



SHKONDIN-MOTOR



DEVELOPING THE MOST EFFICIENT ELECTRIC MOTORS IN THE WORLD

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**To manufacturers of electric motors
Project: Shkondin Motor Wheel**

We present to you a unique product in the field of electric motors, the reductorless Shkondin Motor Wheel (SMW), created by the Russian inventor **VASILY SHKONDIN** (from Puschino Science Town).

In his motor, Shkondin incorporated the secret technology of the inventor Nikola Tesla that **uses the internal energy of permanent magnets**. He discovered the numeric ratios (**patented by Shkondin**) and **principles of interaction of permanent and electric magnets**, like the Fibonacci numbers or the Fourier series. Similarly to energy systems of a molecule, or the Earth planet, or the Solar System, **there are no magnetic or energy conflicts in the Shkondin motors. As the energy systems in the Shkondin motors are similar to the natural ones, the magnets in the motors do not demagnetize, the motors do not generate heat. Shkondin motor are harmonious and simple, just like creations of nature.**

Unique features of the motor:

- ❖ **The motor is comprised of 5 assembly units** – *ingenious brevity and simplicity of design* (comparable competitors have from 12 to 18 assembly units).
- ❖ **Durability** – *magnets in the motor do not demagnetize* (there are no conflicting processes in the motor). *The design is so simple, there is virtually nothing that can brake.*
- ❖ **Uniquely high torque.** *2/3 of the torque is available on the shaft right from the breakway. No competitor in the world can offer this.*
- ❖ **Low feeding voltage and low operational currents** – the unique economy comes with the uniquely high torque. **The torque reaches up to 90 N·m with power consumption of 2 kW.**
- ❖ **The starting current is insignificant.** Conventional motors have the starting current that is higher than the operational current by 3 to 5 times.
- ❖ The Shkondin motor is controlled by a very simple pulse width modulator (PWM). **No computers, no microprocessors, no software are needed.**
- ❖ **The Shkondin motor can be powered directly from power supply with 12-24-48-96 V** without altering the design.
- ❖ **Recuperation.** In the course of operation, the motor returns energy, charging the battery.

The motor wheel is a high-tech product, with following features: simplicity of production, high reliability in operation, efficiency due to constant energy recuperation during operation and low starting current, absence of complex control systems, high torque at low voltages.

Some comments by experts of the Department of Electric Machine Automation Equipment and Special Electric Motors Laboratory in the Moscow Institute of Radio Electronics and Automatics:

"The design of the motor wheel type electric motor is original, it has no analogous devices among the non-contact motors, direct current commutator motors, or other electric machines of the conventional design. The electric drive built on the basis of the Shkondin motor wheel has good dynamic characteristics, it is convenient and easy to operate."



Inventor Vasily Shkondin



This is the motor wheel designed by Vasily Shkondin

The world has acknowledged Shkondin's inventions.

From 1990 to 2006, inventions by V.V.Shkondin were presented at the international exhibitions in Brussels, Paris, Moscow, Geneva, Seoul, Orlando, New-Orleans, Hanover, and Tokyo. They were awarded with six Gold Medals, a Grand Prize, a Prize by the Chamber of Inventors of Belgium, a Special Prize of EU Countries, a Golden Trophy of Korean Institute of Science and Technology, and a prize from Mr. Shaber, the Minister of Finance of Belgium. In 1990, V. V. Shkondin was named "The Person of the Year" in Belgium. In 2006, at the presentation of 300 best European inventions in Moscow, the motor wheel was awarded the gold prize among 13 winners of the competition.



"2nd International Exhibition and Forum "Innovations and Technology 2011" in Moscow. The Minister of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters Mr. Sergei Shoygu examines the invention by V.V.Shkondin.



Concours Lepine, Paris, May 8, 1999. The President of the International Exhibition is on the left, the Chairman of the Competition Jury, a friend of General de Gaulle (on the right) hand over a diploma and a gold medal to the inventor of the motor wheel.



World Inventions Showroom Eureka 1997, Brussels. A power wheelchair with motor wheels and a bicycle with an electric drive – winning a Gold Medal award. Vladimir Kolecko, the President of the Inventors Association of Poland, bestows a special prize of the European Community countries onto Vasily Shkondin.



The author at the International Exhibition Archimedes 2002 in Moscow. Golden medal.



Industrial Exhibition in Hanover, May 2000. (A two seat motorcycle, a motor wheel 2.9 kW, 48 V, 80 km/h)



"Concours Lepine" International Exhibition in Paris, 1999. (A three wheel tow-truck with a quadro engine, capable of towing a vehicle up to 2 tons) — the Gold Medal

The Shkondin motors successfully passed **laboratory tests in Oxford and Southampton universities**. The British scientists confirmed all technical characteristics presented in the patents and stated in their conclusions **that the motor of Russian inventor outperforms traditional electric motors by 50 percent in dynamics and by 30 percent in operational efficiency.** Similar reports were given by Russian test laboratories in Moscow Power Engineering Institute (MEI(TU)), and Moscow Radio Electronic Institute (MIREA).

An excerpt from the letter by Norbert Wissenbach, a German Licensed Engineer in Motor Vehicle Engineering, with 10-year background in VW, Porsche, a professor in the High Technical School:

“You, Vasily Vasilievich, are like the God for Porsche employees. Ferdinand Porsche, the founder of the company, was once awarded in Paris a gold medal for the “Reduction gear motor wheel” for electric motor vehicles in 1900, and 100 years later, at the very same Concours Lepine exhibition in Paris, you were awarded a gold medal for your “Direct drive motor wheel” for virtually all types of transport vehicles, including marine and air transport.

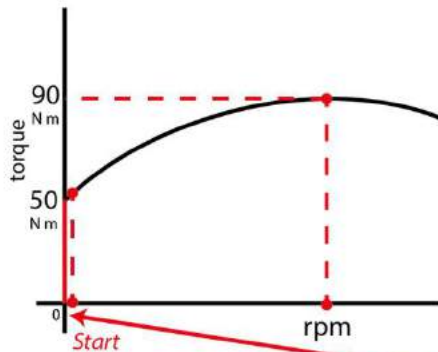
You did not copy the Porsche electric motor. You created a unique motor design with utterly simple control system, that has no need for a gearbox, or a clutch, or even a power steering, hydraulic or electric. Your system is capable of controlling all four wheels concurrently by means of electric pulses, and if it fails, it is possible to plug in directly to the motors and go on. It is just impossible to do that with traditional electric motors. Your motor does not require high starting current, which is very unusual for direct current electric motors. It allows the motor wheel standing on the ground to easily move any vehicle right from the start .”

One example of successful commercialization of Shkondin’s technology is the British company Ultra Motor Ltd. that used it to create and launch a range of vehicle products under the A2B trade mark. In 2017, its sales exceeded 4 billion USD.

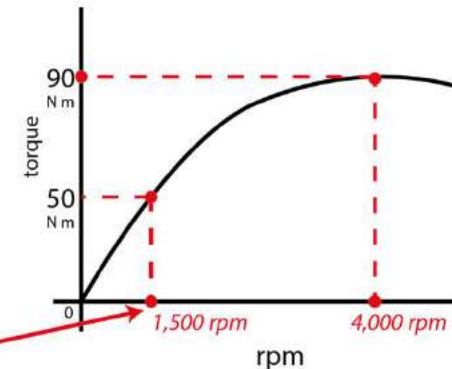
In 2006, Intellectual Property Appraisal Institute in Connecticut Avenue, Washington, upon request by the former Minister of Innovations of Russia Yu.A.Lebedev, estimated the value of Shkondin Motor Wheel technology as 40 million USD. It has to be noted that at the moment the estimate was made only 5 types of motors were already developed. Today there is 108 types of motors ready for production.

The Shkondin motor wheel offers unique ratio between consumed electric power and output torque of the motor.

For example, Toyota Yaris offers a 1 liter engine with 68 h.p.



The Shkondin motor consumes two kW of electric power to achieve the torque of 90 N*m, and the start-up torque of 50-60 N*m.



(56 kW) has maximum torque of 90 N*m (at 4000 rpm), which is comparable to Shkondin motor wheel.

The Toyota Yaris motor reaches 50 N m at 1,500 rpm only.
The Shkondin Motor has it from the start.



- 5 assembly units
- 10 kg
- **no reduction gear**
- power consumption – 2 kW
- torque – 90 N*m max



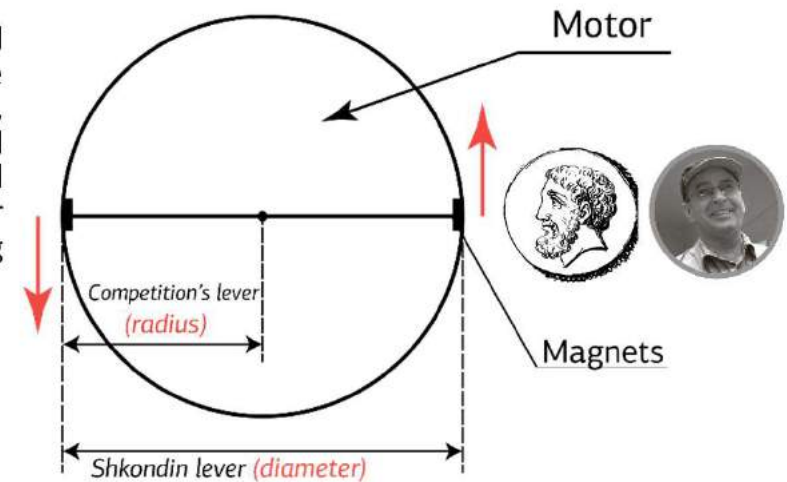
- 2200 parts
- 350 kg
- **Gearbox + 100 kg**
- power consumption – 56 kW
- torque 90 N*m **at 4,000 rpm**

The physical principle

The mode of operation of the electric motor is based on the electromagnetic attraction and repulsion forces that occur in the course of interaction of the electric magnets in the rotor and permanent magnets in the stator. When the electric magnet passes the position where its axis is between the axes of the permanent magnets, the solenoids of the electric magnet are energized in such manner that they create a magnetic pole opposite to the pole of the next permanent magnet in the direction of rotation, and a same-name pole as the pole of the previous permanent magnet. Thus the electric magnet is concurrently repulsed from the previous permanent magnet and attracted to the next permanent magnet. When the electric magnet passes the position against the axis of the permanent magnet, it is de-energized, as the current collector is positioned against the dielectric gap. The electric magnet passed this position by inertia.

The balance of electric and permanent magnets, their relative arrangement and the employed method of electric magnet commutation are the interlinked factors that ensure the resonance of currents running through the windings of the diametrically opposite electric magnets, decreasing the power consumption at the start and acceleration of the electric motor, and improving its dynamic characteristics. Thus the ideal conditions for reaching high torque and high efficiency of the electric motor are created. In addition, the design of the electric motor allows for maximum efficient recuperation of the electric power on the go and when braking that substantially extends the autonomous travel distance of the motor vehicle.

In the Shkondin motors, the electric magnets are placed diametrically opposite to one another, therefore the mechanical lever is as long as the diameter. This is one of the basic aspects of the unique torque produced by the Shkondin motors and their unparalleled powerful start.



Applications



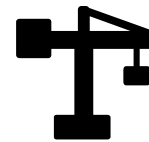
Loaders



Wheelchairs



Electric motor vehicles



Lifting cranes



Elevators



Helicopters



Electric bicycles



Buses



Trolleybuses



Wind power generators



Quadrocycles



Steam boats



Lunar surface vehicles



Trams



Electric trains



Aerial cable ways



Tractors



Snowmobiles

Let's consider the competitive advantages of the motor wheel using the order placed by EMCO, a German company, to the Shkondin Motor Wheel Laboratory as the example. EMCO provided its 10 inch scooter stock motor for modification. After fitting the Shkondin motor into the EMCO motor case, the following results were obtained.

Comparative table for the EMCO motor wheel and the Shkondin motor wheel

No.	Parameter	EMCO motor	Shkondin Motor Wheel (SMW)
1	Power supply voltage, V	48	48
2	Power, kW	1.2	1.2 (average operating value)
3	Maximum torque, N*m	25	50 (<i>higher by 100%</i>)
4	Travel distance, km	50 (actually, 32-38)	55 (<i>regardless of the terrain, also can handle steep or long climbs with confidence</i>)
5	Speed, km/h (using a 31 A*h battery)	45	55
6	Motor weight, kg	13	10
7	Number of assembly units	14	5
8	Number of permanent magnets	46	14 (<i>less by 3.3 times</i>)
9	Wheel diameter, inch	10	10
10	Use of materials for production: - Copper wire - Isotropic steel	100% 100%	25% (<i>less by 4 times</i>) 12.5% (<i>less by 8 times</i>)
11	Motor cost	100 Euro (100%)	70 Euro (70%)
12	Control cost	30 Euro (100%)	20 Euro (67%)

Conclusion. Savings from the use of Shkondin technology amount to 40 Euro per motor. Producing 1 million electric scooters per year, a company can save about 40 million dollars.

Notice. A game changing second generation motor has been designed based on the EMCO shell. It generates torque higher than the analogue by 90%. An engineering prototype of this new motor is being currently manufactured.

Comparative table for conventional electric motors and the Shkondin motor wheel

No.	Parameters	Traditional motors	Shkondin Motor Wheel (SMW)
1	Power supplies	Li-ion or sodium-sulfur electric batteries, fixed voltage parameters	Simple, inexpensive, and reliable low-voltage gel electric batteries, voltage from 6 to 96 V
2	Starting current	100%	<i>30%-50% (less by 2-3 times)</i>
3	Acceleration dynamics	100%	<i>150% (higher by 50%)</i>
4	Travel distance without recharge	100%	<i>130% (higher by 30%)</i>
5	Torque	100%	<i>180%-200% (higher by 80-100%)</i>
6	Resistance to dust and moisture	Sensitive to the operating conditions and ambient temperature (requires cooling)	Can operate when submerged in water, in increased ambient temperature, in any conditions with dust, mud, aggressive environments
7	Motor temperature during operation	Requires active cooling	<i>Max. 70 °C</i>
8	Complexity of design	13-19 assembly units	<i>5 assembly units</i>
9	Dimensions and weight	100%	<i>up to 50% less</i>
10	Control system	Requires complex controls, microprocessors with software	<i>Most simple</i> pulse width modulator, small-size and inexpensive. There is no differential unit
11	Reliability (warranty period)	Warranty 1-1.5 years	<i>Warranty on product 5-10 years</i>
12	Maintenance	High cost of maintenance due to complex electronic controls and the differential unit	<i>Virtually does not require maintenance</i>
13	Cost	100%	<i>Less by 2-3 times than that of traditional motors</i>

Conclusions:

All the specified technical advantages, in combination with the simple design of the Shkondin motor wheel, make its production extremely profitable, as a highly competitive industrial product.

- ❖ Material requirements of the SMW is 4-8 times less, weight is less by 30-50 percent, compared to the traditional engines. Therefore, cost of materials for the SMW would be less by 50 percent minimum.
- ❖ The SMW has simple design, comprised of only 5 assembly units, compared to 13-18 assembly units in the traditional motors. This results in high adaptability to streamlined production and assembly and, consequently, high reliability and maintainability of the product. Eventually, adaptability for streamlined manufacture is better by 2.5 times.
- ❖ Fewer steps in the production process means less production costs. One can save human resources, needs less machines, less electric energy consumption at the production site. Respectively, the production cost for the 1st SMW would be less by 2-3 times.
- ❖ Torque increase by up to 50 percent.
- ❖ The diametrically opposite arrangement of the electric magnets ensures significantly higher torque.
- ❖ Thus increasing: travel distance up to 30%, maximum speed up to 35%, acceleration characteristics up to 40%.
- ❖ Possibility to use any type of electric batteries feeding voltage from 6 to 96 Volt.
- ❖ Service life is longer by 5 times. The result of the Shkondin motor test conducted at the laboratory of Hero Cycles works in India, is a spectacular example. The motor was submerged in water for 1 hour. Then the motor was running on the test bench for 9 days nonstop which corresponds to the travel distance of 5 thousand kilometers. The temperature of the motor was stable at 40 °C during the entire time of the test. After disassembling the motor, they did not find any magnetic dust. The 22 mm long brushes have worn by just 1 mm, which gives the total motor mileage resource of 100,000 km before the first service.
- ❖ Absence of starting currents.
- ❖ Recuperation. In the course of operation, the motor returns energy to the battery – which is thus recharged.
- ❖ The Shkondin motor operates as a generator. For example, when the electric battery runs out in the electric bicycle, one can go by pushing pedals, recharge the battery, and then go on electric power again.
- ❖ Resistance to aggressive environments: the Shkondin motor can operate when submerged in water, at high ambient temperature, and in any conditions of dust, dirt, aggressive environments. Competing motors are sensitive to the operational conditions, ambient temperature.
- ❖ The temperature of the Shkondin motor during operation is never over 70 °C.
- ❖ Absence of complex electronic units to control the motor: there is no computers, microprocessors or software involved. The Shkondin motor is tolerant to electromagnetic fields, ionization, and other interferences. This is why a helicopter powered by a Shkondin motor would never crash under a nuclear explosion or directional combat electromagnetic radiation aimed at disabling the control systems.

List of engineering prototypes manufactured based on the patents

A. Patent No. 2285997, "Pulse inertia electric motor", validity period till 11.04.2025

1. **Bicycle**,
24 V, 25 km/h



2. Road **bicycle** (scooter),
36 V, 45 km/h, with
electric speed regulator
(ordered by Sitrel,
Switzerland)



3. **Bicycle**,
48 V (4 electric
batteries), 70 km/h,
relay switching of the
source of current (it is
immune to the effects
of electromagnetic
waves from military
equipment of the
developed countries)



4. **Wheelchair**
(2 motors), 24 V,
2 x 150 W
10 km/h



5. **Wheelchair**
(2 motors), 24 V, 2 x 200
W, 18 km/h



6. **Bicycle**,
20 inch, 48 V,
4 electric batteries,
70 km/h, relay
switching of the current
source. Pursuit race on
the cycle track.



B. Patent No. 2172261 "Pulse electric motor for mobile facilities (variants)", term of validity till 18.05.2021

1. **Three-wheel tractor**,
3 batteries 12 V, 19 A*h, 1
kW, 36 V, 60 Nm,
36 km/h. International
exhibition Concourse
Lepine in Paris, 1999, a
Gold Medal award



2. New high-speed
motor (transverse
design),
48 V, 900 rpm,
1.8 kW, 75 km/h.



3. New model of the
motor-generator with
addition of points from
patent No. 2303849,
power 3.0 kW, featuring
self-rotation by an
integrated motor-
generator



Patent No. 2340994 "Induction electric motor (variants)", validity term 05.06.2027

1. **Engineering prototype**, diameter
180 mm, 6 two-teeth solenoids
(E980 steel grade)



2. Electric motor for tow-cars and
tractors, diameter 308 mm, voltage
24 V, speed 35–38 km/h, torque
250 Nm

D. Patent No. 2303849 "Brushless synchronous generator", validity term 01.11.2025

1. **Generator wheel** in the front fork of the mini motorcycle, it charges the block of electric batteries (24 V, 18 A*h) with current from 5 to 10 A on the go, thus increasing the travel distance by 3 times, travel distance 300 km



2. **Generator wheel** in a 26 inch rim, for charging a 48 V power unit in scooters, bicycles, motorcycles



3. **Generator** to install directly coupled with petrol engine on electric car, diameter 220 mm, 6 phases, charging voltage for the current source of 96 V, 5 kW.



E. Patent No. 2290328 "All wheel drive vehicle", validity term 21.07.2025

1. **Rickshaw vehicle.** 96 V, 2 motors 2.2 kW each, with 5 hp petrol motor which recharges the power supply unit, electric current from 5 to 20 A, fuel consumption 420 g per 1 hour of operation, petrol tank 14 l. The Rickshaw vehicle is a new generation hybrid vehicle, weighing 600 kg plus weight of three passengers. Two Shkondin motors, 2.2 W each, are installed in the back. The vehicle also has a petrol (internal combustion) motor of 5 hp, which is not linked to the drive, and a generator. The batteries are charged when the internal combustion motor is running. The batteries feed current to the motor wheels. The internal combustion engine stops when the batteries are fully charged. The Shkondin motor wheels are very efficient in terms of electric power consumption, the total fuel consumption is 0.8 l per 100 km in the mixed cycle. The Rickshaw vehicle does not require a stationary charging station. The Rickshaw vehicle is the first step to create a city motor car with extra small consumption of petrol, and also to develop a high capacity truck, self-propelled barge, and other transport facilities, where n-fold decrease of fuel consumption is important.



2. **Quadrocycle**, converted into a tricycle, 48 V, electric speed regulation unit, motor wheel 3 kW, speed up to 60 km/h



3. **Motorcycle**
60 V,
80 km/h,
4.8 kW,
120 Nm



4. **Scooter motor**
48 V, 1.5 kW, 50
km/h,
50 Nm



Our Team

We are a team of professionals who have travelled a long way from the bold idea to the acknowledged success under guidance of Vasily Shkondin. Over the years of work, as a result of continuous selection, a strong team capable of meeting and solving most uncommon and complex technical challenges has been formed.



Shkondin V.V.
Chief Designer



Shalatov D.A.
Technical
Director



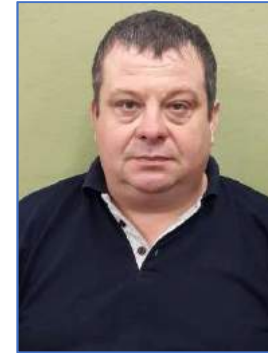
Pavlichev A.A.
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Engineer



Makeev V.S.
Mechanical
Engineer



Mitiuskin A.Yu.
Software
Engineer



Petrushenko P.A.
Process Engineer



Khirny S.M.
Operations
Director

Total of 27 prototypes of motors or generators created based on five existing patents. Additionally, 4 motors and 2 generators have been manufactured based on new technologies developed by V.V.Shkondin, not yet patented.

Currently, in the laboratory of Shkondin Motor Wheel, LLC, the work is under way to create new forth generation motors. Complex scientific and technical research is done to prepare the batch manufacturing. The work is focused on developing calculation and design methods, improving the design and technical parameters of the motor wheel type electric motors.



Diplomas and awards

