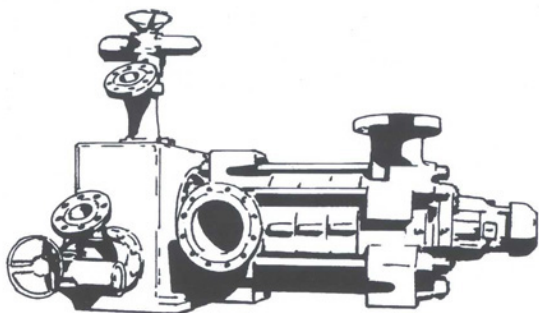


**SULZER PUMPS**

*HIGH PRESSURE PUMP WITH  
INTEGRATED PELTONTURBINE*



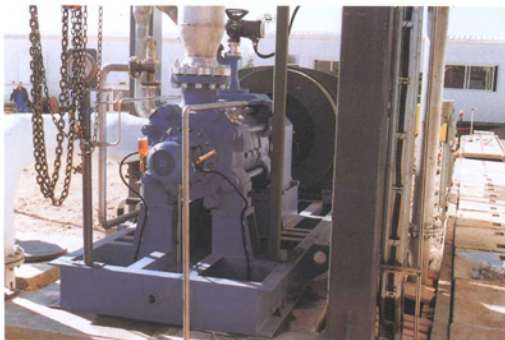
**TUP**

# The SULZER TUP Turbinepump – An Investment which pays for itself – fast

## Product Development

New processes and options are opening up new perspectives. In Reverse Osmosis (RO) sea water desalination, the desalination is achieved through semipermeable membranes, which reject the salt and let the water pass. High pressure and, to work economically, turbines for power recovery are required.

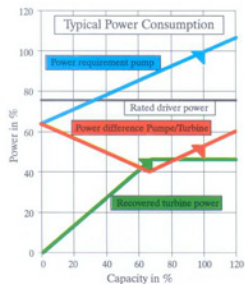
This was the basis for the Sulzer TUP concept. In the best engineering tradition we combined the proven SULZER pump and turbine technology to a perfect blend of function and economy.



## Economic operation

The main requirement in seawater desalination is the economic production of freshwater. Only cost-effective water generation will be able to meet the growing worldwide demand.

The TUP Turbinepump has been developed to put this principle into practice, see power consumption chart.



■ = Operating Point Pump

■ = Operating Point Turbinepump

■ = Operating Point Turbine

## Application

The integrated Turbinepump TUP has been especially designed for reverse osmosis sea water desalination. The pump is suitable for pumping sea or brackish water, the turbine for concentrated sole water (brine). Its characteristic features are:

- minimum energy consumption
- high reliability
- easy servicing
- economy in operation

## Design

Turbinepumps of the SULZER series TUP are horizontal, multistage high pressure centrifugal pumps direct-coupled onto a common shaft with a pelton energy recovery turbine.

**Casing:** Suction and discharge flanges and mounting feet are cast integrally with pump suction and discharge casing. The casing elements of the pump part are sealed by O-rings and held together by external tie bolts. The casing of the turbine part is a welded construction. Inlet flanges

are screwed with the casing and include the nozzle head.

**Shaft:** Accurate machining provides precision fits and clearances for assembly and operation. Machined shoulders provide positive location of mounted parts.

**Impeller (Pump):** The key-driven pump impellers have closed channels and are sealed against the casing elements by replaceable casing wear rings. The flow is guided from stage to stage by stationary diffusers.

**Runner (Turbine):** The Turbine runner is in pelton design and mounted on the shaft with a tension element. The flow is guided by adjustable needle nozzles to the pelton wheel blades.

**Bearings:** The shaft is supported at each end of the Turbinepump by oil-lubricated anti-friction bearings with automatic oil level regulation. Roller bearings are used as bearings for the massive Turbinepump shaft in the bearing bracket mounted on the turbine (driver) side, whereas paired taper roller bearings take up the axial forces at the non-drive side.

# The SULZER TUP Turbinepump – Offers Imp

## **Efficient axial thrust compensation by balance drum**

- low residual axial thrust, long bearing life
- has the effect of a hydrodynamic plain bearing and ensures smooth running
- shaft seal only exposed to suction pressure

## **High load capacity bearings**

- sturdily dimensioned, oil-lubricated antifriction bearings
- paired taper roller thrust bearing, roller-type radial bearing on turbine side
- long bearing life

## **Replaceable wear rings**

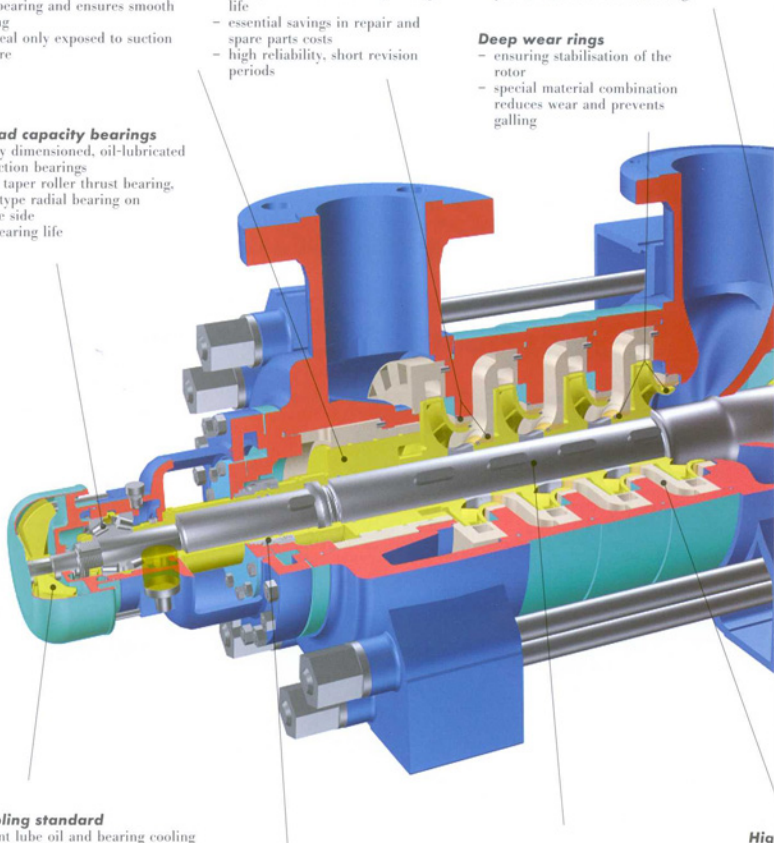
- stationary and rotating wear rings, stage bushes
- ensuring steady, high efficiency over the whole operating life
- essential savings in repair and spare parts costs
- high reliability, short revision periods

## **Rigid Rotor**

- critical speed much higher than operating speed
- smooth running also in the partial load and overload range

## **Deep wear rings**

- ensuring stabilisation of the rotor
- special material combination reduces wear and prevents galling



## **Fan cooling standard**

- efficient lube oil and bearing cooling
- low bearing temperatures with all operating conditions and in every climate zone
- no cooling water piping, no cooling water consumption

## **Mechanical shaft seal**

- leakage and maintenance-free
- easy-to-change

## **Stiff shaft design**

- ample diameter to transmit max. torques
- shoulders positioning the running parts for troublefree operation

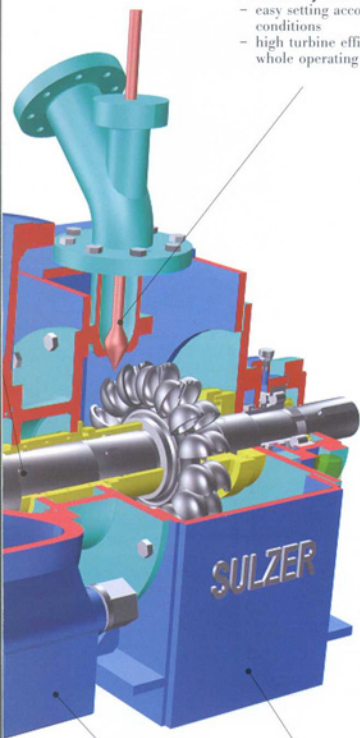
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# ressive Design And Cost Advantages

## Electrically-driven needle nozzles

- easy setting according to operating conditions
- high turbine efficiency over the whole operating range



## Turbine casing

- welded construction
- with large cover for easy inspection and maintenance
- one or two nozzles depending on operating conditions

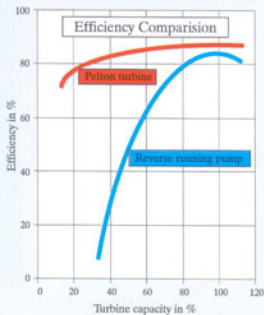
## High efficiency diffuser design

Several impeller sets  
Low energy consumption, economic  
operation  
Easily interchangeable with standard  
C pump range

## Heavy mounting feet

- cast integrally with suction and discharge casing
- reduces alignment problems

## Pelton-type wheels for increased efficiency



**Efficiency – the magic word in water desalination. Greater efficiency means using less energy so water is generated with better cost-effectiveness.**

## Main advantages

- increased efficiency
- compact in size
- high power concentration
- recovered power is directly changed into pumping energy, without mechanical losses

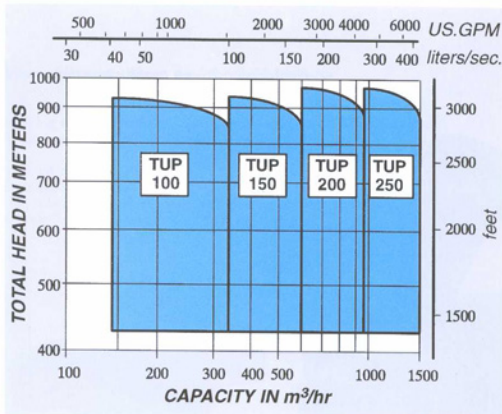


## Pelton wheel fastening

- with special shrink tension element to transmit highest torques
- easy disassembly/assembly and adjusting

## Operating range

Sizes DN 100–250  
 Capacities Q up to 1500 m<sup>3</sup>/h  
 Heads H up to 900 m  
 Pressures p up to 100 bar  
 Different pelton wheel hydraulics to suit operating conditions (brine capacities).

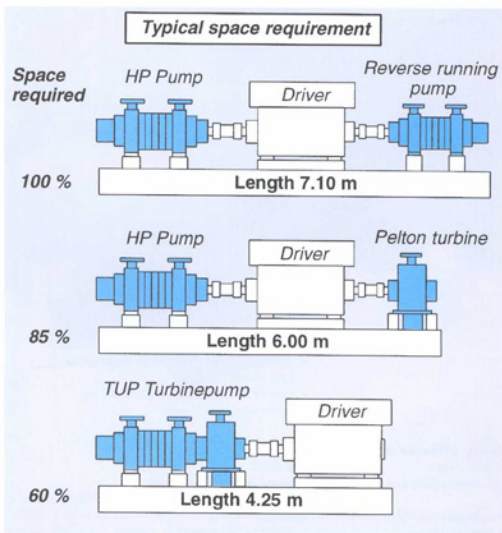


## The big advantage is its small size

The integrated TUP Turbine-pump can be delivered as a compact unit with coupling and driver on a heavy fabricated steel baseplate.

Advantages:

- reduced space requirement
- lower investment costs
- short filed installation and start-up periods
- reduced alignment - and maintenance procedures



# SULZER PUMPS