540	10	430	8	360
63	1600	17	745	13	586	11	500
71	1800	22	980	18	770	15	650
79	2000	29	1250	22	980	20	870
87	2200	35	1550	27	1200	23	1000
94	2400	43	1900	34	1500	29	1280
102	2600	52	2300	41	1800	34	1500
110	2800	62	2700	48	2100	41	1800
118	3000	73	3200	57	2500	49	2160
126	3200	86	3750	67	2950	57	2500
134	3400	98	4300	76	3350	66	2900
142	3600	112	4900	89	3900	75	3300
150	3800	128	5600	100	4400	86	3750
157	4000	145	6350	114	5000	97	4250
177	4500	189	8300	148	6500	128	5600
197	5000	242	10600	189	8300	162	7100

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