









SCIENTIFIC POTENTIAL + TECHNOLOGY PARK = SUCCESS

HIPAR Sp. z o.o. was created in 2004. The registered office of the Company is in Wola Rafałowska. At the beginning the main object of the Company operations was machining of steel and cast iron elements. Since 2006 the main products of the Company have been pulleys to Volkswagen motors. At that time the Company became a supplier of the pulleys for the production lines of new motors.

Since 2015 **Hipar Sp. z o.o.** has also manufactured equipment for independent operation of power plants outside of the power grid. Among other things, the Company offers innovative vertical axis wind turbines (VAWT) and photovoltaic trackers enabling the generation of 45% more energy from the PV panels compared to the stationary system.

Hipar as a production-trade enterprise provides an individual approach to each customer, adapting all its offered products to customer needs and environmental conditions i.e.: the geographical location, insolation, landform, level of the average wind speed which makes it an unmatched company in comparison to other companies.

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THE ADVANTAGES OF OUR WIND TURBINES

ECOROTE Wind Turbines Line It is our flagship product. We produce turbines with

ECOROTE turbines have been developed by our team of designers and constructors in close cooperation with the Rzeszow University of Technology's flagship research

High manufacturing

Aesthetic appearance

Possible operation at temperatures ranging from -40°C to +70°C

Resistance to any weather

Polish engineering and



Low starting speed – approx. 1 m/s



Service-free operation





Absence of friction devices



High quality of the applied materials



No detrimental impact on the environment



Hipar sp. z o.o.

THE ADVANTAGES OF TURBINE CONSTRUCTION

A wind turbine allows for processing 71% (0.42 of Betz number) of wind energy into electricity. 98% of materials of which our products are made come from Polish manufacturers. Disc generator that converts the kinetic energy of wind into electricity has been developed so as not to have friction elements, by which it excludes maintenance. The blades of the turbine, thanks to the use of extruded aluminum profile of seamless monolith construction, are characterized by resistance to thermal expansion caused by heat. In addition, a white, sunlight reflecting paint, of C5+M resistance class is applied on the turbines. In addition, steel elements are galvanized and aluminum elements are anodized in order to ensure their effective corrosion protection.



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TURBINE **PARAMETERS**

Turbine name	ECOROTE 300	ECOROTE 1500	ECOROTE 2800	ECOROTE 9800		
Turbine power	300W	1500W	1500W 2800W			
Impeller diameter	1	2,2	2,2 2,2			
Turbine height	1,2	1,5 3		5,5		
Starting speed	3 m/s	1,5m/s	1,5m/s 1,25m/s			
Rated speed	10m/s	12m/s				
Total weight	48 kg	155 kg 175 kg		550 kg		
Wings and arms	Aluminium structure with resistance tested in extreme conditions					
Brake	Electromagnetic	Electromagnetic and electromechanical additionally				
Operation system	On-Grid/Off-Grid/Hybrid					
Controller	Microprocessor					
Inverter output voltage	24/48/96V DC or 230V AC	1x230V AC or 3	3x230V AC 50Hz			
Inverter output voltage	1	1 or 3		3		
Generator output voltage	AC					
Noise level acc. to PN-EN 61400-11	< 46 dB at 8 m/s in the distance of 60 m					
Operating temperature	-40°C to +70°C					
Corrosion protection	Anodizing, galvanizing, powder coating C5+M					
Mast types	Concrete posts, metal posts, lattice work, and roof platforms Possible structure manufacturing to individual order					
Mast sizes	2 m to 25 m					
Compliance with standards	CE,IEC 61400-2, 61400-11					

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USE OF TURBINES



1. On-grid system/ On-grid hybrid system

a solution usually applied when a building is connected to power engineering network. It is one of the simplest systems consisting of a wind turbine of any capacity, grid inverter of the output voltage of 1 x 230 V AC or 3 x 230 V A, two-directional meter to measure the power generated and consumed, security measures in the form of circuit breakers and surge arresters, turbine stopping resistor and connection to the power grid. On-Grid systems may also be developed for photovoltaic modules, thus creating Hybrid systems. Moreover, batteries saving surplus power may be installed. In case of frequent power failures from the grid, the system may be additionally provided with a diesel generator.

An On-Grid system enables the use of directly generated power and resale of the power in case of energy surpluses or accumulation in the power grid.

2. Off-grid system / Off-grid hybrid system





3. On/off-grid system / On/off-grid hybrid system

a solution combining the advantages of On-Grid and Off-Grid systems. An On/Off-Grid system removes the problem of power failure, usually as a result of weather anomaly, power grid repair, etc. The system first of all accumulates surplus energy in batteries and uses the accumulated energy when the wind turbine combined with the additional photovoltaic panels are not generating enough energy, or uses the batteries in case of complete grid failure. The battery of specific capacity takes missing energy from the power grid through the system controlling inverter as soon as the battery has been completely discharged. The system may also output energy to the gird when the batteries are fully loaded and the energy generated by the wind turbine and the photovoltaic panels is sufficient for the building supply.

Legend -

1. Ecorote wind turbine 2. Inverter/hybrid controller 3. Batteries 4. 230V receivers 5. Water heater / hot water / heating 6. Photovoltaic panels (in a hybrid system) 7.Generator (optional) 8. Switch /AC counter 9. Network



TYPES OF MASTS

PRE-STRESSED MAST

are made by concrete pouring into a rotating conical mould, which ensures high technical parameters and smooth surface. The masts are characterised with long-lasting operation and durability. They are cheaper than other masts of similar heights. An attachment with platform for turbine installation is needed for a pre-stressed mast.

STEEL MAST WITH CABLE STAYS

are made of combined thin-wall tubes. Lightweight construction and the possibility of the mast disassembly into short sections ensure comfortable transport. The stays fixed to concrete anchors balance the stress that may be present. The turbine is mounted directly on the mast, without any additional attachments.



FLAT-ROOF MAST

have the form of latticework of large span between the legs, which ensures stability and durability of the structure. It is possible to design a mast which does not reach higher than three metres above the roof. Four structure elements ensure simple transport, installation and dismantling. On flat roofs two vibration damping connectors are additionally applied in order to minimise the vibrations transferred to the building.

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Productivity analysis of **ECOROTE 2800** turbine for selected regions

	Country	City	Average wind speed in a year [m/s]	Annual energy production [kWh]	Co2 emissions savings [kg CO2]	Cour
ļ	Argentina	Buenos Aires	5,5	3225	2612	Morocco
	A	Melbourne	8,9	21006	17015	Netherla
	Australia	Sydney	8,1	14896	12066	
	Austria	Vienna	5,9	4276	3464	Nigeria
	Belarus	Minsk	5,5	3224	2611	Norway
	Belgium	Brussels	5,8	3992	3234	Norway
	Brazil	Rio De Janeiro	6	4575	3706	
	Bulgaria	Sofia	3,8	721	584	Poland
		Varna	5,4	2994	2425	
	Canada	Ottawa	7,7	12287	9952	Portuga
	Chipa	Beijing	5,5	3224	2611	Qatar
	China	Shanghai	6,7	7115	5763	
	Creatia	Dubrovnik	6,8	7547	6113	Russia
	Croatia	Zagreb	4,5	1434	1162	
	Czech Republic	Prague	5,4	2994	2425	
	Denmark	Copenhagen	6,4	5926	4800	South A
	Estonia	Tallinn	7,1	8955	7254	
	Finland	Helsinki	7,2	9462	7664	Spain
		Bordeaux	5,9	4276	3464	
	France	Marseille	7,8	12910	10457	Sweden
		Paris	5,7	3722	3015	
		Berlin	5	2195	1778	Turkey
	Germany	Hamburg	6,3	5564	4507	UAE
		Hannover	5,1	2378	1926	Ukraine
	Greece	Athens	6,2	5218	4227	
	Hungary	Budapest	6,6	3224	2611	
	Iceland	Reykjavik	8,8	20181	16347	United
	India	Mumbai	3,8	721	584	
		Dublin	7,8	12910	10457	
	Ireland	Waterford	8,3	16316	13216	USA
	Israel	Tel Aviv	5,7	3722	3015	
		Catania	4,6	1567	1269	
	Italy	Milan	3,3	405	328	
		Roma	4,1	983	796	And
	Japan	Tokyo	5,9	4276	3464	
ł		Aktau	7,3	9988	8090	pro
	Kazakhstan	Almaty	6,4	5926	5926	turb
		Astana	6,9	7998	6478	
		Atyrau	7,6	11683	9463	(mou
	Latvia	Riga	7,1	8955	7254	rougl
L	Lithuania	Klaipeda	6,6	6701	5428	
		Vilnius	5,7	3722	3015	
	Mexico	Mexico	5,2	2572	2083	

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Country	City	Average wind speed in a year [m/s]	Annual energy production [kWh]	Co2 emissions savings [kg CO2]
Morocco	Marrakech	5,8	3992	3234
Netherlands	Amsterdam	6,6	6701	5428
Nigoria	Abuja	4,1	983	796
Nigeria	Lagos	5,5	3224	2611
Norway	Bergen	8,4	17053	13813
	Oslo	7,2	9462	7664
	Gdansk	6,8	7547	6113
Poland	Cracow	5,2	2572	2083
	Warsaw	5,4	2994	2425
Portugal	Lisbon	7,1	8955	7254
Qatar	Doha	5,8	3992	3234
	Novosibirsk	5,9	4276	3464
Russia	Moscow	5,9	4276	3464
	St. Petersburg	6,9	7998	6478
	Vladivostok	6,5	6305	5107
South Africa	Capetown	7,4	10533	8532
	Barcelona	5,4	2994	2425
Spain	Madrit	4,8	1862	1508
	Malaga	6,4	5926	4800
Sweden	Goteborg	7,1	8955	7254
Sincucii	Sztokholm	6,7	7115	5763
Turkey	Istanbul	6,6	6701	5428
UAE	Abu Dhabi	4	889	720
Ukraine	Kiev	5,3	2777	2249
Okraine	Odessa	6,3	5564	4507
	Glasgow	6,7	7115	5763
United Kingdom	Liverpool	7,6	11683	9463
	London	5,3	2777	2249
	Kanzas	6,6	6701	5428
USA	New York	6,3	5564	4507

An example amount of energy produced of the **ECOROTE 2800** turbine

(mounted at 15m height, taking with terrain roughness class of 1 and a Weibull factor of k=2.6)

PV TRACKERS (follow-up systems)



Created for maximum use of solar energy

PV trackers (follow-up systems) are devices that increase the efficiency of a photovoltaic system by up to approx. 45% per year, by reducing the losses resulting from the sunlight angle. The movement of the panels prevents the deposition of dust and other contaminants that can cause the effect of local overheating of the panels. The follow-up system increases productivity of inverters that control the process of electricity generating from sunlight. The inverters work best at a high load, which is obtained only by using the follow-up systems. Through the use of wind and snow/ice sensors in the control automation, we protect the tracker against adverse weather conditions.

PERFECTLY PRODUCED

The structure is entirely made of steel and aluminum, it is driven by two German K + G cylinders and coronary transmission designed for reliable operation in extreme weather conditions.

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Hipar's offer includes trackers from

 $3000 W_{\rm to} \ 8000 W$

