



Enriching Lives



**PAANI SE**  
**BIJLEE**

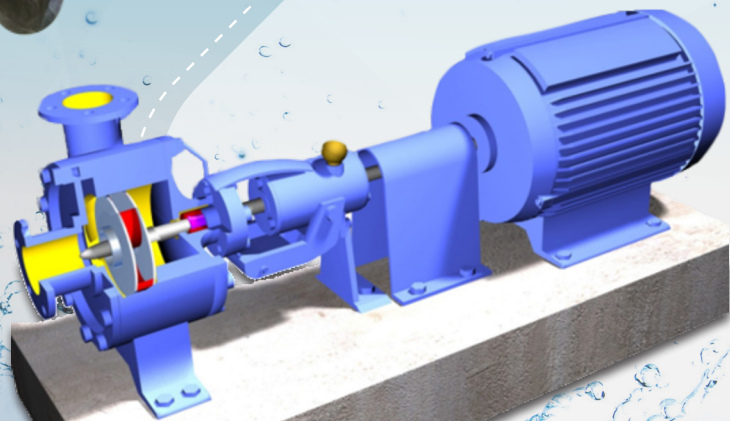
# HYDRO POWER GENERATOR

**SPARK**  
PICO Hydro Power Generator



**PICO**  
(Spark)

**PAT**  
(Pump as Turbine)



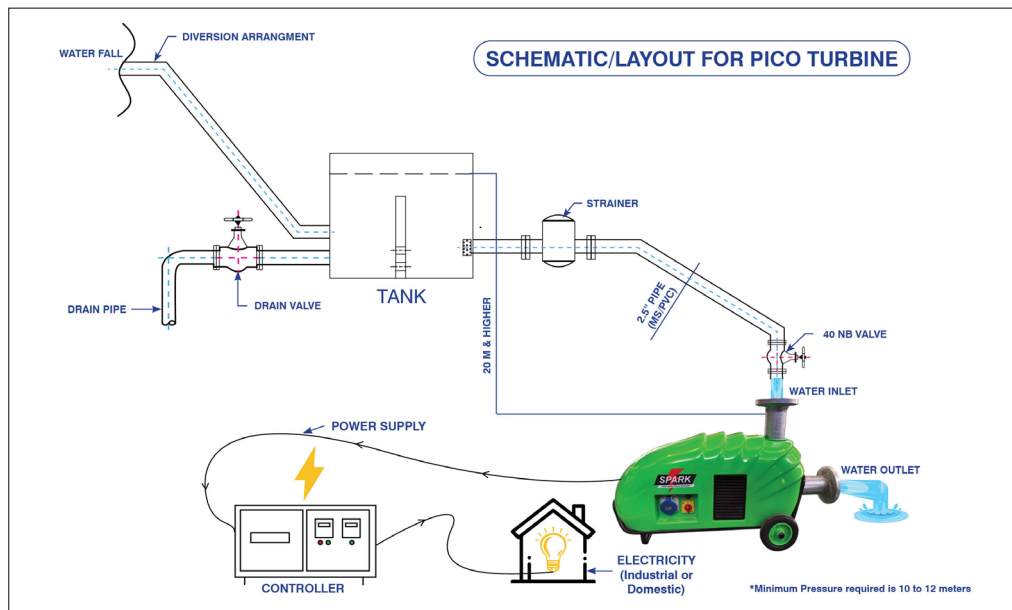
**KIRLOSKAR BROTHERS LIMITED**

Established 1888

A Kirloskar Group Company

## What is PICO and PAT Turbine?

Turbine producing power up to 5 kW (SPARK-PICO) and 300KW (PAT) of electricity utilizing the hydraulic energy of water in motion. These installations can provide power to an industrial application, isolated home or small community for local consumption & utilization and even connecting it to grid.



## Advantages of KBL PICO/PAT Turbine

- Availability for a wide range of heads and flows
- Low cost investment – ROI in max 2 to 3 years
- Easy availability of spare parts
- Ready to installation
- Short Delivery Time as many products are off the shelf
- Easy to handle and transport
- Eco- Friendly operation
- Zero Operating cost

## Role of Pump as Turbine in Micro-Hydro-Power Application for energy sustainability

Decentralized small scale hydro electric power generating unit is one of the most techno-commercially feasible solution to the energy scarcity, In which a Pump as Turbine (PAT) can be employed as the prime mover of the generating or the pumping unit.

A Centrifugal pump that operates in reverse mode as a turbine, works on the same principle as a Francis turbine. The energy is recovered from pressure difference (head); while flow is fed back into the existing system. Both, direct drives of machinery and electricity generation (grid connected or isolated) or combinations of both of these are possible using PAT just as with a conventional turbine. The only difference is that a PAT cannot make use of the available water as efficiently as a turbine due to its lack of hydraulic controls.

## Product Unique Features

- Efficient models, proven design and robust performance
- Strong sales and service network
- In-house manufacturing and robust testing facility
- Efficient post warranty service
- Smart ELC Panel offered with remote monitoring option
- Industry 4.0 (Clouds Data Storage)

## Some of the potential applications of Pump as Turbine (PAT)

### (a) Domestic Water supply systems

- Damping excess pressure in system
- Balancing of pressure in supply lines/ tanks at different elevation
- Pressure control /Throttling in closed-loop systems
- Extraction of excess pressure at the outlet of a water supply line

### (b) Extraction of hydro energy from natural resources:

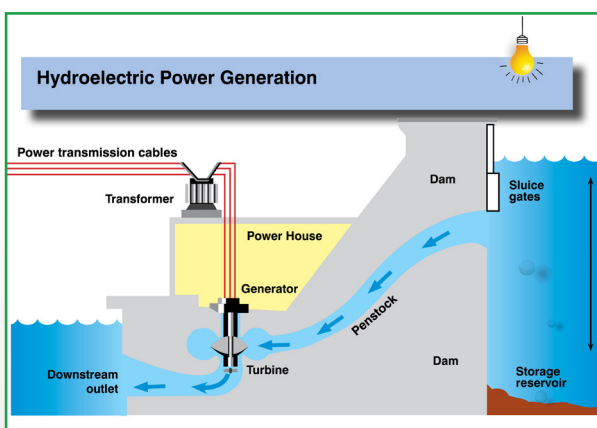
- Decentralized Micro Hydropower plants in natural streams in hilly areas
- Irrigation barrages/dams
- Drinking water supply schemes in hilly remote areas

### (c) Industrial Application:

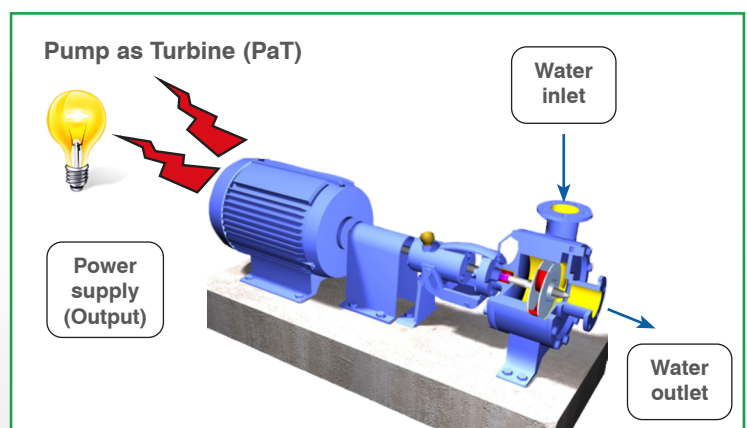
- Pressure damping in cooling water circulation systems
- Reduction of process water pressure
- By pass line to PRV (Pressure Reducing Valve) and utilising the pressure drop to generate power

### (d) Hydro Power Plants:

- Utilising the access pressure and generate power for local utilities
- Suitable for pumped storage up to 500 kW

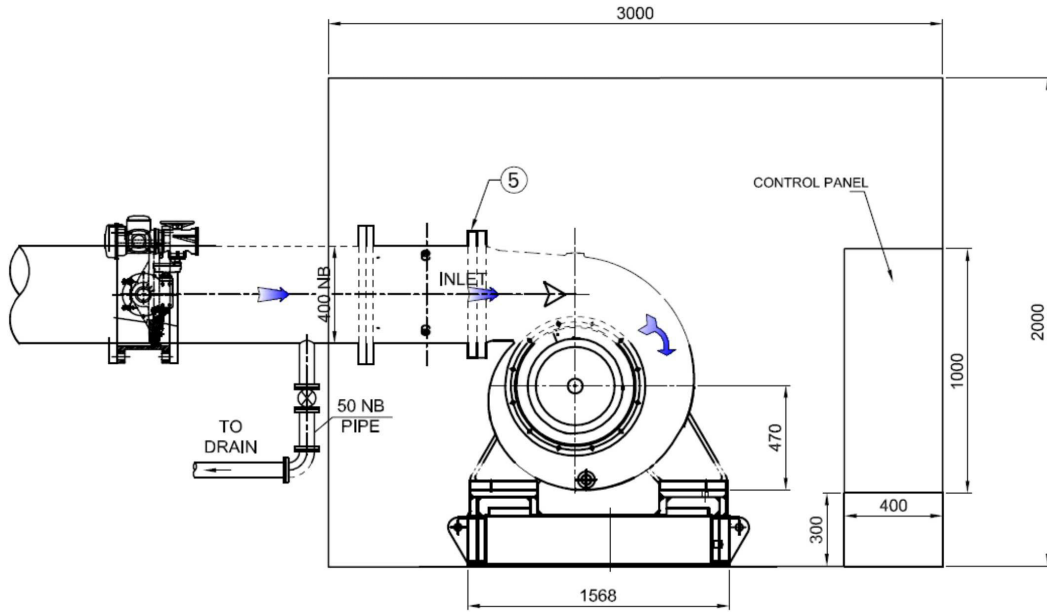


Concept of Hydro Power Generation



Working of PAT (pump as turbine)

## Packaged Container Unit - 160 kW



### Calculation of Power Potential:

WTP Capacity (MLD <sup>*</sup> )	AVAILABLE HEAD/PRESSURE AT RAW WATER RECEIVING END (Meter of water column)											
	10	12	15	18	22	25	30	32	35	37	40	50
10	9	10	13	16	19	22	26	28	30	32	35	43
20	17	21	26	31	38	43	52	65	61	64	69	87
30	26	31	39	47	57	65	78	83	91	96	104	130
40	35	42	52	63	76	87	104	111	122	128	139	174
50	43	52	65	78	95	109	130	139	152	161	174	217
100	87	104	130	156	191	217	260	278	304	321	347	434
150	130	156	195	234	286	326	391	417	456	482	521	651
250	217	260	326	391	477	543	651	694	760	803	868	1085

\* Minimal Liquid Discharge

The power potential (P) can be approximately estimate using following simplified formulae:

$$P \text{ (kW)} = 7 \times H \text{ (in meter)} \times Q \text{ (in m}^3\text{/s)}$$

Refer Table 1 for quick estimation of approximate power potential at the raw water receiving end of WTP.

TABLE 1: Ready reckoner for power potential (approximate) in **kW**.

**Note:** Actual power output may vary, based on the application PaT and generator model.



## Features and Benefits



**LOW MAINTENANCE**



**EASY INSTALLATION**



**STANDARD SPARE PARTS**



**ZERO OPERATING COST**



**PORTABLE POWER SUPPLY SYSTEM**



**EASY MOBILITY**



**COMPACT DESIGN**



**INDUSTRY 4.0**



**REMOTE MONITORING SYSTEM**

Sr. No.	Pico Model	Rated Output (kW)	Required Flow at Rated Output (m <sup>3</sup> /h)	Required Head at Rated Output (m)	Head Range (m)	Flow Range (m <sup>3</sup> /h)	Output Range (kW)
1	PE 216	.5	34.5	21.5	20-28	30-45	0.2-1.4
2	PE 314	1	55	22	20-30	48-75	0.2-1.4
3	PE 318	1	43	29.5	25-32	35-48	0.2-1.4
4	PE 325	1	26	37	32.5-45	15-39	0.2-1.4
5	PE 538	1.5	31	45	35-55	18-38	0.5-3
6	PE 515	2	110	17.5	12.5-20	85-125	0.5-3
7	PE 527	2	50	35	25-41	28-61	0.5-3
8	PE 830	3	65	38	25-40	36-68	0.5-3
9	PE 837	3	52	45.5	35-50	33-56	0.5-4
10	PE 1040	4	66	44	25-48	30-70	0.5-4
11	PE 1030	4	100	30	20-32.5	65-105	0.5-5
12	PE 1331	5	112.5	32.5	20-32	85-115	0.5-5

## PICO Selection Chart

PRODUCT: PICO HYDRO TURBINE PACKAGE
RATED SPEED: UP TO 3000 RPM
OPERATION MODE: ISOLATED
APPLICABLE STANDARD: ISO 9906 2018 GR. 2B

## Applications





# TANSA DAM PROJECT

## BENEFITTED WITH 350,000 UNITS OF ANNUAL POWER GENERATION CAPACITY USING KBL'S PUMP AS TURBINE (PAT)

KBL engineers have crafted a pump that can be operated in reverse as a turbine for generating electricity.

Now KBL's Pump as Turbine (PAT) solutions, installed as full-fledged energy generation units, are not just helping companies and government projects in reducing their energy costs but are also being considered as a potent alternative for combating global warming.

One such unit, installed as Tansa Dam near Mumbai, can annually generate up to 350,000 units of electricity. This is enough to fulfill 24x7 energy requirements of more than 100 homes. More importantly, it also has potential to reduce operation costs by up to INR 1.8 million.

...thus, our PAT is enriching lives the KBL way.

