



# Suhner White Paper

## Energy Efficiency of Abrasive Tools



**SUHNER**<sup>®</sup>

# Energy efficiency of abrasive tools

Energy efficiency is a catchword that has not lost any of its current relevance. Although the minimum energy consumption and/or duty cycles of diverse products may render this discussion of energy efficiency a moot point, it is certainly highly relevant for economical and efficient machining on surfaces with aggressive abrasives and long duty cycles.

Who can answer this question better than Suhner, a competent partner in the treatment of surfaces and manufacturer of many hand tool series featuring three drive types: tools with flexible shaft, power tools, and pneumatic tools. This wide range of hand tools allows Suhner as an abrasives expert to present an objective comparison with its own products.

## Tools with flexible shaft

These tools are designed for heavy duty applications with a flexible shaft that decouples the drive motor from the tool in the user's hand. The result is less vibration, less fatigue, and greater safety, and the speed can be regulated either continuously or via presets. The user can therefore utilise a combination of powerful drive output and a lightweight hand piece. Further advantages are the low noise levels, the high torque, and the potential reduction of workspace needs.



The comparison was made with the tried and tested ROTOfera featuring a three phase 400 V electric motor and an FSM angle hand piece.

## Power tools

These tools are driven by a powerful single phase universal motor. Its advantages are its compatibility with

the ubiquitous single phase mains, digital constant electronics with starting current limitation, overload and undervoltage protection, ease of handling, and compact design for outstanding manoeuvrability.



The comparison was made with the compact UGW 10-R angle grinder.

## Pneumatic tools

Thanks to their multidisc motor, these tools are highly robust, easy to service, powerful, and lightweight. Providing high reliability and operating safety, these motors can withstand overloading without damage, even when stationary.



The comparison was made with the highly manoeuvrable, lightweight LWG 12 angle grinder.

# Energy efficiency of abrasive tools

## Comparison

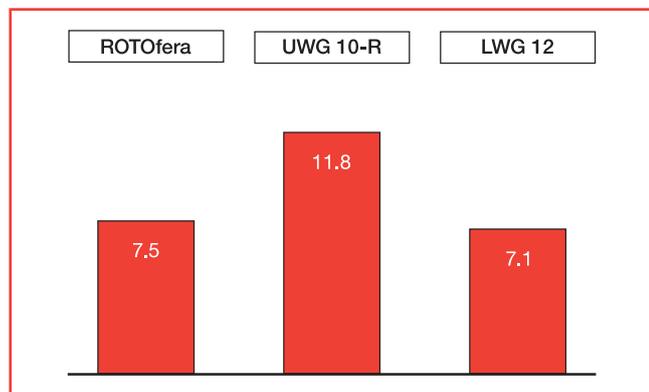
- All three tools were fitted with a new, identical roughing wheel 125 mm in diameter.
- Operating time per tool: 3 x 3 minutes with three users
- Machined material: X5 CrNi 18 9 / 1.4301
- Speed optimised to the abrasive for the best possible removal of material
- Equally high and constant contact pressure

## Findings

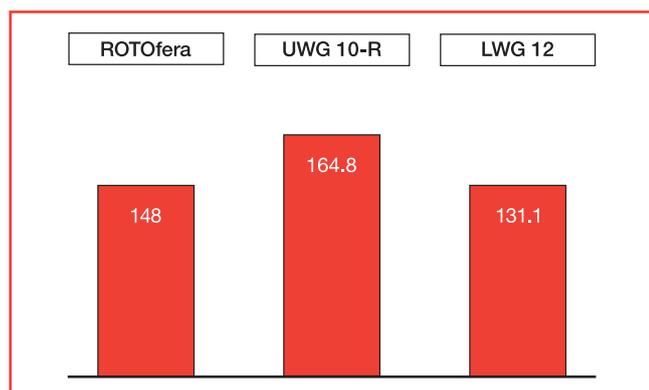
	ROTOfera	UWG 10-R	LWG 12
Air consumption m <sup>3</sup> min <sup>-1</sup>	-	-	1.2
Power input (W)	1300	1300	7200*
Continuous power output (W)	800	650	900

\* Empirical power input of air compressor 100 W/(m<sup>3</sup> h<sup>-1</sup>)

- Wheel wear (g)



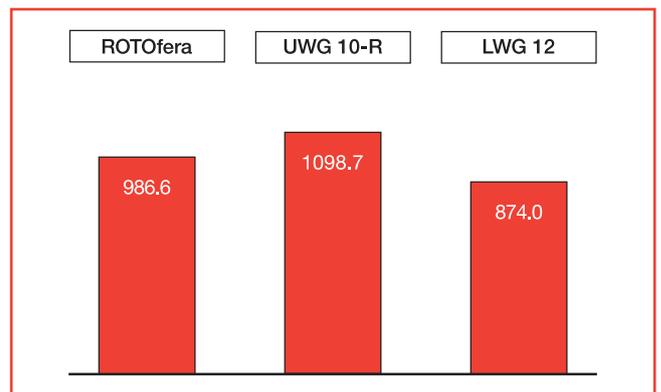
- Material removal (g)



- Efficiency comparison

	ROTOfera	UWG 10-R	LWG 12
Energy costs per hour (AUS)	0.25	0.25	1.37

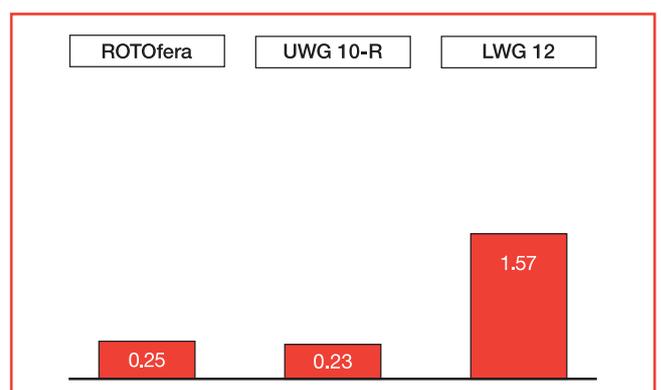
- Material removal per hour (g)



- Ratio of material removal to wheel wear



- Energy costs per kg of material removal (AUS)



- kWh price: AUS 0.19

## Energy efficiency of abrasive tools

A material removal rate of 500 g/h corresponds to a typical industrial application that includes factors like fatigue, etc. An eight hour shift therefore removes 800 kg of material over 200 working days each year.

- Energy costs comparison (AUS)

	ROTOfera	UWG 10-R	LWG 12
Single shift	203.00	184.00	1256.00
Double shift	405.00	368.00	2512.00
Three shift	608.00	552.00	3768.00

### Findings, assessment, and conclusion

- The overload protection on the UWG 10-R power angle grinder switched to cooling mode just before the end of the comparison
- The UWG 10-R power angle grinder exhibits 50% greater wheel wear
- The LWG 12 pneumatic angle grinder delivers a performance nearly equal to its competitors. Its energy costs, though, are many factors higher owing to the expensive generation of compressed air
- The tool with flexible shaft continues its status as the unchallenged powerhouse. When a lot of material has to be removed over long periods and the available working space permits this, this tool presents a highly convincing economical solution

### AUS savings per year

When a tool with flexible shaft is used instead of a pneumatic model:

	One tool	Five tools	Ten tools
Single shift	1053.00	5265.00	10530.00
Double shift	2107.00	10535.00	21070.00
Three shift	3160.00	15800.00	31600.00

### Potential increase in system efficiency

This is not possible for flexible shafts and power tools, but the great potential presented by air compressors should

be utilised to the full. This should take account of the following optimisation potential:

- Leaks must be eliminated at screw unions, O rings, couplings, hose clips, etc.
- Untight fittings, couplings, valves, etc., must be replaced with modern, tight equivalents, e.g. swivel couplings
- Switch OFF the air compressor over night and the weekends
- Optimise the cross section and length of the hosing
- Optimise compressor operations between full and no load
- Optimise the network pressure. The operating pressure is 6.3 bar. Higher pressures are inefficient
- Install an auto shutoff
- Timed condensate trap for opening the drain valve at fixed intervals
- Use a solenoid valve to switch OFF constant consumers

According to an EU study, these measures represent a cost savings potential of about 33% of an air compressor's total costs.

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