

Stream finishing machine for series production

OTEC has developed the new SF 3/105 immersion finishing unit with pulse drive system specially to enable the system to be fully integrated into production lines for large-scale production runs. This unit type enables complex turned parts such as worm drives, gear wheels and camshafts to be deburred, rounded, burnished or polished in a matter of seconds. It is very easy to adjust the unit to the production cycle time, which is often only a few seconds.



Fig 1: Automatic loading of the SF machine

How the machine works:

The workpieces are clamped by means of a mandrel or similar device. Loading can be carried out manually, by the use of a handling system or by a robot (especially for series production). Processing is carried out by immersing the workpiece in a flowing stream of grinding or polishing media. The media stream is generated by means of a rotating drum.

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The pulse drive

The pulse drive system developed by OTEC delivers perfect results by rapidly alternating the direction of rotation. During this process, the clamped workpiece is immersed in a media stream of grinding or polishing media where it is alternately processed in each direction of rotation. Decelerating and accelerating again to 2,000 rpm takes only half a second. This creates relative velocities of up to 30 m/s and accelerations of up to 40 G. The main advantage of this is extremely short finishing times.

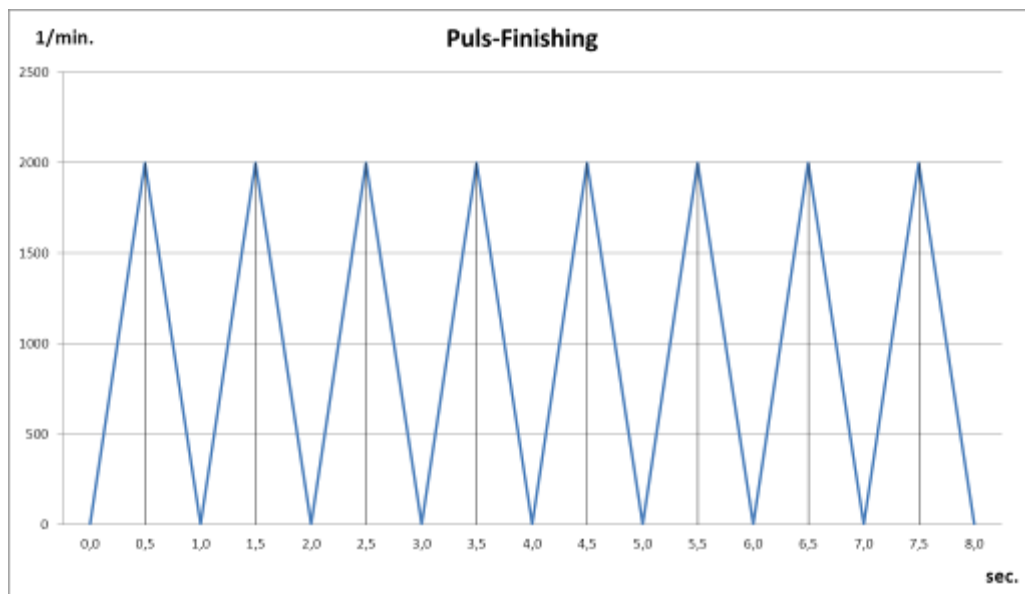


Fig. 2: Alternating direction of rotation

Additional features:

The **angle of incidence** can be adjusted by means of a servo motor and is therefore variable and can be changed automatically during the finishing process. Predefined positions can be processed and stored in the program so the flow can be adjusted according to the precise requirements of the workpiece.

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Fig. 3: The angle of incidence can be adjusted by means of a servo motor

A **suction nozzle** is fitted to continuously pump out the waste water and the sludge from the wet finishing process. The benefits of this system are obvious:

- » Constantly high rates of material removal
- » No sludge in the process drum
- » Grinding and polishing media are always kept clean
- » Clean workpieces

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Fig. 4: Suction nozzle for extracting the waste water

Example: Finishing camshafts

Task:

To debur and round the edges to approx. $70\ \mu\text{m}$ whilst at the same time smoothing the surface from $Ra\ 0.4$ to under $0.2\ \mu\text{m}$ and an Rpk value of less than $0.1\ \mu\text{m}$.



Fig. 5: Before finishing

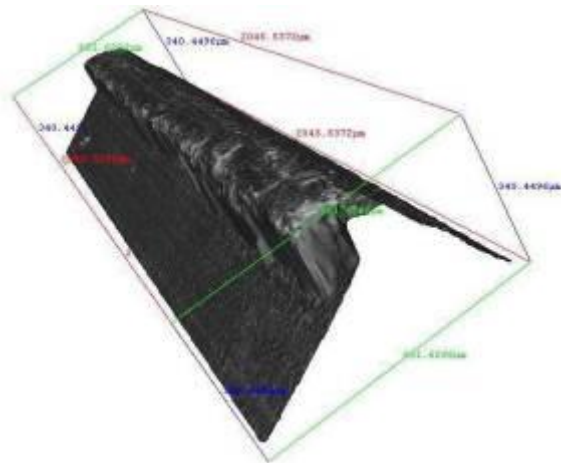


Fig. 6: Before finishing

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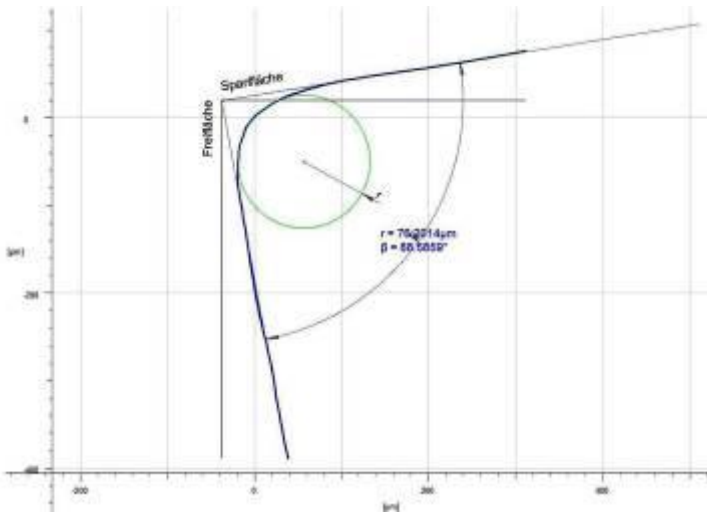


Fig. 7: After finishing

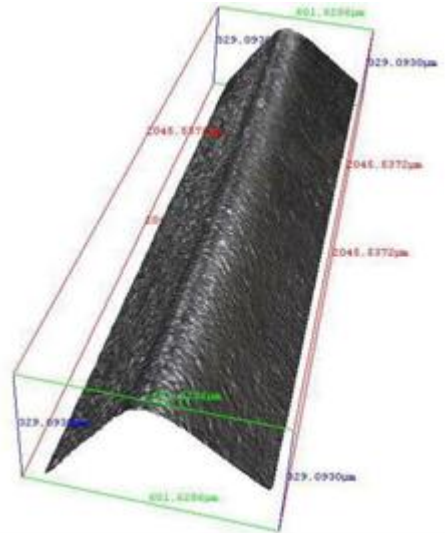


Fig. 8: After finishing



Fig. 9: After finishing



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Result:

The finishing time required was approx. 30 seconds.

This means that with an SF 3 machine with 3 pulse drives, one workpiece would be finished every 15 seconds.

	Before	After
Ra values	0.4 μm	0.09 μm
Rpk values	0.4 μm	0.06 μm

Benefits for the customer

- » Less friction, reducing energy consumption
- » Our process reduces wear, since there is less friction
- » No run-in necessary – sharp points are rounded without chips being formed
- » Since no run-in is necessary, there is much less pollution of the oil, which increases oil change intervals by up to 100%
- » Up to 10% less heat generated
- » Up to 50 % less noise is generated than with conventionally ground parts

The next page shows an example of Rpk 0.2.

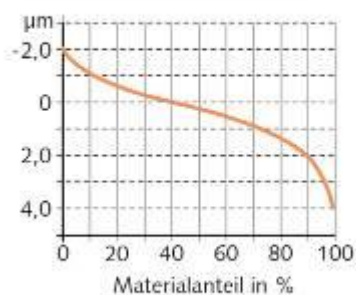
With the OTEC process, we can achieve Rpk values considerably under 0.1 μm .

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Camshaft measurements:

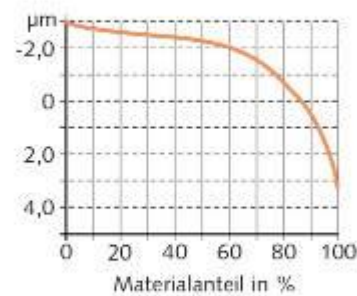
Conventional grinding

Rpk = 0.2 μm



With PULSFINISH®Ra = 0.2 μm

Ra = 0.1 μm Rpk < 0.1 μm



The company:

OTEC is a medium-sized manufacturer of drag, disc and stream finishing machines. Founded by Helmut Gegenheimer in 1996, the company has steadily established itself as a market leader by developing innovative new machine concepts and numerous patented processes.

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