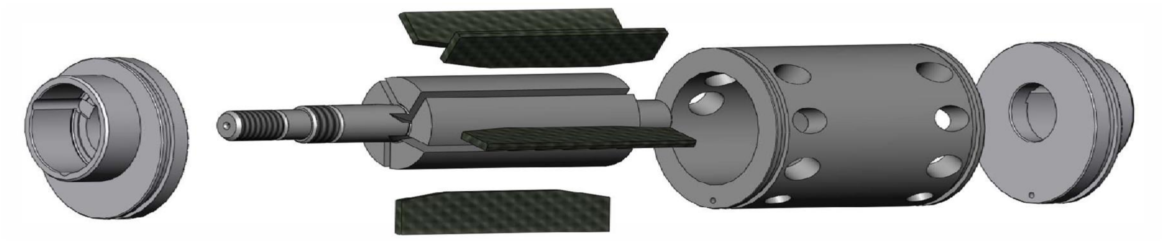
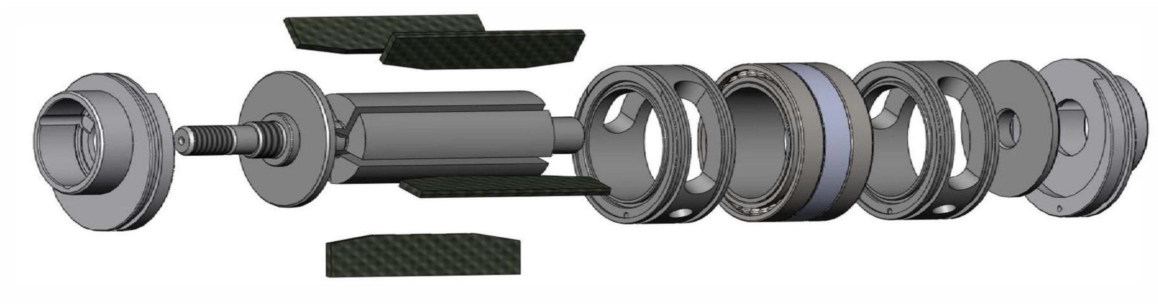


On the picture above you can see standard existing products on the market. It has stationary cylinder and lateral plates, and small openings with adhesive barriers among them for inlet and outlet from the working chamber.

When rotor starts to rotate vanes go out of rotor groves and leans against wall of the cylinder. There is a big friction and wear between vane and stationary cylinder. It is possible to substitute wear of the vane on the radial side with centrifugal force that push vane more and more out of rotor groves. Due to the wear, height of the vane is getting smaller and smaller until it comes to case when vanes is so small that it falls out of the rotor groves and it breaks between rotor and cylinder.

There is also big wear between vane and lateral plates of the cylinder. It is not possible to substitute wear of the vane on the lateral side and to the worn vanes at the lateral side there is leakage of the air between parts of the working chamber with higher pressure to the parts of the working chamber with lower pressure and due to that machine start to loose power. Another problem is that due to worn vanes on the lateral side length of the vane is less then length of the cylinder and vane starts to beat between lateral sides with high possibility to be broken.

Small openings with adhesive barriers among them for inlet and outlet from the working chamber highly increase volumetric losses.



The essence of our invention is the machine having stationary and rotating cylinder parts where the cylinder rotating parts are roller bearings.

When rotor starts to rotate vanes go out of rotor groves and leans against inner bearing ring and due to contact between vanes and inner bearing ring, bearing is actuated to rotate. It is important to emphasize that due to bigger diameter of the cylinder stationary part then diameter of the inner bearing ring vanes don't touch stationary cylinder part. In our case wear exist only due to difference of the peripheral speed between the most and least thrown blade (rotor is placed eccentrically) which is only few percent of the normal wear (extended life cycle, the best power to weight ratio, oil-less production which enables clean surface and more environmentally friendly operation, etc)

Lateral partitions, closing the cylinder working chamber are firmly pulled over the rotor and rotate with it. When rotor starts to rotate vanes go out of rotor groves and wear only exist because vanes go out and in of the rotor groves which is only few percent of the normal wear.

In the stationary cylinder part there are big radial openings allows the working media to pass through in and out of the cylinder working chamber without adhesive barriers. This is also important if you have large amount of water, dust or small particles when large openings allow easy passage of these harmful substances.

Banko pneumatic grinders are based on innovative Banko vane machine with stationary and rotating cylinder parts and enhanced efficiency protected with several patents worldwide i.e main concept patent US patent 8,047,824 etc.

MACHINE 1 'BANK0' - TORQUE DIAGRAM

MACHINE 1 'BANKO' - POWER DIAGRAM

On the pictures above you can see the comparison between our vane machine and best current vane machine on the market. All results were acquired in our lab by testing on eddy current dynamometer produced by Magtrol from Switzerland.

The torque is force applied in a turning direction and it is directly proportional to operator's feed force. If the vane machine doesn't have enough power and the operator applies more force to the tool, the rotational speed decreases until the torque of the operator becomes equal to the machine torque. If the rotational speed decreases then both the material removal rate and overall efficiency of the grinding process also decrease.

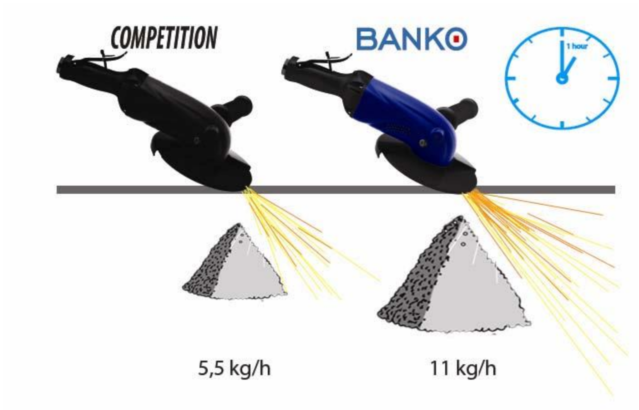
The diagram shows that our machine generates double enhanced torque and power in working range for the same size of the machine (working chamber). Initial torque is the same but our torque falling slowly then competitor torque and in working range we have double enhanced power (Power=Torque*Velocity)

If the force of the operator is the same, our machine will operate at higher velocity. At each turning the tool removes a certain amount of material, and if the velocity is higher more material is removed and the operating time is decreased.

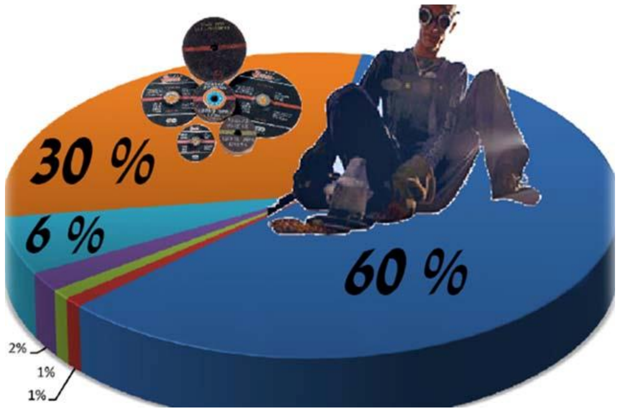
The Banko pneumatic grinder achieves 60-100 % faster grinding at the right speed with high material removal rate, which improves production rates and allows new levels of productivity.

Our straight grinder GSB41 S12 is only one machine that can work at 12.000 rpm with double material remove rate in comparison with any other competitor (Our main competitor is Atlas Copco). All other competitor works at 6.000 rpm (it is not possible to reach our speed and if they reach that speed life time will be only few days because wear of the vane is equal to third potency of the speed). For this speed you have to use reinforced grinding wheel at 80 m/s as well as for GSB31 S18 with double speed in comparison with any other competitor.

Banko grinder also provides grinding with much less vibration due to grinding of the accessories at the right speed and it is ergonomically shaped for less operator fatigue and easy control.



On the pie chart you can see segmentation of the labor costs per hour. The chart shows that the greatest cost is spent on man power. We also have decreased costs of the abrasives due to the grinding at the right speed with much less vibration.



60% - man power

30% - abrasives

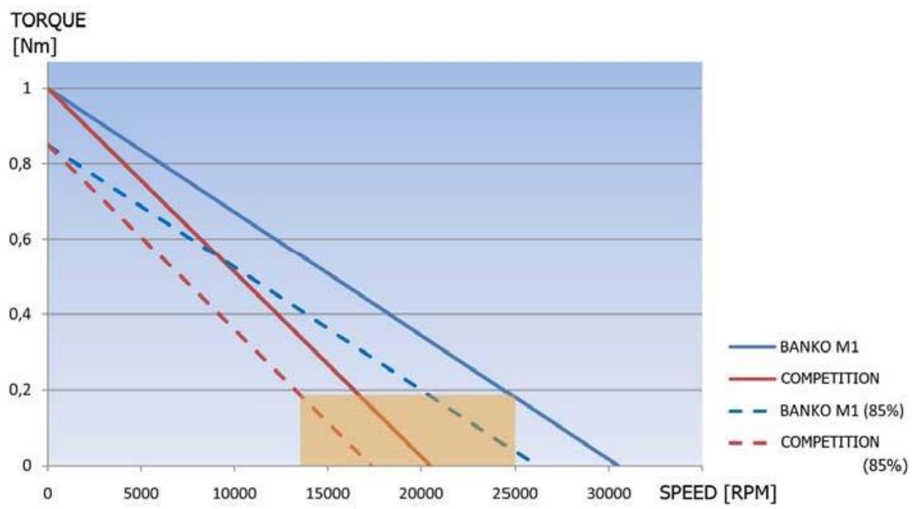
6% - energy

2% - pneumatic grinder

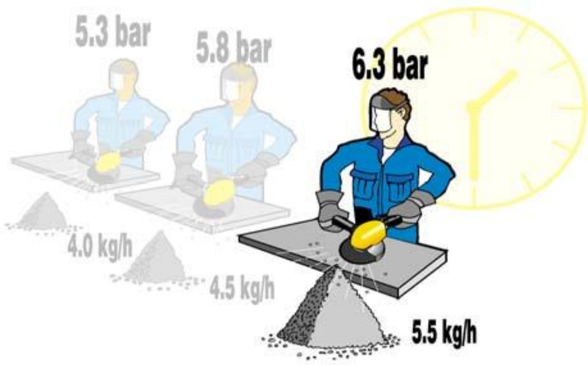
1% - maintenance

1% - other costs

On this picture you can see what happens if the pressure is decreased by 15% due to the leak in air system or if more tools are connected to the air system than it was designed. Dotted torque curves on the diagram show the torque if the pressure is decreased by 1 bar. Even in this case our grinder is still inside the working range.



The picture lower shows the relation between the pressure and the amount of removed material and it is also significant for understanding why machine must have enough power. Now it is easier to understand why our machine with enough power in working range can removed much higher amount of the material for the same time.



In classic vane machine wear of textolite vanes ranges from 1-2 mm per 100 hours. Overall life cycle of the vanes depends on its original size and especially on height of the vane allowable to be worn (when height of the vane is small vane goes completely out of rotor groves and machine is blocked). If we assume 2 hours working per day life cycle of the vane machine depending on machine design and operating conditions is 3-8 months or 100 -300 hours. If machine work in 2 shift life cycle of the vane machine is 1,5-4 months but in most production is 3-4 working hours in one shift (not 2 hours) life cycle of the vane machine is 0,75-2 months.

In our vane machine wear of the parts is reduced by 90% and our machine can work 500-1500 hours depending on size of the machine which is at least few times better than any other machine.