Selecting the right chipping hammer

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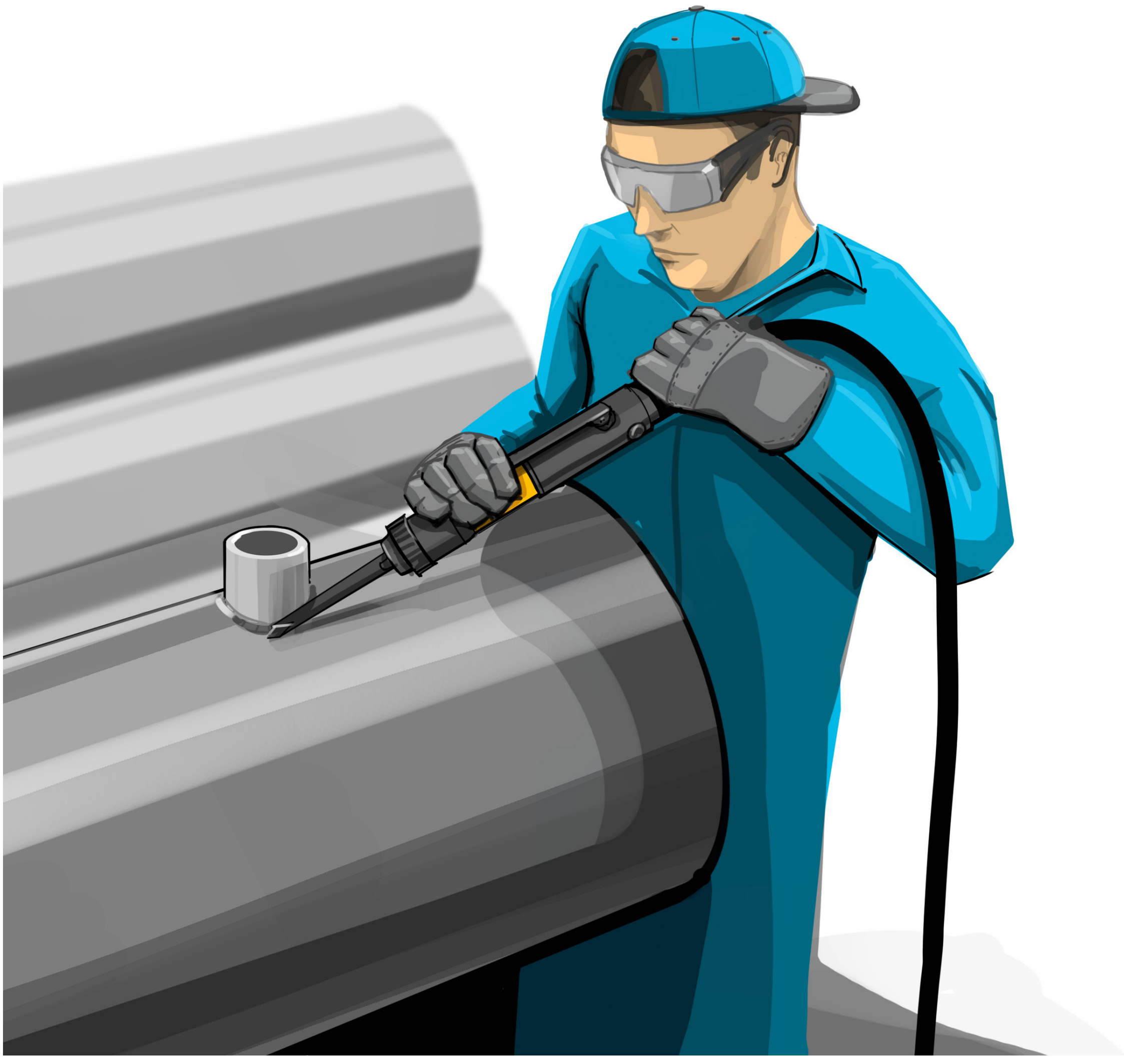
Introduction

Selecting the right hammer for the application is crucial for the performance. And once you have made the choice – productivity is kept high. Now you just need to know how to choose.

The key to high productivity is understanding what tool specifications actually can do for performance – and how they can be translated to optimize your process.

Chipping hammers and scalers are widely used in all kinds of metalworking, construction and other industrial areas. The workpiece can be metal in different forms (cast, welded, sheet etc.), concrete, stone or other materials. Typical applications for chipping hammers are cutting, de-burring, cleaning, hole-making, edge cutting and light demolition.



The metal matters

Metals come in different alloys and hardness, and construction material such as concrete can be reinforced. This makes it challenging to find a chipping hammer best suited for the job, as different variants (alloys) of the same material may have different mechanical properties.

This short whitepaper will help you to choose the right hammer for your application. It will also describe how tool specifications relate to the rate of material removal, to make sure that you select a hammer that will improve productivity.

Selecting hammer from a material perspective

For soft materials where the intention is scaling – not demolition – scalers or small chipping hammers with low impact energy or short stroke are preferable. The impact energy is sufficient to remove the material but not too high to damage surrounding areas. Productivity is kept high thanks to the high impact rate. Reinforced soft materials may need a hammer with higher blow energy, to be able to penetrate the material and keep the productivity at a high level.

For light chipping and scaling of weld flux, rust and paint removal, together with cleaning of castings, a scaler or small chipping hammer with high blow rate is ideal. There is rarely a need for high impact energy as the material is easily removed. Too high impact energy increases the risk of unnecessary damage to surrounding areas. Rust and paint removal is preferably done with a needle scaler or a scaler with a wide chisel.

For tougher materials, such as metals, the choice of chipping hammer depends on the metal, alloy and application. For removal of flash from light-alloy materials and iron castings, a small chipping hammer can be used. Sheet cutting requires small or medium sized chipping hammers. These hammers have higher impact energy, which is required to penetrate the material. Small and medium sized chipping hammers are also suitable for light fettling of castings, splitting spot welds and plug hole drilling.

Heavy chipping and trimming work on steel structures, requires medium or large sized chipping hammers. The large hammers can also be used to remove burnt-on sand or for concrete demolition.

Large chipping hammers are also well suited for cleaning foundry crucibles, cement mixers and more.

Selection guide - Chipping & Scaling

	Scaler	Light chipping hammer	Medium chipping hammer	Large chipping hammer
Slagging welds	o	o		
Fettling castings		o	o	o
Joint and root chipping			o	o
Sheet-metal cutting		o	o	
Rust and paint removal	o*	o		
Hole-making or light demolition			o	
Trimming concrete	o	o		

*Needle scaler

Understanding the hammer specifications

P=E*f

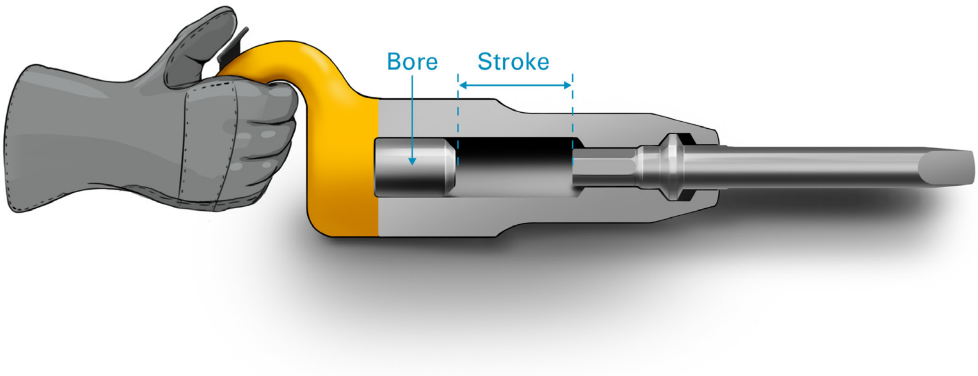
E = Energy per blow
f = Impact rate

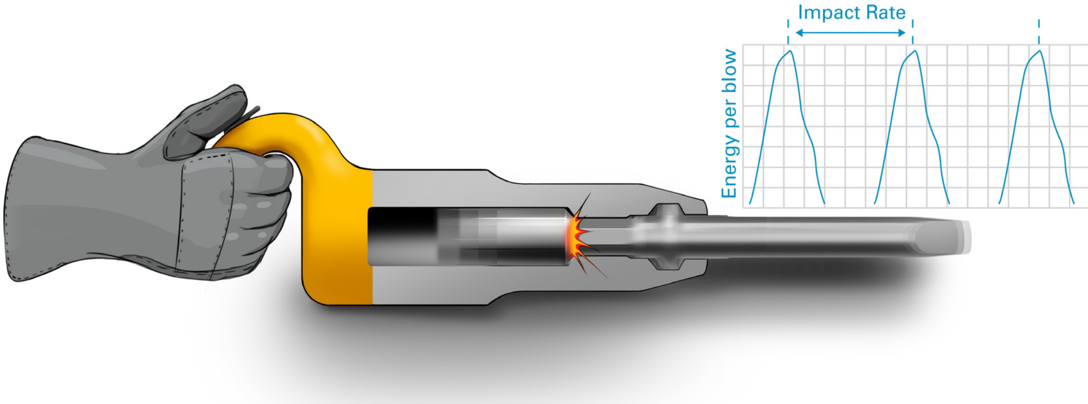
In the past, heavier hammers meant more **power** and increased **material removal rate**. The weight may still be a valid measure for conventional hammers, but with the introduction of vibration damped hammers, the tool casing could be made out of light-alloys. Light-alloys reduce the weight of the tool – but do not alter the power. In fact the power is kept at the same level as a conventional hammer. To find the most productive hammer, other tool data than weight has to be evaluated to understand which hammer to choose.

Rate of material removal is perhaps the clearest indicator of performance and is best described with Energy per blow and Impact rate (blow frequency), measured in Joule and Hertz. The power is Energy per blow multiplied by Blow frequency, and it is measured in Watt.

Increased power is attained by either increasing the blow energy, the impact rate, or both. Increasing both at the same time is in most cases not feasible as higher energy requires large pistons and long strokes – designs that typically reduce the impact rate. Note that the energy per blow must be high enough to penetrate the material of the workpiece, to deform or demolish it. Otherwise, material removal isn't possible, regardless of the impact frequency. However, as long as the energy per blow is enough, higher impact rate will increase the material removal rate.

Not all manufacturers measure Blow energy. To get an idea of the performance, there are other technical data that can be looked at. Impact rate, stroke and bore (or piston diameter) are normally given by all manufacturers and give an indication of the performance. The energy per blow is proportional to the mass and impact velocity of the piston. The piston's mass is normally related to the bore and the impact velocity corresponds to the stroke. Longer stroke and larger bore result in high energy per blow.





Examples

Hammers with the same impact mechanism

Table 1 shows an example of the correlation between bore, stroke, impact rate and energy per blow for hammers with the same impact mechanism. Hammer 1 has shorter stroke and smaller bore, compared to hammer 2 which shows higher impact rate, but lower energy per blow.

Table 1. Hammers with the same impact mechanism.

	Impact rate [Hz]	Energy per blow [J]	Bore [mm]	Stroke [mm]	Power [W]
Hammer 1	57	2.0	18	33	114
Hammer 2	38	4.4	22	43	167

Hammers with different impact mechanism

For hammers with different impact mechanisms (Table 2) it is not as easy to compare hammers just based on bore and stroke data. Hammer 3 has longer stroke and consequently higher energy per blow, but it also has a higher impact rate. However, hammer 3 has a stroke that is 55% longer than hammer 2, but the energy per blow is only 25% higher. So hammer 2 has – for its size – a very efficient impact mechanism.

Table 2. Hammers with different impact mechanism.

	Impact rate [Hz]	Energy per blow [J]	Bore [mm]	Stroke [mm]	Power [W]
Hammer 3	45	5.5	24	67	248
Hammer 2	38	4.4	22	43	167

Conclusions

For tools of the same size and similar impact mechanism, it is worth noting that:

- Short stroke means high impact frequency and low energy per blow
- Long stroke means low impact frequency and high energy per blow
- Small bore means low energy per blow
- Large bore means high energy per blow

Checklist for determining performance:

1. Energy per blow (in J)
2. Impact rate (in Hz or rpm)
3. Bore and stroke (similar dimensions often indicate roughly similar performance)
4. Air consumption