



# Landustrie



## *LANDY SCREW PUMPS & HYDROPOWER SCREWS*

# ECS

Water Control 

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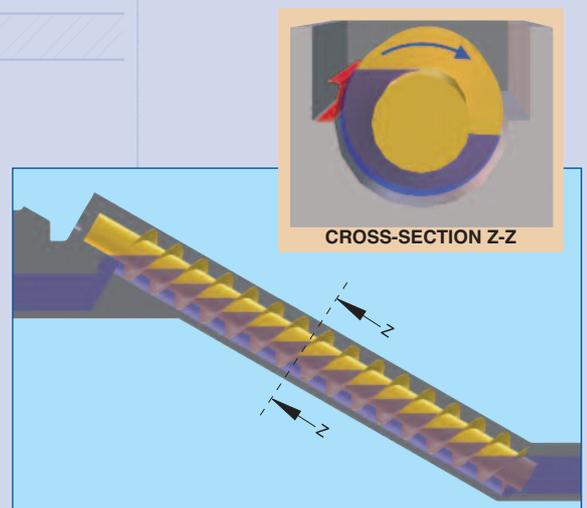
# LANDY SCREW PUMPS

## INTRODUCTION

Landustrie has a broad experience in the field of screw pumps and screw pump installations. For nearly 100 years Landustrie has designed, manufactured, supplied, erected and maintained many types of screw pump configurations. Since the early eighties Landustrie has used a fully automated screw pump selection program which enables the engineers to select the optimum screw pump for a particular application. The program is based on a large number of tests, with an equal number of variables, in the Landustrie test facility. The accompanying calculation method has, for several of our orders, been approved by Germanische Lloyds. In addition, Landustrie has developed, over many years, its specific pump knowledge base, which is continuously updated by means of R&D and the latest technology – for example using Finite Element Analysis (FEA) methods. The latest range of the Landustrie screw pump also covers the hydropower screw pumps. All this knowledge and experience makes Landustrie one of the leading manufacturers in the world of screw pump installations.

## PRINCIPLE OF THE SCREW PUMP

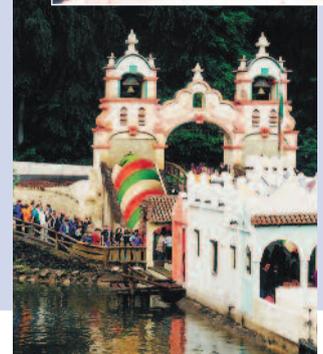
The principle of the screw pump is an inclined tube, provided with blades, which by rotating lift the medium to a higher level.



## WIDE APPLICATION POSSIBILITIES

Applications for the screw pump are countless:

- ✦ effluent pumping stations in WWTP
- ✦ intermediate pumping stations in WWTP
- ✦ return sludge pumping stations
- ✦ hydropower screw
- ✦ fish-friendly screw pumps for fish passage
- ✦ irrigation projects
- ✦ drainage projects
- ✦ reclamation of wetlands
- ✦ circulation within aeration systems
- ✦ wild water rides in fun parks
- ✦ industrial applications
- ✦ storm water applications





# Landustrie

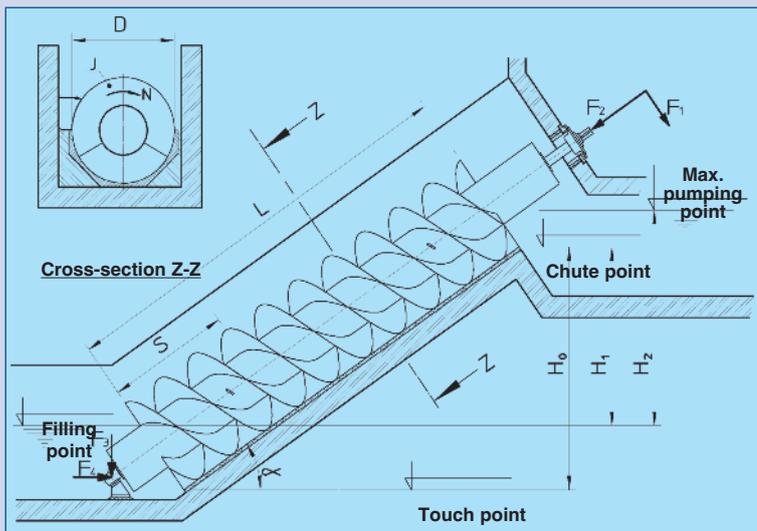
## LANDY SCREW PUMPS

Screw pumps and screw pump installations in general are characterized by the following features:

- ✦ open, clog-free, simple and robust construction
- ✦ high efficiency, low maintenance, low operational costs
- ✦ highly reliable, long lifetime and virtually no wear (no spare units required)
- ✦ automatic adjustment of the pump capacity as a function of the incoming flow
- ✦ operating in a wide range, with a capacity from 10 to 11.500 l/s and lift from 0 to 12 m
- ✦ changes in the capacity are easy and, if necessary, stepless
- ✦ insensitive to supply conditions and also (because of the low rpm) no problems with cavitation
- ✦ custom-made for each project

## SCREW PUMP TERMINOLOGY

The picture below shows the most common definitions regarding screw pump installations:



D = Diameter  
J = No. of flights  
N = Speed  
S = Pitch

L = Flight length  
H = Nominal lift  
F = Tension  
 $\alpha$  = Inclination



## FISH-FRIENDLY SCREW PUMPS

The Archimedean screw pump can easily be converted into a very fish-friendly version:

- ✦ The diameter of the blades will be increased gradually from the tube towards the outside diameter of the screw pump
- ✦ The blades will ultimately merge with the casing of the screw pump, in order to prevent fish from becoming trapped between the blades and the casing
- ✦ A thicker rounded edge at the start of the blades to create pressure waves in the water so fish will be directed into the main water flow in order to prevent contact with the blades

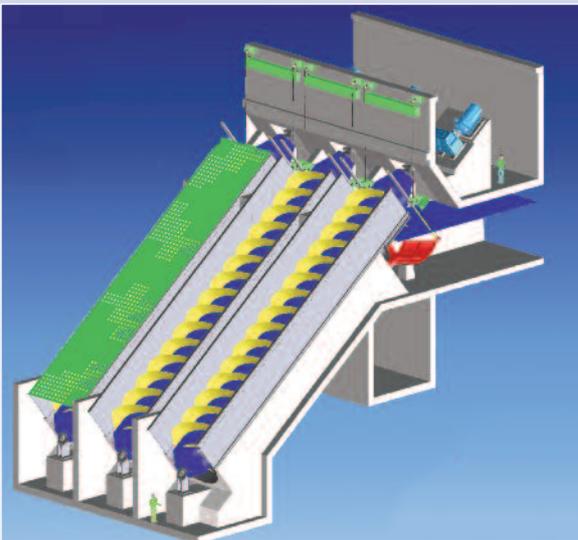
With these provisions the screw pump is extremely suitable to pump up water without damaging fish (unharmed > 98%).



# LANDY SCREW PUMPS

## HYDROPOWER SCREWS

Hydropower installations generate renewable energy from flowing water resources. This could be from a lake, disused locks at weirs or in downstream flows. The major advantage of hydropower is the possibility of 24 hour use. Most of the energy generated is fed back into the grid or alternatively used on site.



Feed-in tariff regulations for renewable energy exist in most countries. Depending on the energy source, tariffs are paid on a per-kWh basis. This makes it worthwhile to use renewable energy. An efficient use of water power is already achieved at a level difference of 1 m and a capacity of 500 l/s. The largest capacity and level difference for hydropower screw units is as much as 15000 l/s at 10 m.

**General Rule of Thumb Calculation of electrical power output is:**

$$H(m) \times Q(m^3/s) \times g(9,81m/s^2) \times 0.75 = P (kW)$$

**Energy production per year:**  
 $P (kW) \times 8760 (hr) = (kWh/y)$

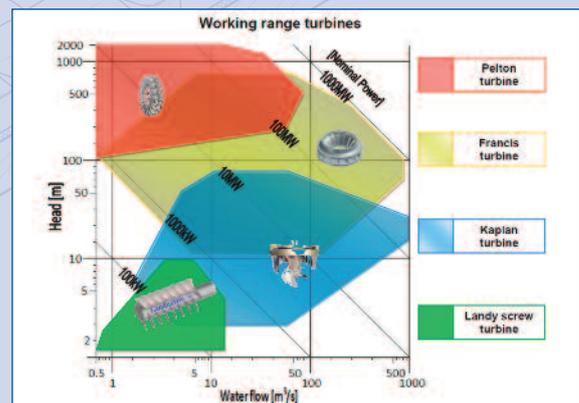


Hydropower screw at Windsor, UK

*Note: energy generated from flowing water resources gives the highest efficiency rating of all sustainable energy sources!*

Benefits of hydropower screw pumps:

- ✦ Highest efficiency (up to 86%)
- ✦ Simple installation
- ✦ Easy implementation in existing situations (no civil construction work)
- ✦ Extremely fish-friendly
- ✦ Insensitive to clogging
- ✦ Low maintenance costs
- ✦ Long life time
- ✦ Improvement of water quality
- ✦ 24 hour energy supply
- ✦ Active flow control without extra losses
- ✦ Possibility to switch over to pump function
- ✦ Self-regulating to changing water flow





# Landustrie

## OPEN, CLOG-FREE, SIMPLE AND ROBUST CONSTRUCTION

Depending on the medium (in most cases raw waste water) several kinds of contamination can occur. The screw pump has an important advantage: due to its open construction, screens can be situated behind the screw pump, if required.



This results in lower civil costs of the total installation. By means of its advanced screw pump selection program, Landustrie is capable of selecting screw pumps which, in many cases, will have two flights. This offers advantages in respect of less deflection because of the lower tensile stress, lower welding tension, and lower resultant forces on



the civil construction. This in turn will allow bigger lifts. As a standard, Landustrie, based on nearly a century's experience, allows for a tensile stress of

20 N/mm<sup>2</sup> maximum, and a maximum deflection of L/2500. The actual stress is determined using FEA. All selected screw pumps can be supplied in either a coated steel or stainless steel version in AISI304 or AISI316. Other exotic materials are also possible.

## HIGH EFFICIENCY, LOW MAINTENANCE, LOW OPERATIONAL COSTS

Because of contamination of the medium, the efficiency of screw pumps for this application will be much higher than for other types of pumps. Moreover, the screw pump is ideally suited to cope with variations in the incoming flow whilst working at a nearly constant efficiency (see under automatic adjustment of pump capacity). Also, the lower number of revolutions of screw pumps adds to the relatively high efficiency of the overall installation. Because the complete screw pump installation is built up from an electric motor, gearbox, upper and

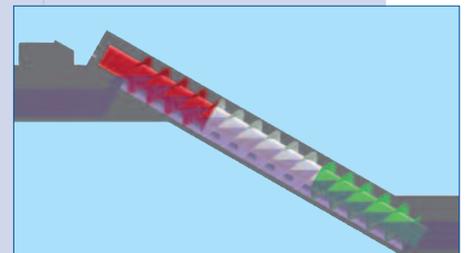
lower bearing, the maintenance is limited to an annual oil change and periodic checking of all greasing points. All these factors lead to very low operational costs for Landustrie screw pump installations.

## HIGHLY RELIABLE, LONG LIFETIME AND HARDLY ANY WEAR (NO SPARE UNITS REQUIRED)

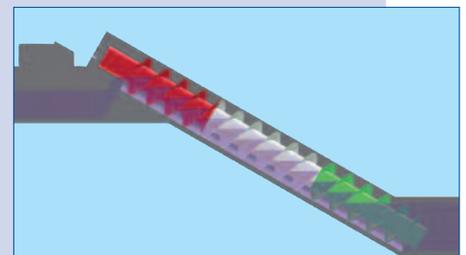
The robust construction of the screw pump body and both bearings, the use of standard components such as electric motors and gearboxes at low revolutions gives the screw pump a unique reliability record. With intensive use a lifetime of 20 years is normal. Even screw pumps which have been in operation for more than 40 years occur quite regularly. An additional advantage of the extreme reliability is that no spare unit needs to be considered at design stage.

## AUTOMATIC ADJUSTMENT OF THE PUMP CAPACITY AS A FUNCTION OF THE INCOMING FLOW

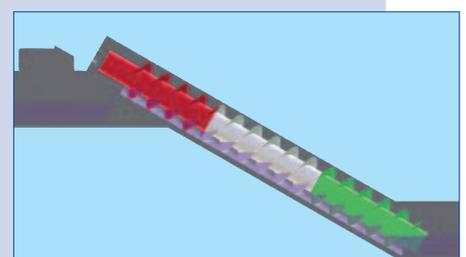
The capacity of the screw pump is automatically adjusted in the event that the incoming flow is lower than the screw pump capacity. When the incoming flow is greater than the pump capacity, the discharge will be limited to the screw pump capacity. Because of this equable flow regime, a screw pump is extremely suitable as an effluent pump for a waste water treatment plant, as hydraulic overloading is prevented.



Incoming flow at filling point



Incoming flow above filling point



Incoming flow below filling point



# LANDY SCREW PUMPS

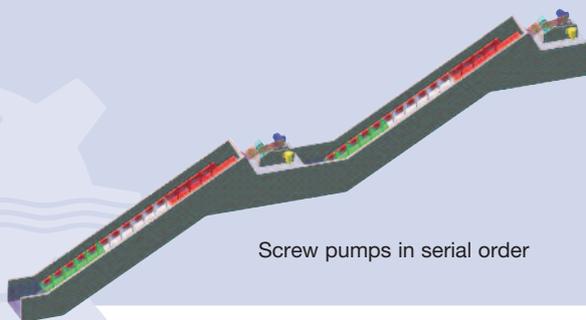
## WIDE DESIGN RANGE CAPACITY FROM 10 TO 11,500 L/S LIFT FROM 0 TO 12 M

Every single screw pump is specifically designed and therefore tailor-made for each project. This always gives an optimum balance between function and design, varying between capacities of 10 and 11,500 l/s. As regards the lift, the possibilities are practically unlimited when screw pumps are installed in series. The adjacent table shows an indicative overview of the most common options. Also screw pump installations with different inclinations, which were quite often used in the past, can be quoted on request.

Screw diameter (mm)	Max. speed (r.p.m.)	30°		35°		38°	
		Capacity max (m³/sec.)	Ho max. (mm)	Capacity max (m³/sec.)	Ho max. (mm)	Capacity max (m³/sec.)	Ho max. (mm)
300	118	0,016	2800	0,012	3200	0,011	3500
450	98	0,041	4000	0,033	4600	0,029	5000
600	75	0,082	4700	0,066	5400	0,059	5900
800	62	0,154	5500	0,125	6300	0,112	6900
1000	53	0,272	6700	0,218	7700	0,196	8400
1250	46	0,430	7700	0,360	8900	0,312	9700
1500	40	0,690	8600	0,556	10000	0,500	10900
1800	36	1,080	9800	0,866	11400	0,777	12500
2100	32	1,500	9200	1,210	10500	1,087	11500
2450	29	2,210	8000	1,770	9100	1,591	10000
2800	26	2,980	10500	2,390	12100	2,150	13300
3200	24	4,070	10600	3,273	12100	2,940	13300
3600	22	5,360	11000	4,306	12600	3,860	13800
4050	21	7,060	11400	5,670	13000	5,090	14200
4500	19	9,000	11700	7,240	13300	6,500	14600
5000	18	11,530	12000	9,260	13600	8,320	14900

## SCREW PUMP SIZING

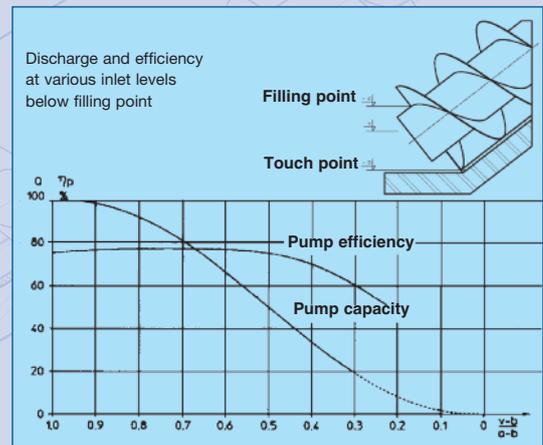
Many years of research and experience have given Landustrie the ability to select the efficient application for each screw pump. The optimum combination of inclination, pitch/diameter ratio, diameter/tube ratio and number of flights will result in substantial savings of both investment and operational costs.



Screw pumps in serial order

## CHANGES IN CAPACITY ARE EASY AND STEPLESS IF NECESSARY

The capacity of the screw pumps is easy to adapt by simply adjusting the speed of the screw using a multi speed motor or a variable frequency drive (VFD). To adapt the speed of a fixed speed screw, the pulleys of the V-belt transmission can be changed. In all but a few cases the efficiency will be maintained after changing the speed. This characteristic is very important. Most installations do not get the input for which they are designed. Therefore it is important that the input in practice will be pumped as efficiently as possible. So if the actual input deviates substantially from the design input the efficiency of the total installation will not be reduced in situations where screw pumps are installed.



## INSENSITIVE TO SUPPLY CONDITIONS AND, BECAUSE OF ITS LOW SPEED, NO PROBLEMS WITH CAVITATION

Because of the low revolutions and the nature of the screw pump no special demands have to be met regarding the inlet channel of the screw pump. The screw pump is, contrary to other types, insensitive to supply conditions. Even at higher revolutions when critical supply conditions could lead to cavitation, which in practice can often occur with competing pump designs, the screw pump maintains its efficiency levels.

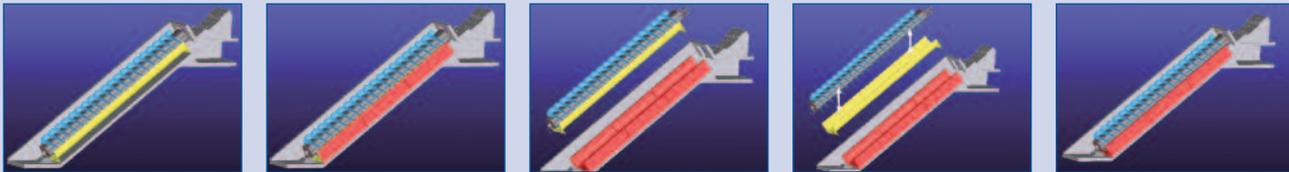


# Landustrie

## HIGHER EFFICIENCY

New screw pumps are often installed by using a casting mould for creating the concrete trough. The advantage of this method is that a superior quality of concrete trough can be achieved. Also, concreting is less dependent on weather conditions and craftsmanship.

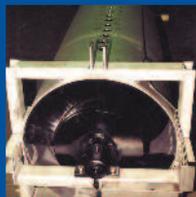
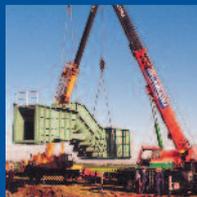
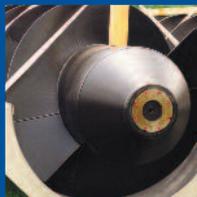
The increase in wear resistance also leads to energy savings: a wear resistant layer between the screw pump and the trough means a fixed clearance for the lifetime of the screw pump installation. Increasing leak losses because of sand, gravel and other dirt will no longer occur. A perfect trough is essential in order to build highly efficient screw pumps.



## TROUGHS

The choice of troughs presents several options. First of all there is the classic concrete trough, for which the screw pump itself is used to grout the trough to its final shape, working at low speed and using a special mortar. When this specific know-how is not available it is possible to order either a screw pump with a steel casting mould which is removed after the concrete has been cast, leaving the correct clearance between the screw pump and the concrete.

This can also be done with a cast-in steel (or stainless steel) trough, which will remain in the concrete. For special applications there is also the option of a fully self-supporting steel trough or a completely pre-fabricated screw pump, including trough bearings and drive-unit. The last option has the advantage that installation time is extremely short. For smaller screw pumps, a pre-fabricated pump can be installed as a tube screw pump.



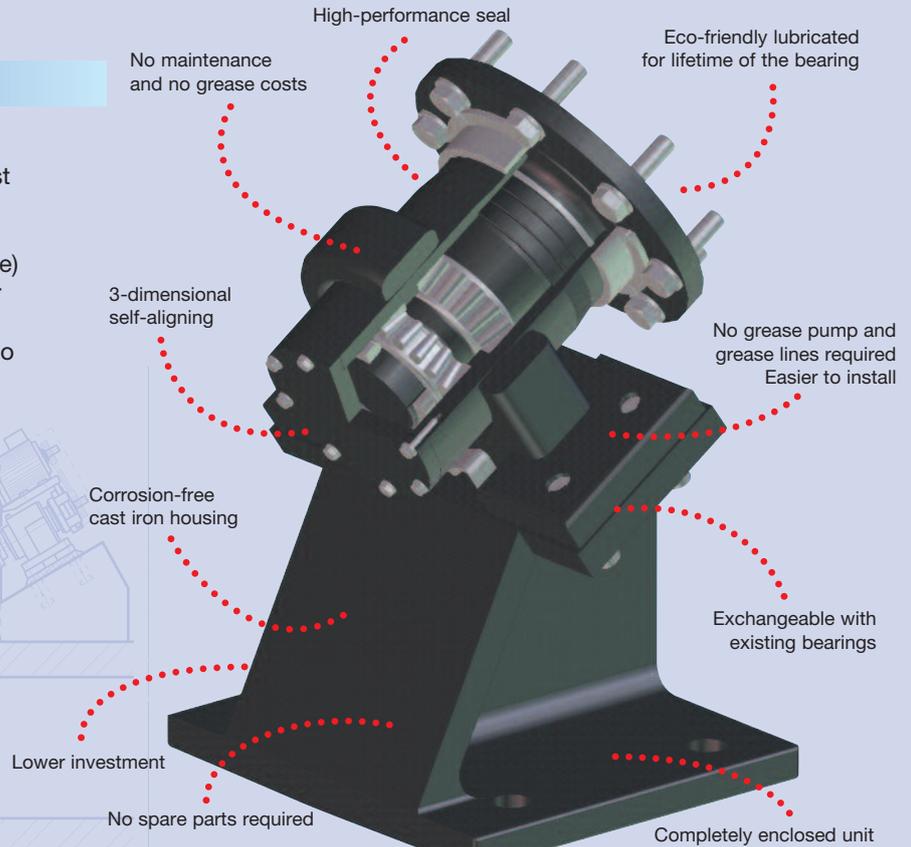
TROUGH TYPE	CONCRETE	CASTING MOULD	STEEL (LINER)	PREFABRICATED	TUBE TYPE	FISH FRIENDLY
ADVANTAGE	Optimal clearance	Optimal clearance Wear resistant concrete Smooth surface Cheap Multipurpose mould	Easy to install	Short installation time Very easy to install	Short installation time Very easy to install	Suitable for fish passage
DISADVANTAGE	Installation experience required Non-wear resistant concrete	None	Slightly less efficient Slightly more expensive	Expensive Slightly less efficient	Limited in diameter/Q/H Less efficient Expensive	Slightly more expensive



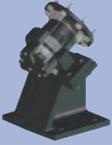
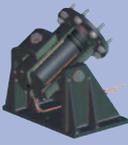
# LANDY SCREW PUMPS

## LOWER BEARINGS

For the lower bearings Landustrie has three different standard types. The most recent is the Landy Eco-friendly lower bearing, with a number of specific advantages (see the adjacent 3-D image) In the table we have compared the four different Landustrie lower bearings. All lower bearings, of any type, only have to absorb radial forces. The lower bearing also absorbs the heat expansion and contraction of the screw.



## ECO-FRIENDLY LOWER BEARING

LOWER BEARING SELECTION TABLE	Eco-friendly	Conventional	Heavy Duty
			
Lubrication	Lifetime	Grease	Grease
Grease filling		●	●
Grease return line	NA	On request	●
Maintenance required	●		
3D-self-aligning	●		●
Installation time	low	average	average
Heavy duty			●
Exchangeability with existing bearings	●	●	
Investment	low	medium	high
Operational costs	low	medium	medium
Lifetime	average	average	long



# Landustrie

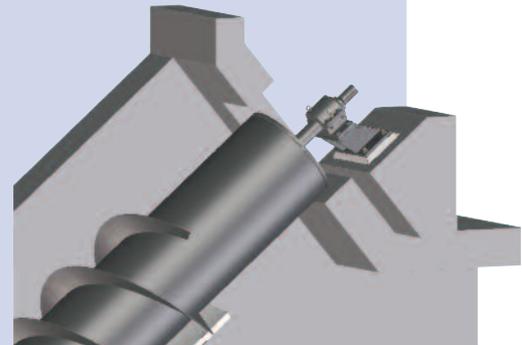
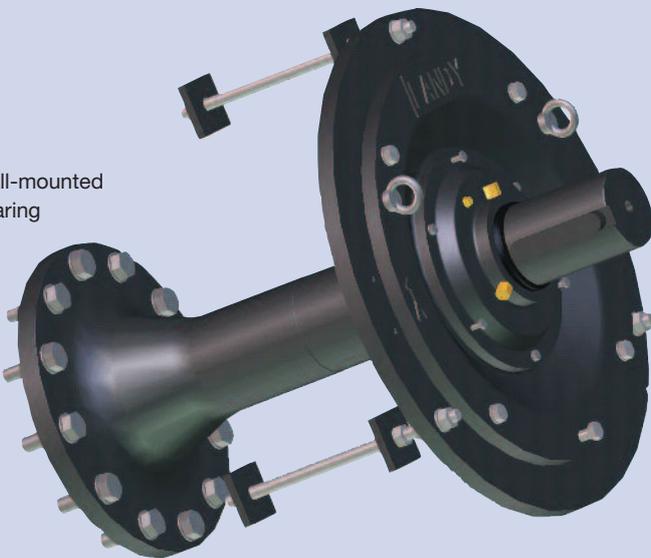
## UPPER BEARINGS

For the upper bearing Landustrie can offer the choice between two different versions; a wall-mounted or a foot-mounted upper bearing. The preference is normally for the wall-mounted upper bearing, firstly because the forces on the civil construction will be better absorbed, and secondly because an odour-tight separation is created between the screw pump and the room in which the drive-unit is installed.



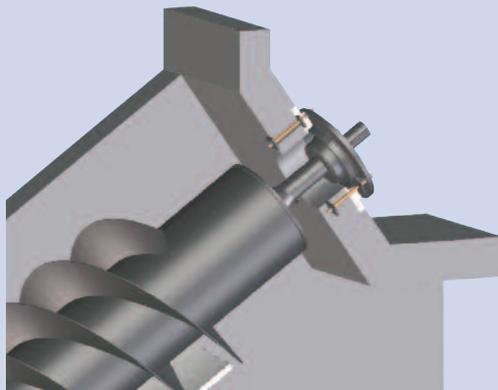
Foot-mounted bearing

Wall-mounted bearing



## WATER-IN-OIL DETECTION

All Landy Eco bearings can be fitted with a water-in-oil alarm system. This system gives an alarm when a certain amount of water or some other conducting medium has polluted the oil in the bearing housing. The system can be fitted to new bearings as well as be retrofitted to existing bearings.

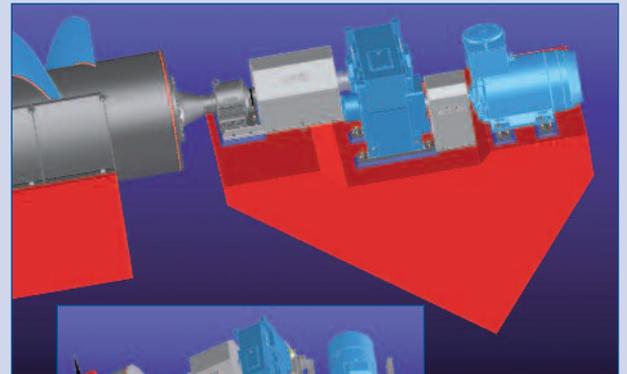
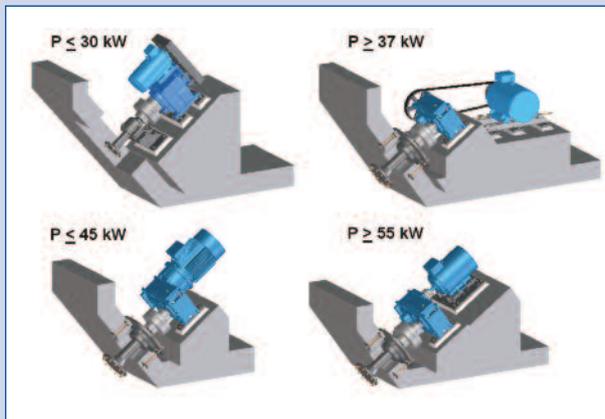




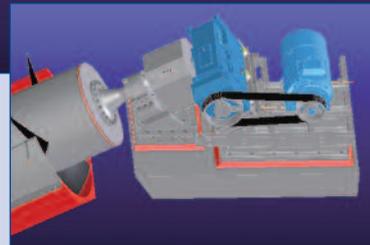
# LANDY SCREW PUMPS

## DRIVE-UNIT OPTIONS

Depending on the local circumstances there is a choice of different drive-unit arrangements. Different options are shown schematically in the drawing below. Deviations from these guidelines is, of course, possible, if so required.



V-belt transmission



Direct drive

## RENOVATION OF EXISTING INSTALLATIONS

ECS is capable of renovating any screw pump installation including those supplied by other manufacturers. Due to our vast experience we will guarantee that installations renovated by ECS will be improved by at least 15% in terms of operational cost.



ECS maintenance engineers

## TOTAL COST OF OWNERSHIP

Any screw pump installation will perform better than any other type of pump based on Total Cost of Ownership. This is due to better efficiency over a large working range of the screw pump, less maintenance and a superior life time of the installation.

## AFTER SALES

ECS's after sales service is the customers connection to Landustrie not only for the supply of spare parts but also for training and supervision. In addition, installation upgrades, some of which have amazingly short payback times through savings in energy and maintenance, can be carried out on existing applications.

 [sales@ecsengineeringervices.com](mailto:sales@ecsengineeringervices.com)

 01773 860001

## RESEARCH AND DEVELOPMENT

For many years Landustrie has been active in research to improve the screw pump even further. The most recent results are the Eco-friendly lower bearing, which has been tested for over 10 years. In addition, the latest developments with hydropower screws have been tested in-house on a 1:1 scale, as well as the increased use of the Finite Element Analysis techniques on the Landustrie screw pump designs.



# Landustrie

## LANDY SCREW PUMPS BECAUSE...

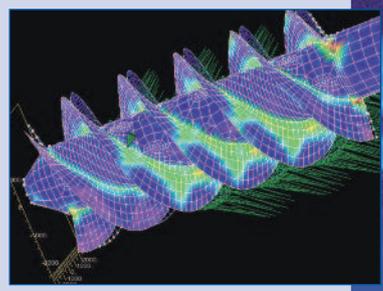
Besides the general characteristics of the screw pump, the Landy screw pumps are distinguished by:



- ⚙️ Full in-house manufacturing
- ⚙️ Totally reliable manufacturing schedules and delivery times



- ⚙️ Minimum tolerance on outside diameter



- ⚙️ Efficient design -
  - Usually 2 flights
  - Limited deflection
  - Limited occurring tension
  - High efficiency
- ⚙️ Ongoing R&D
- ⚙️ Finite Element Analysis



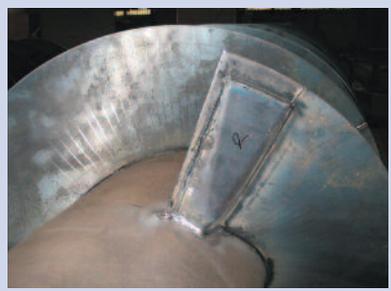
- ⚙️ Manufactured with permanent lifting eyes and balancing weights



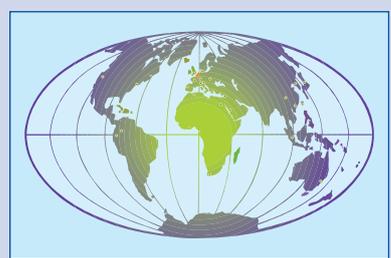
- ⚙️ Endplates
  - Fully watertight by means of caps over threads of connection bolts
  - Fully parallel and concentric manufacture using special lathes



- ⚙️ Basic material of bearing shafts is nodular cast iron
- ⚙️ Use of fully self-aligning bearings



- ⚙️ Reinforced leading edges of flights



- ⚙️ Nearly 100 years experience
- ⚙️ World-wide service with local support
- ⚙️ Superb after-sales service
- ⚙️ Erection with competent and experienced Landustrie mechanics. On request, we can also offer full supervision of installation



- ⚙️ Coating. All required coatings are applied professionally, and can be supplied with additional requirements regarding sand, salt or pH.



- ⚙️ Fully qualified welders
  - X-ray or ultrasonic
  - Welding Shop Approval
- ⚙️ Alignment of the screw pump by machining the bearing joint face



In other words a first class product with  
**STATE-OF-THE-ART**  
 screw pump technology



# LANDY SCREW PUMPS

## COVERS

On request Landustrie can cover the installation with a modular light weight synthetic cover construction. Advantages are:

- ✦ protection of the screw pump against thermal expansion
- ✦ creates a safe working environment
- ✦ reduces the level of noise production

## ECS ENGINEERING SERVICES: INSTALLATION

ECS has a great deal of experience in this field and is supported through its supply distribution agreement with Landustrie and is capable of delivering any size of project. ECS offers a complete service from the initial site visit, through design, installation and commissioning. Design engineers will produce bespoke specifications for each individual application which will be installed by qualified and experienced personnel to the highest standards.



Windsor, UK



Veneriete, The Netherlands (renovation)



Windsor, UK

## REFERENCES

During the nearly 100 years of their existence Landustrie has undertaken some 7,000 screw pump projects, which are all unique in terms of design and execution, varying in power from 1 to 600 kW and in diameter from 10 cm to 5 meter, and in length from 50 cm to 25 m. All these projects have added to the vast amount of knowledge and background information built up over the years regarding the design, manufacturing and installation of screw pumps. For every new project, you, as our customer, are using this inexhaustible amount of experience. You will find some of our most recent projects in the adjacent photo collage.

## REPAIR & SERVICE

ECS also offers a complete package of maintenance and repair services for all Archimedes type screw pumps including round-the-clock emergency breakdown cover. For customers looking to maintain and improve the efficiency of existing installations, ECS has the experience and the expertise to deliver a reliable and efficient solution for every application including hydro-power screws. ECS has a large number of field based installation & service engineers with fully equipped vehicles that can remove and repair all types of screw pumps.

## **ECS Engineering Services**

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