Understanding and Maximising the characteristics that influence Efficient Blasting

South Africa
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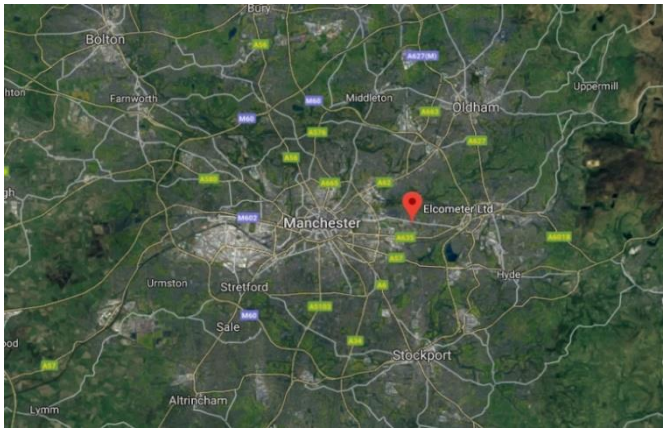
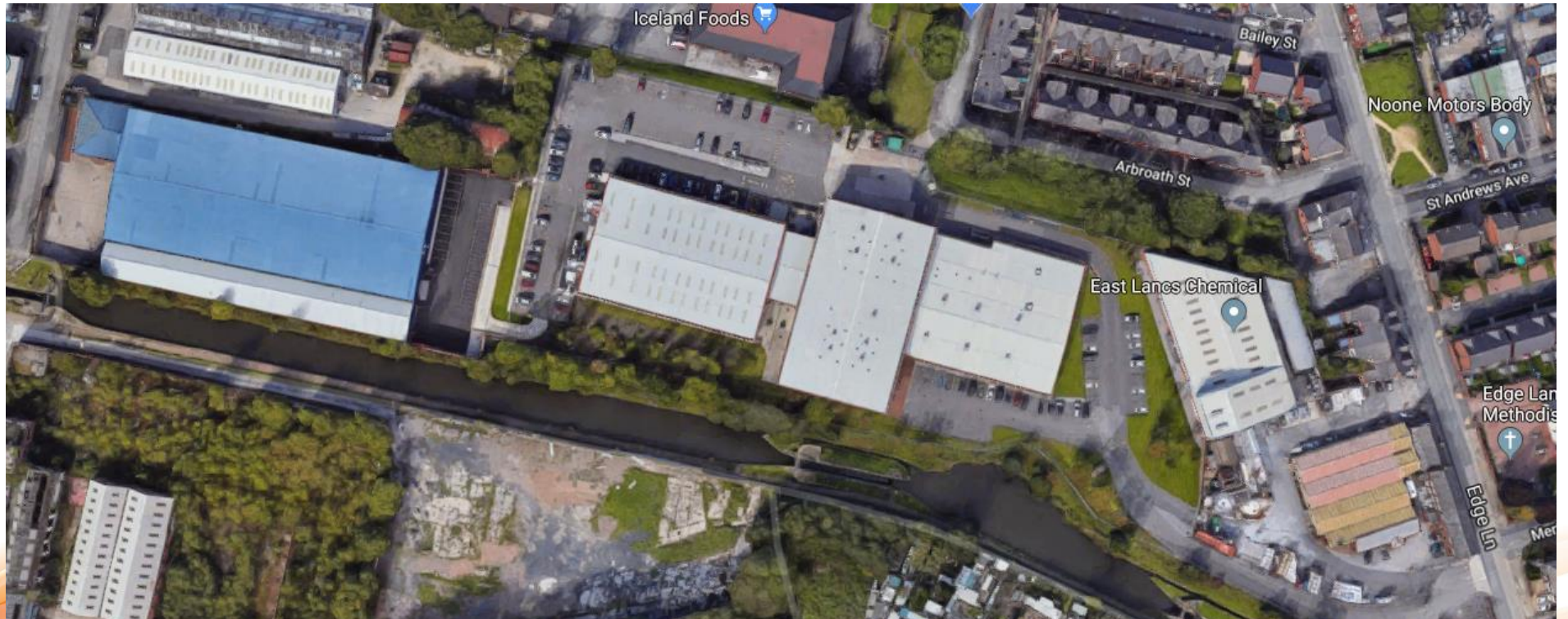
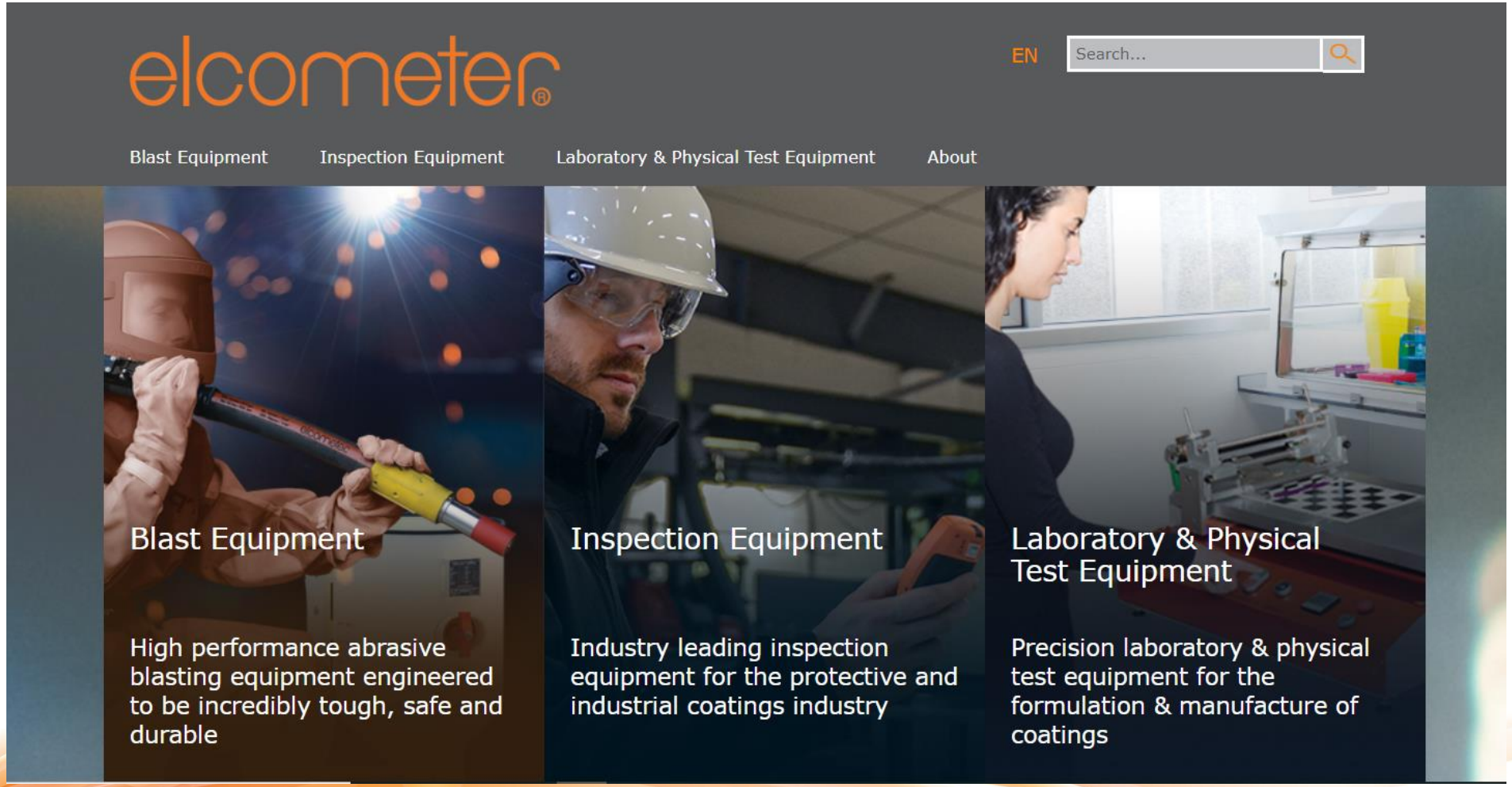
Where is Elcometer?





What is Elcometer?

We have changed!



Elcometer Blasting Equipment

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Elcometer Blasting Equipment

- What is Blasting?
- Key Aspects of Blasting
- The Elcometer Advantage
- Elcometer Testing - Proving the concept
- Simulation Software
- The Elcometer Blast System & other USP's

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What is Blasting?

Abrasive blasting is the operation of forcibly propelling a high speed stream of abrasive material against a surface to either smooth or roughen a surface or remove surface contaminants

A pressurised fluid, typically compressed air, is used to propel the blasting media

There are several variants of the process using various media

- Highly Abrasive: Shot blasting and Grit blasting
- Moderately Abrasive: glass bead and plastic media blasting
- Mildly Abrasive: Sodablasting
- Light or Non Abrasive: Ice blasting and Dry-Ice blasting

The first abrasive blasting process was patented in1870

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Key aspects of Blasting

There are a number of key parameters which affect the performance of the blast process

These include:

- Compressor Pressure & CFM Capacity
- Blast Pot Pressure Loss
- Blast Hose Pressure Loss
- Nozzle Selection (Outlet CFM)
- Total System Losses

However the key aspect of blasting is **Nozzle Pressure**

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The Blasting Process

- Abrasive Media is accelerated by Nozzle Pressure and CFM capacity of the nozzle in the normal blasting process
- The Abrasive is 'energised' by this process and impacts the surface at high speed with high kinetic energy & high momentum
- Due to high abrasive hardness this impact energy is transformed into impact damage or profile on the surface of the component being abraded
- The key characteristics affecting the process are abrasive hardness, abrasive breakdown, abrasive energy and abrasive speed
- Hardness is abrasive specific
- Kinetic Energy = $\frac{1}{2}$ mv^2 i.e. dependent upon grit mass and speed

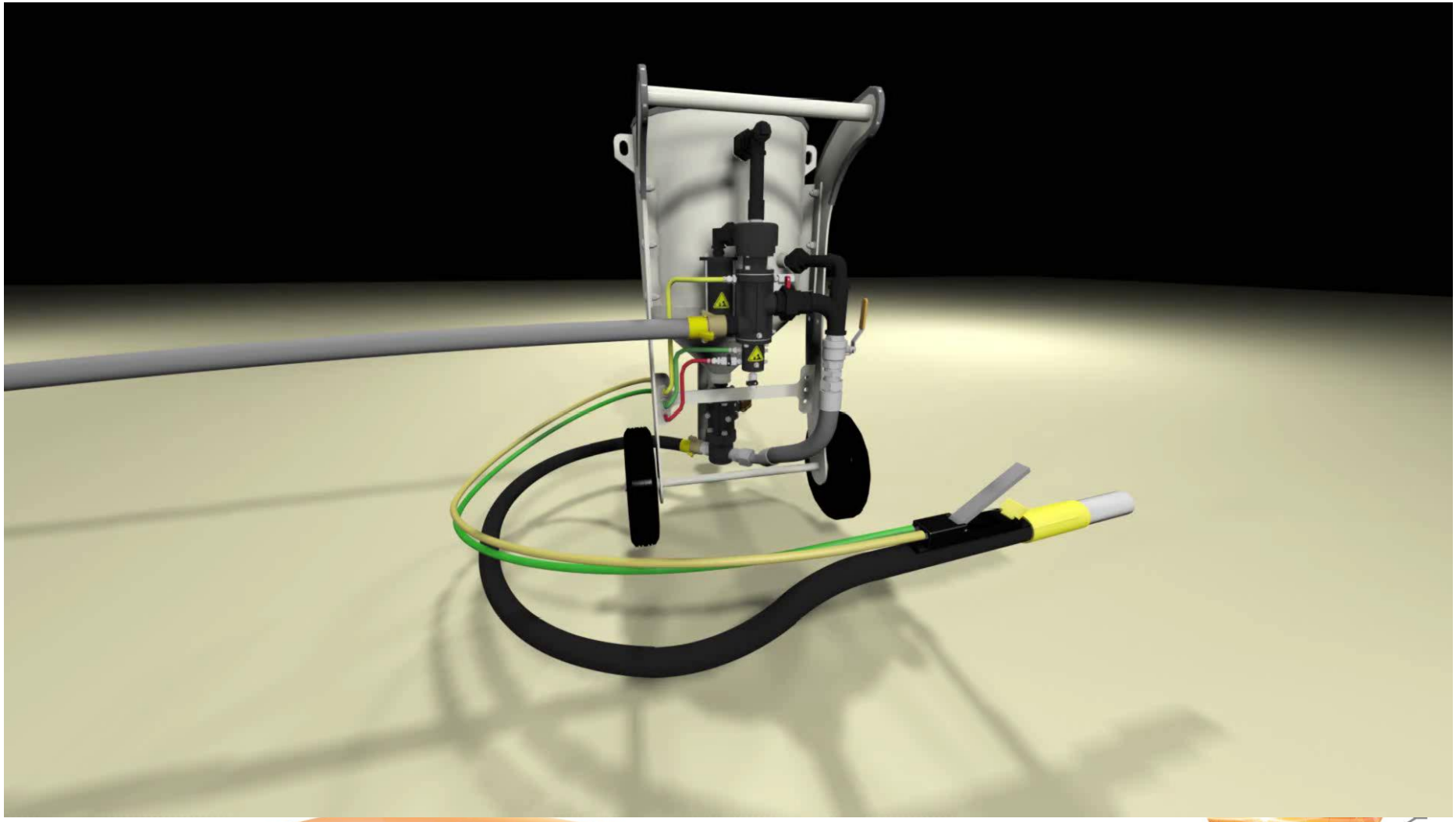
The Blasting Process

- It is necessary for the abrasive to impact the surface with high energy and speed in order to profile the surface
- As the mass of the abrasive is relatively constant (except aluminum grit) then the abrasive speed or velocity is critical
- Abrasive speed is generated by nozzle inlet pressure. The higher the pressure the higher the speed. As a result high nozzle pressure is critical to the success of the blast operation
- There is a 'natural' maximum nozzle working pressure of approximately 7.5 bar (where site conditions allow) which is restricted by the strength of the blaster

The Blasting Process

- There is a 'natural' maximum nozzle working pressure of approximately 7.5 bar (110psi) which is restricted by the strength of the blaster
- There are many publications that refer to '100%' blast efficiency at 7.5b or 110psi. No such restriction actually exists. Other publications refer to 1.5% efficiency gains achievable from each 1psi pressure increment. This is also misleading
- Nozzle pressure is created by the size of the nozzle and restricted by the CFM capacity of the compressor. Larger nozzles require a greater CFM capacity in order to generate the required pressure
- Larger nozzles provide a greater blast coverage area which, assuming that pressure and CFM is sufficient, will result in greater blast coverage

Airflow explanation



Why should you consider using Elcometer Blast Equipment

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The Elcometer advantage

What is technically different about the Elcometer product?

Elcometer offer two key technical advantages:

1. High Pressure capacity (12 and 15 bar)
   - Provides the opportunity to use bigger nozzles
   - Allows the use of longer blast hose
   - Note: requires higher CFM air supply

2. More efficient Blast Machine air flow
   - Provides additional nozzle pressure at no extra cost

How does that work and why should the market want to do it?

What is Nozzle Pressure and CFM?

- The compressor provides the inlet pressure and CFM capacity
- Compressible Fluid dynamics science tells us that higher nozzle pressure results in greater air (and abrasive) speed from the nozzle
- However high nozzle pressure must be paired with CFM air flow capacity to provide the necessary grit energy
- In simple terms the compressor CFM capacity has support the CFM that can flow from the nozzle
- The 'mix' of compressed air and grit also affects the CFM output of the nozzle
- The CFM flow and blast system operating pressure provides the nozzle pressure
- Long hose lengths and elevation drop nozzle pressure
- Inefficient Blast Machines also reduce nozzle pressure

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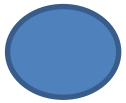
The Elcometer advantage – High Pressure

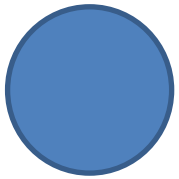
High Pressure Pot Capability

- Assuming that a nozzle pressure of 7.5 bar is required to blast efficiently then Elcometer provides the opportunity to use bigger nozzles whilst maintaining that nozzle pressure

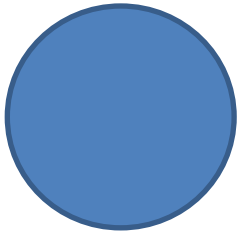
- A suitably pressurised ½" nozzle can blast an area 4 times bigger than the same pressure ¼" nozzle and 75% more quickly than a 3/8" nozzle



¼" Nozzle
Area 31mm²



3/8" nozzle
Area 71mm²



1/2" nozzle
Area 123mm²

- Allows the use of longer and elevated blast hose. Note that nozzle pressure drops by up to 2 bar per 40m for horizontal hose and up to 1 bar per 20m elevation

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Elcometer advantage – why not?

There are a number of perceived arguments against….so lets discuss them

- Compressor Fuel usage
  - High pressure high CFM compressors use more fuel?
  - This may be an additional 6 litres per hour
- Compressor Costs
  - High pressure high CFM compressors are more expensive than lesser machines?
- Media Usage
  - High pressure airflow uses more grit
- I already have a collection of old blast pots
- Elcometer Systems are expensive
- I don't understand the Pressure & CFM argument

Elcometer Testing - Proving the concept

- Elcometer have commissioned a technical paper which is based upon a series of product comparison tests carried out in July 2019
- Testing included Elcometer and four other manufacturers equipment
- The work assessed blast coverage and blast time to remove a 3 coat GF epoxy coating using different pressure and nozzle settings
- The testing measured abrasive usage and pressure losses across the system in each configuration
- The results illustrate the advantage of high pressure blasting in terms of greater blast efficiency and the consequent cost savings that can be achieved

Elcometer Testing – Test Parameters

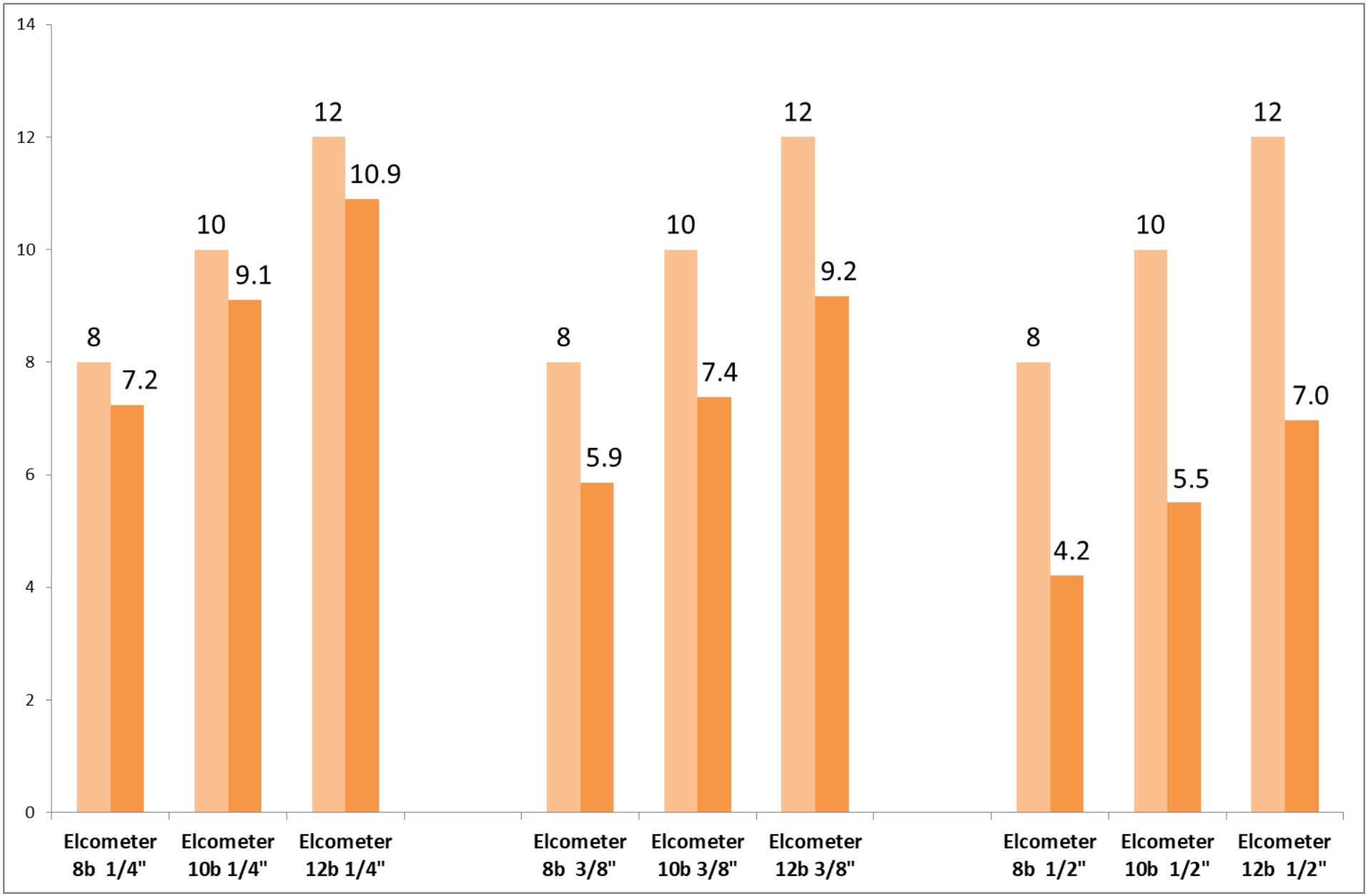
We recorded the below characteristics for each setting:

- Compressor Pressure
- Blast Pot Inlet Pressure
- Blast Pot Outlet Pressure
- Nozzle Pressure
- Blast Time per m^2
- Abrasive Usage
- Relative Humidity

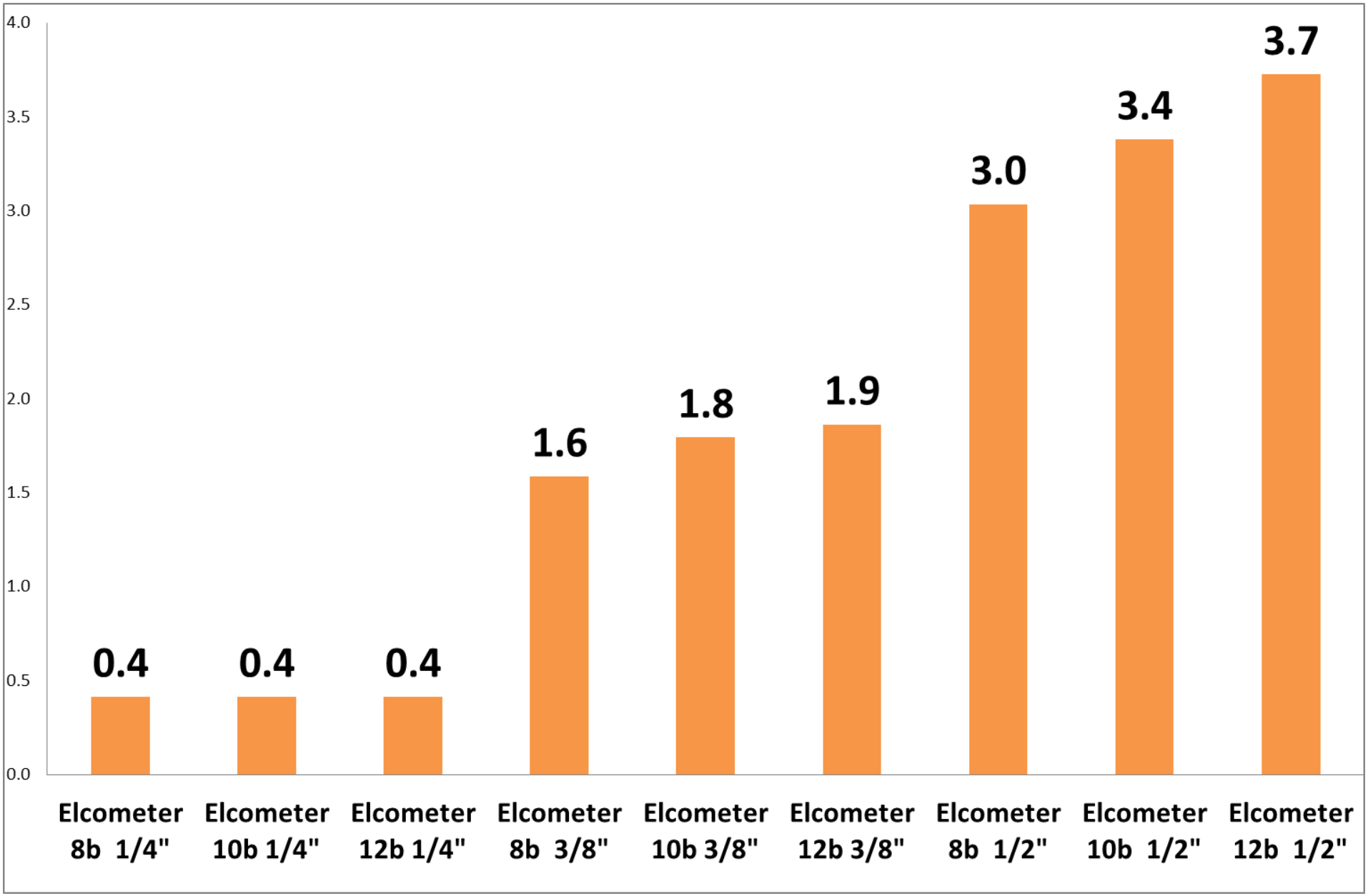
We calculated the below characteristics for each setting:

- Grit Valve Setting
- Abrasive used per m^2
- Abrasive Cost per m^2
- Clean Up Cost per m^2 (not including disposal)
- Fuel Costs per m^2
- Blast Team Labour Cost per m^2
- Compressor Rental/Purchase Cost
- Blast Pot Depreciation Cost per m^2

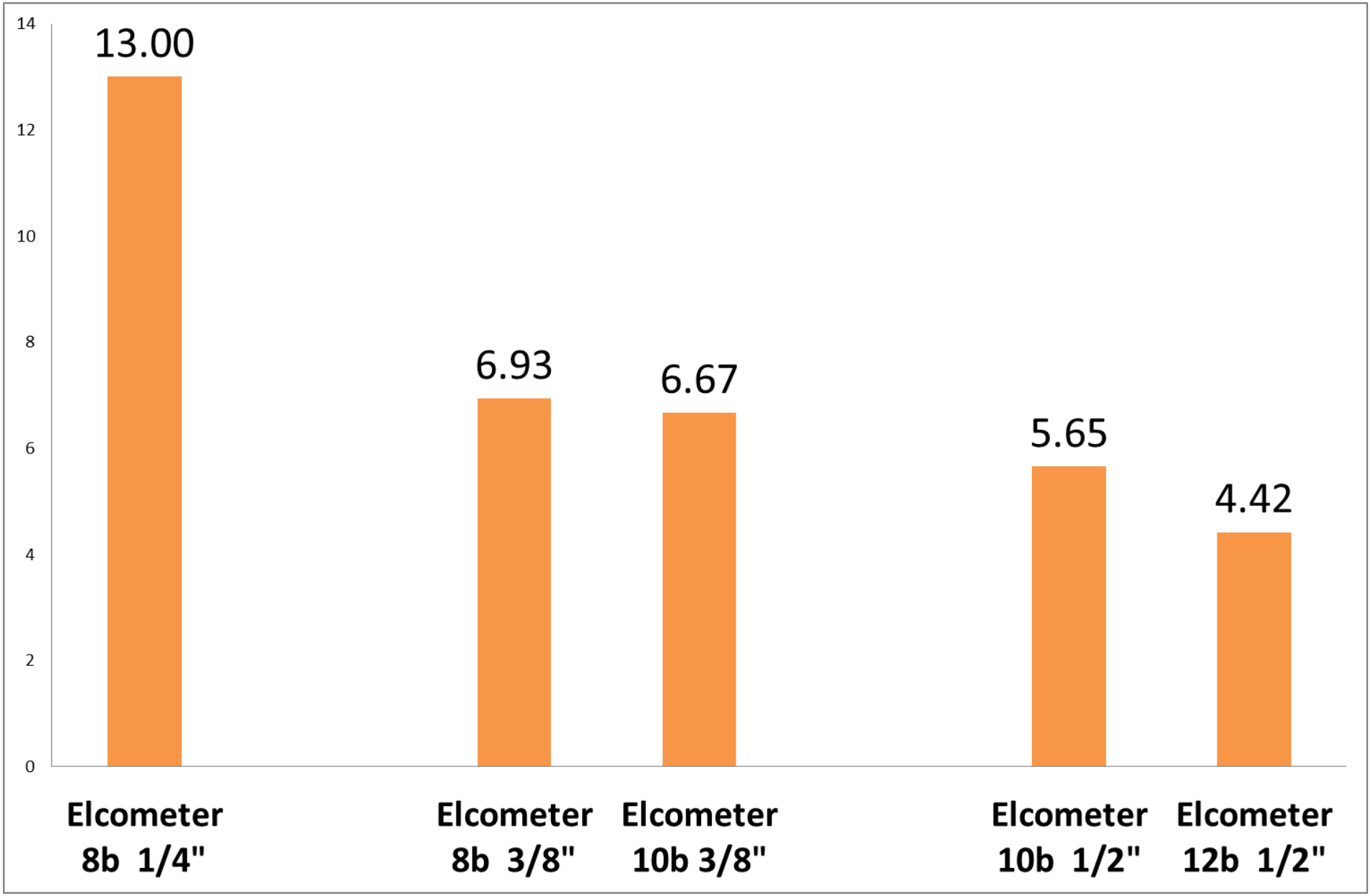
Typical System Pressure Losses (90m)



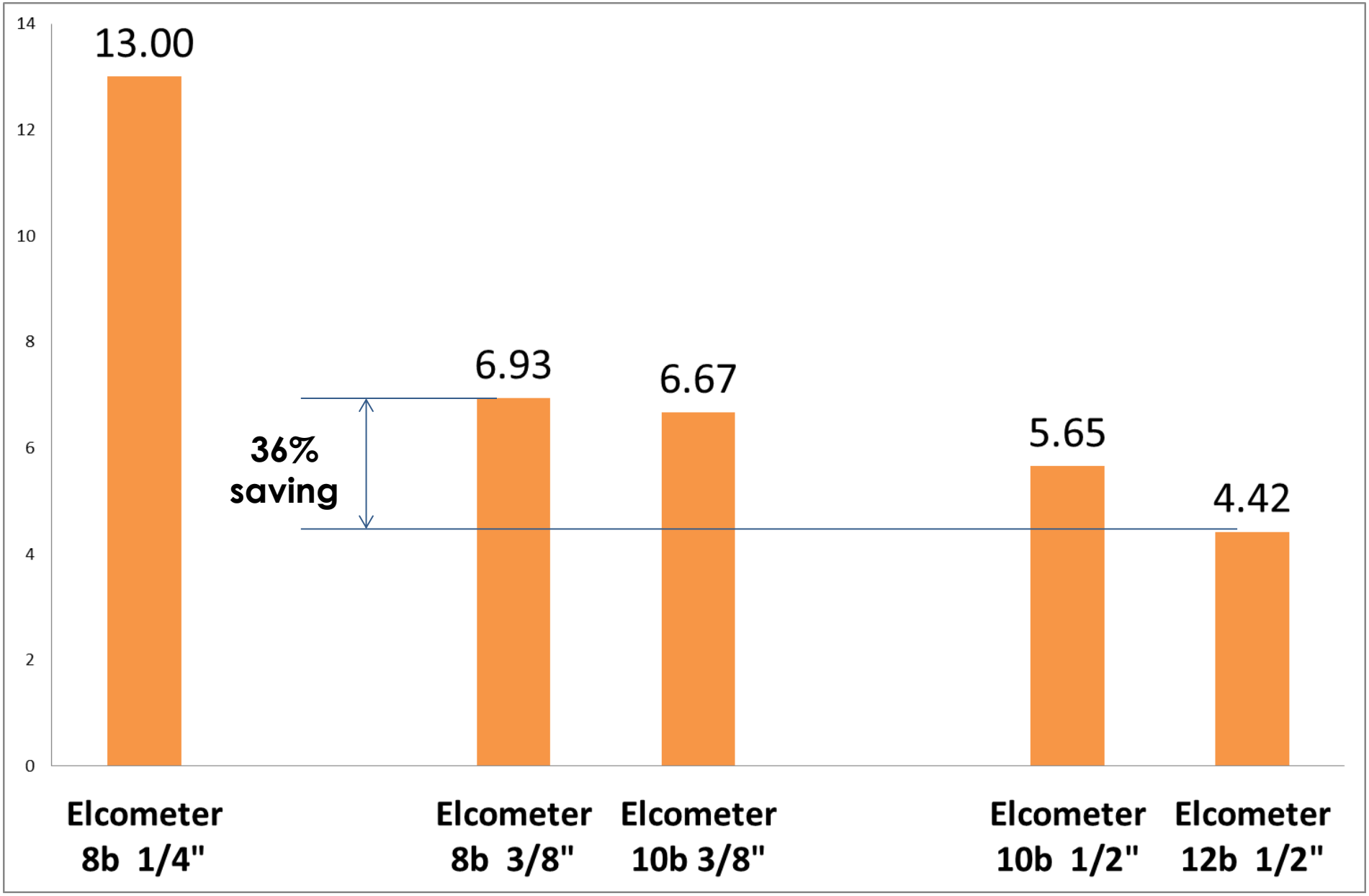
Hose Pressure Loss (90m hose)



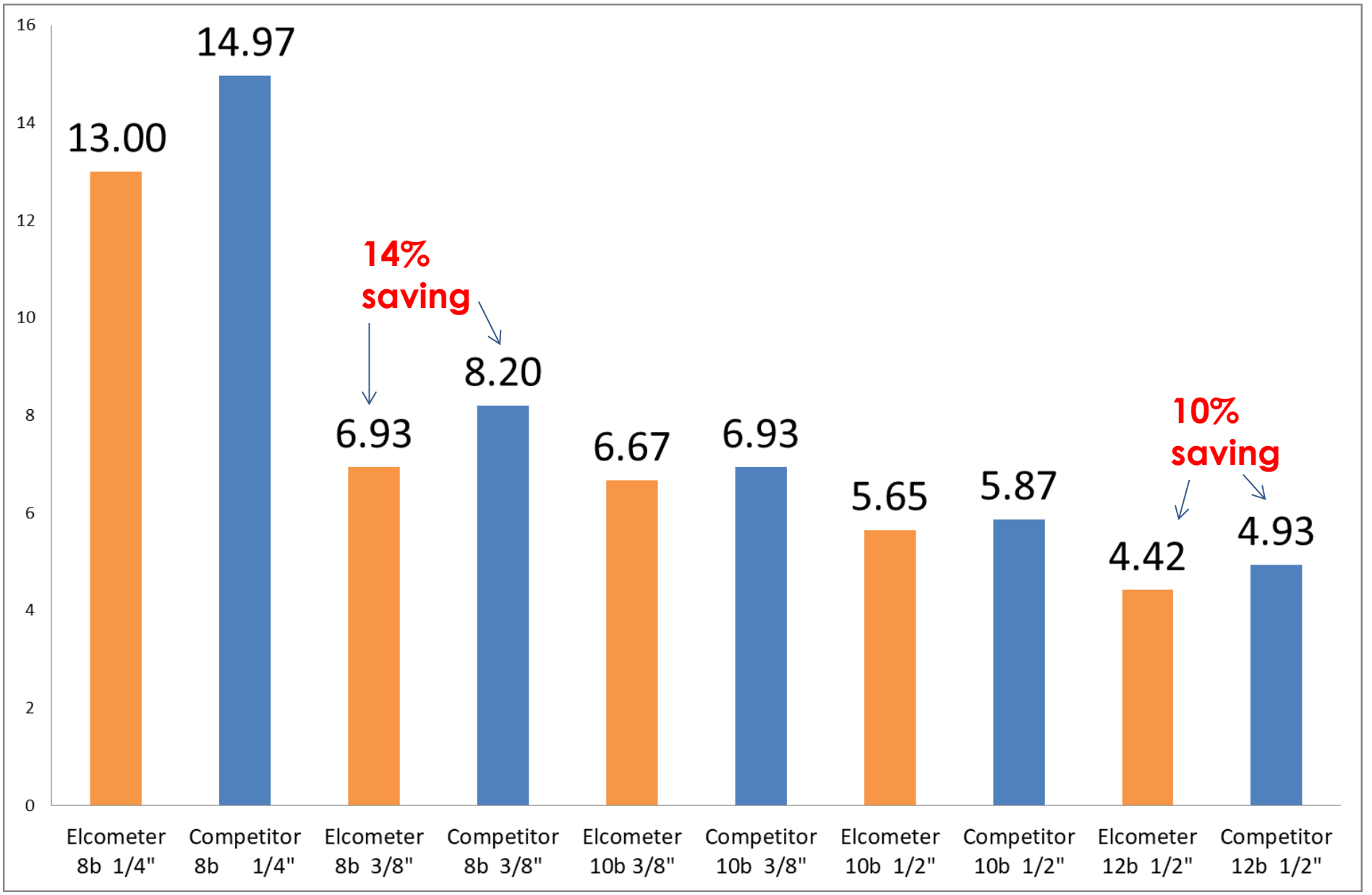
Blast Time in mins/m²



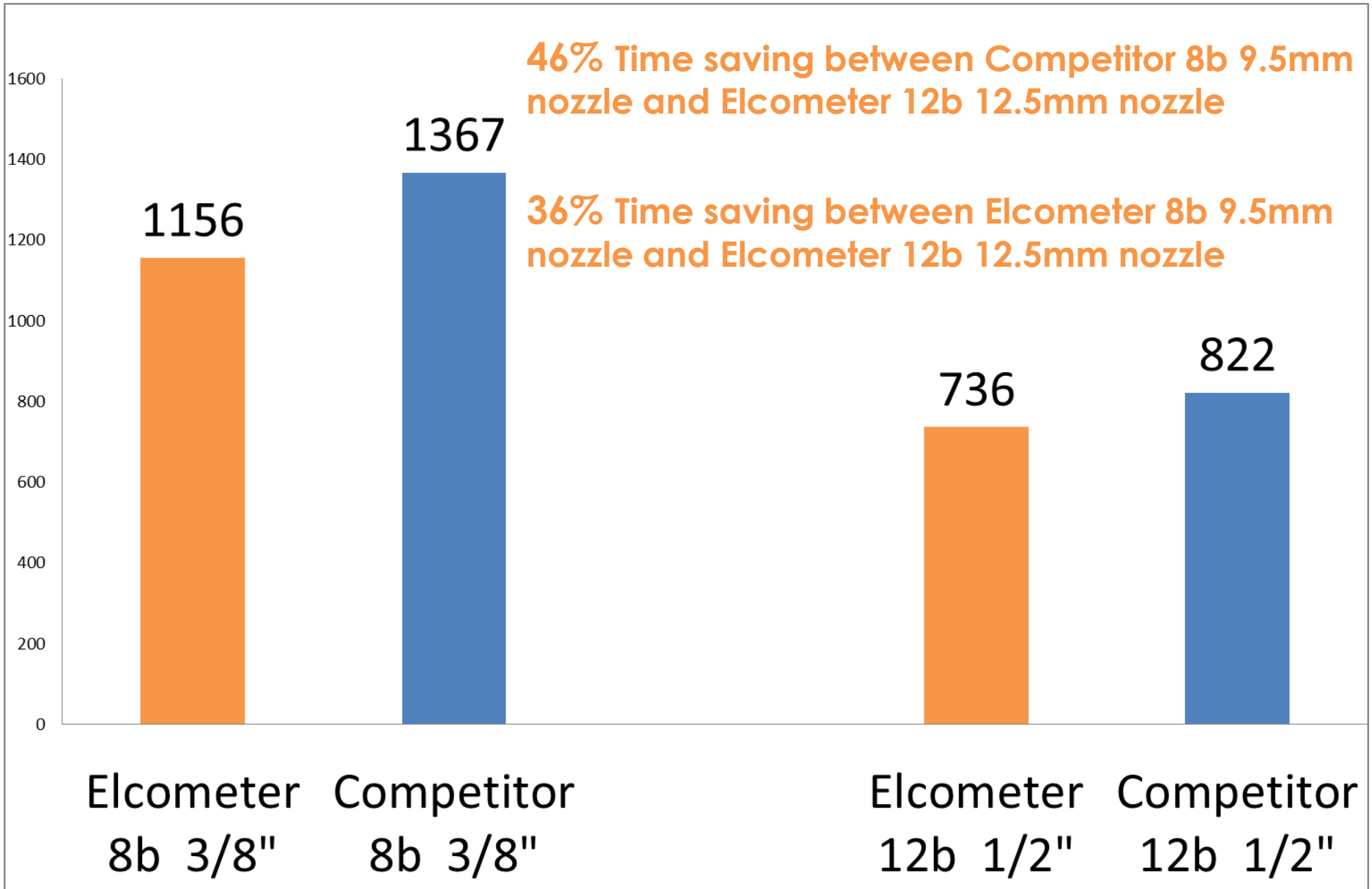
Blast Time in mins/m²



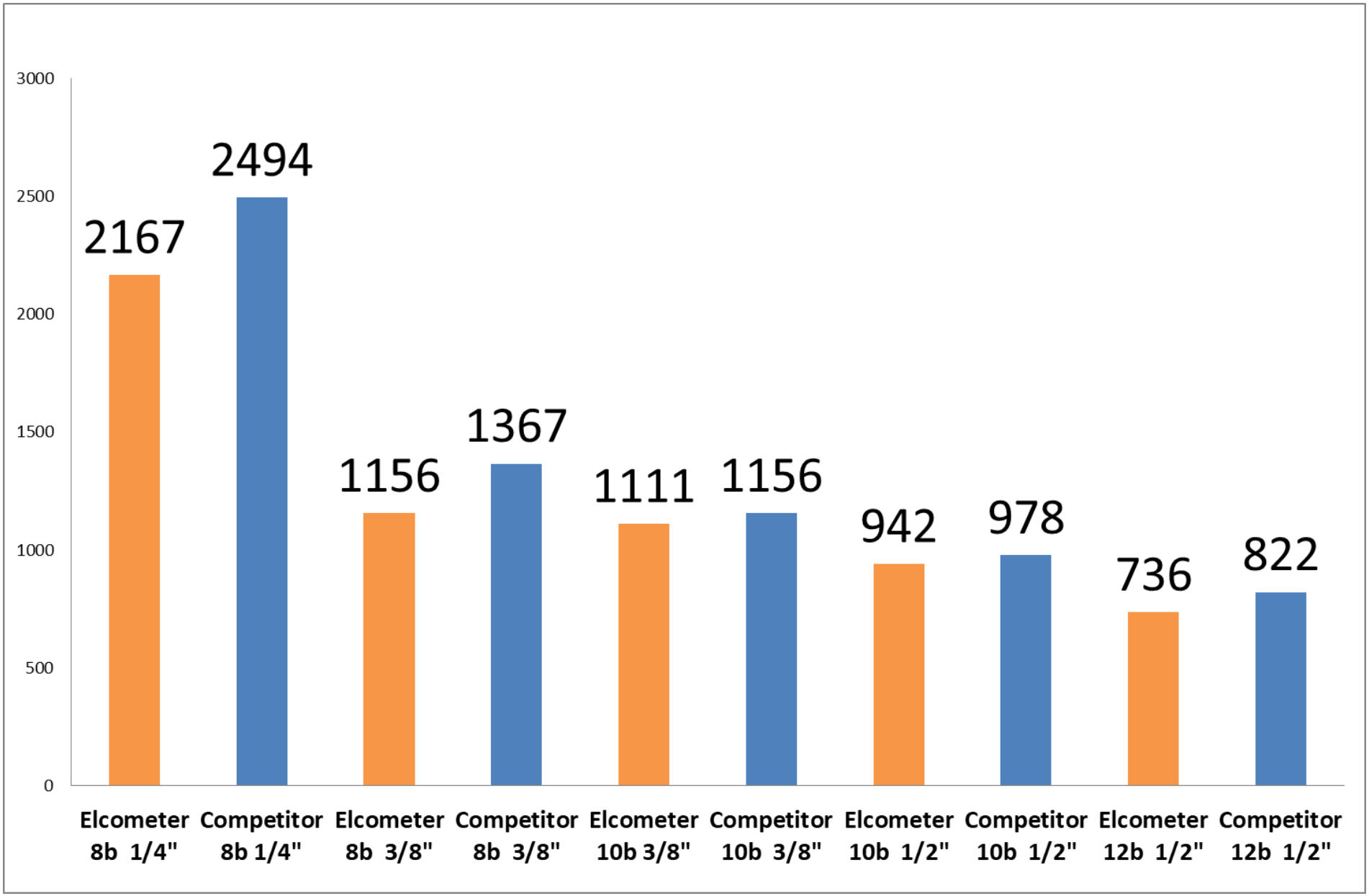
Blast Time in mins/m²



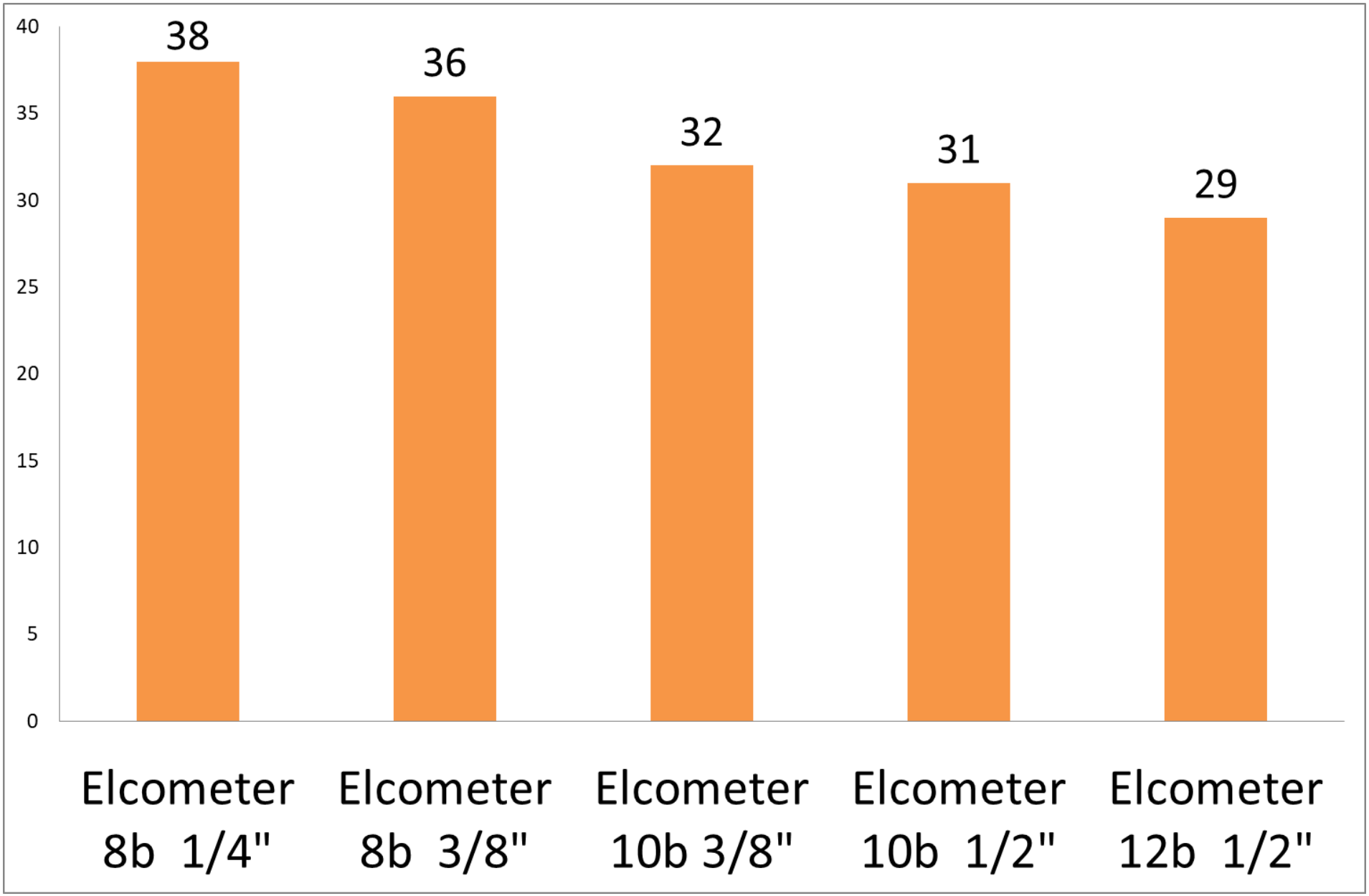
Blast Time (hours per 10,000m²)



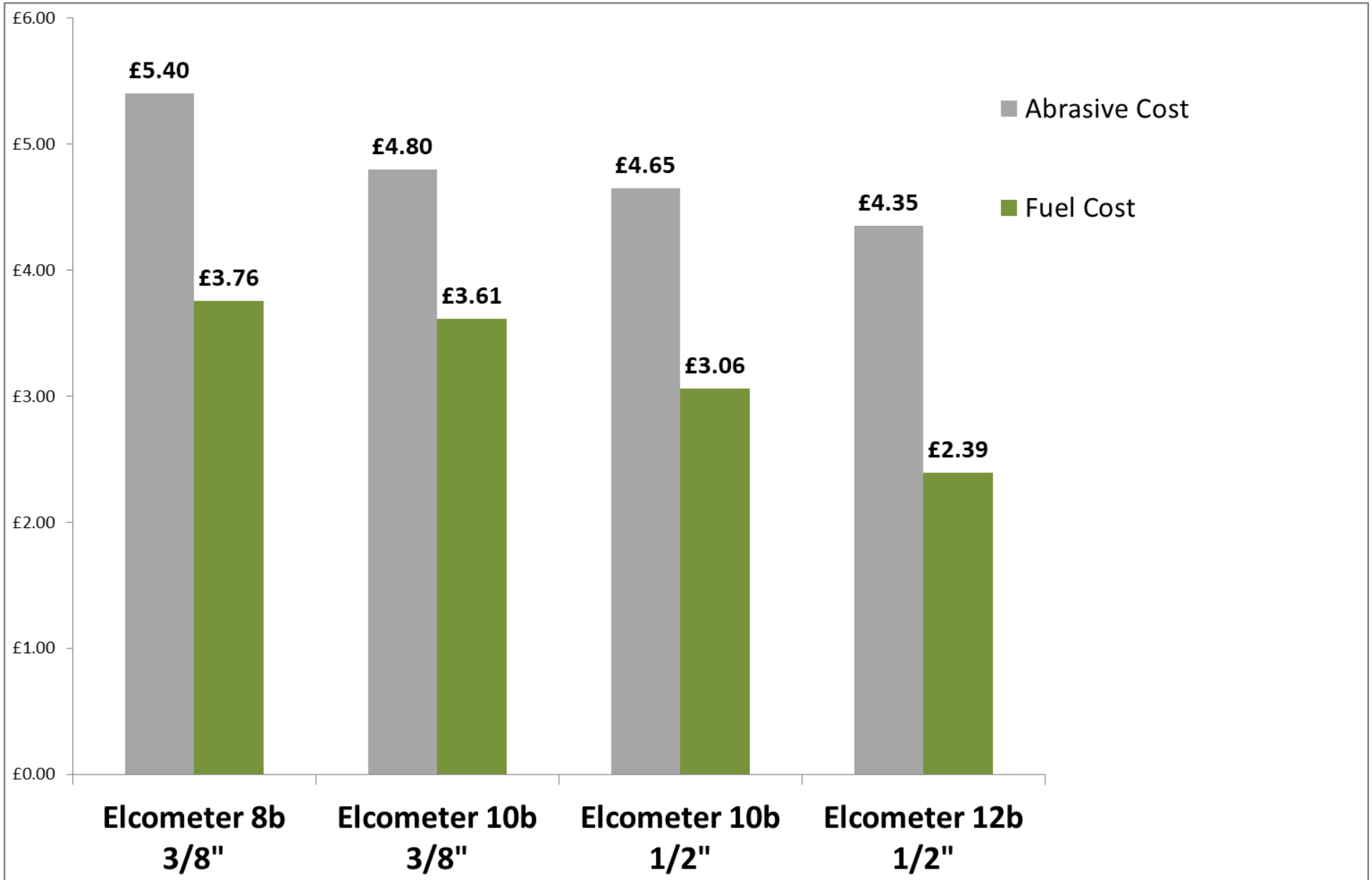
Blast Time (hours per 10,000m²)



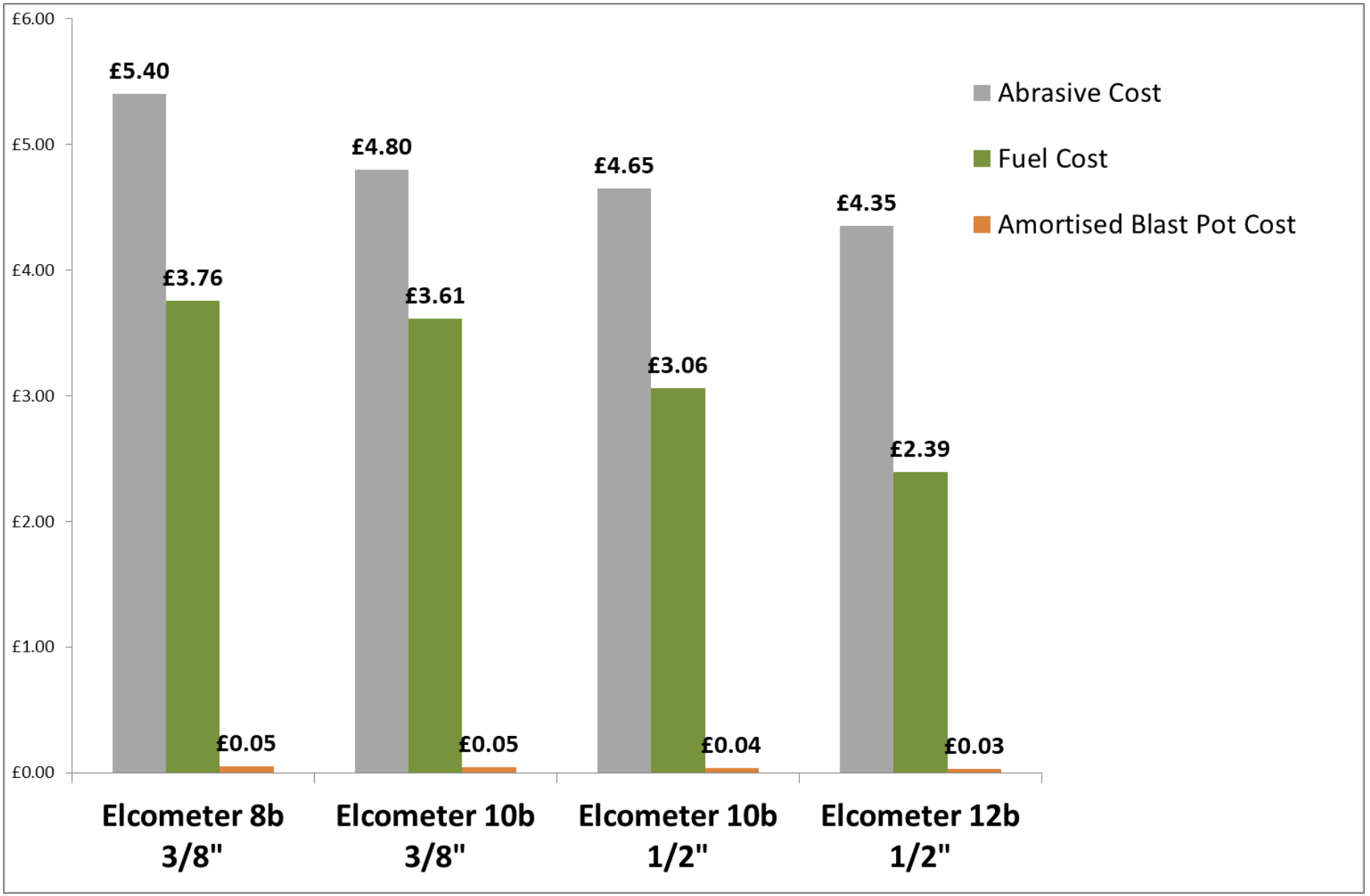
Abrasive Used kg/m²



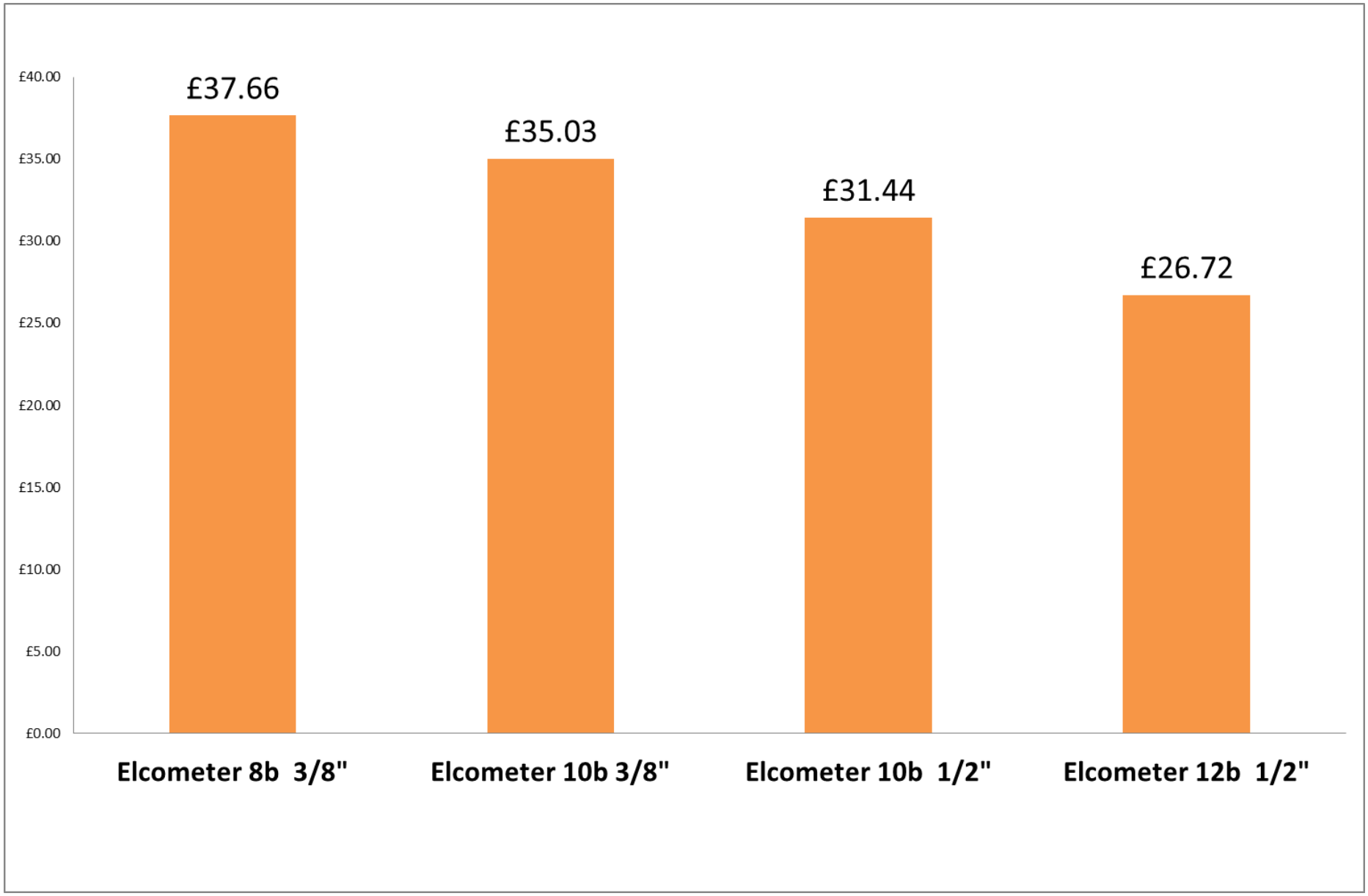
Fuel & Abrasive Cost per m²



Fuel, Abrasive & Blast Pot Cost per m²



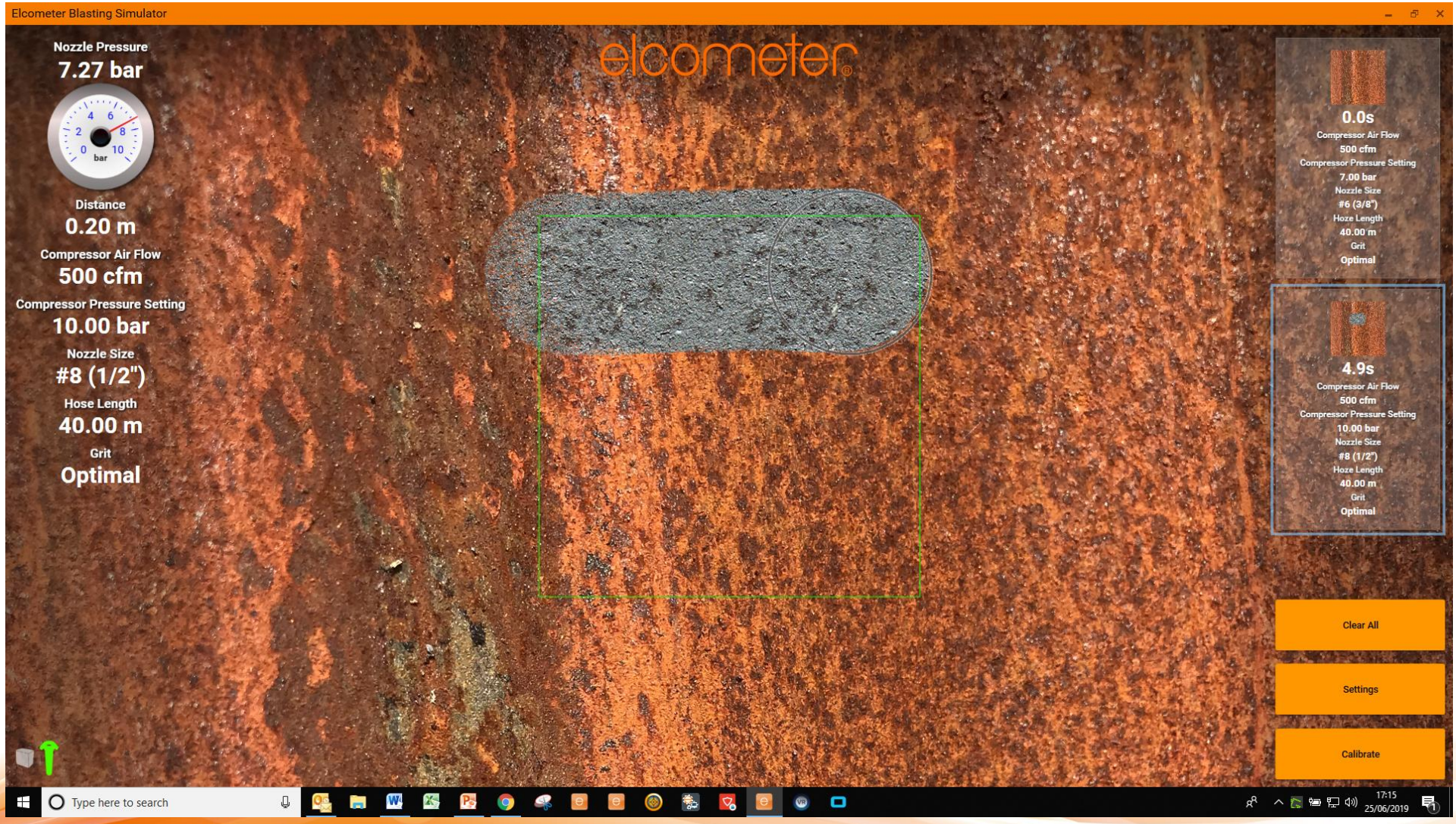
Total Blasting Cost per m² (GBP Sterling)



Total Blasting Cost per m² (GBP Sterling)

Elcometer Simulation Software

Introducing ElcoBlast blast parameter simulation software



The Elcometer Blast System & USP's

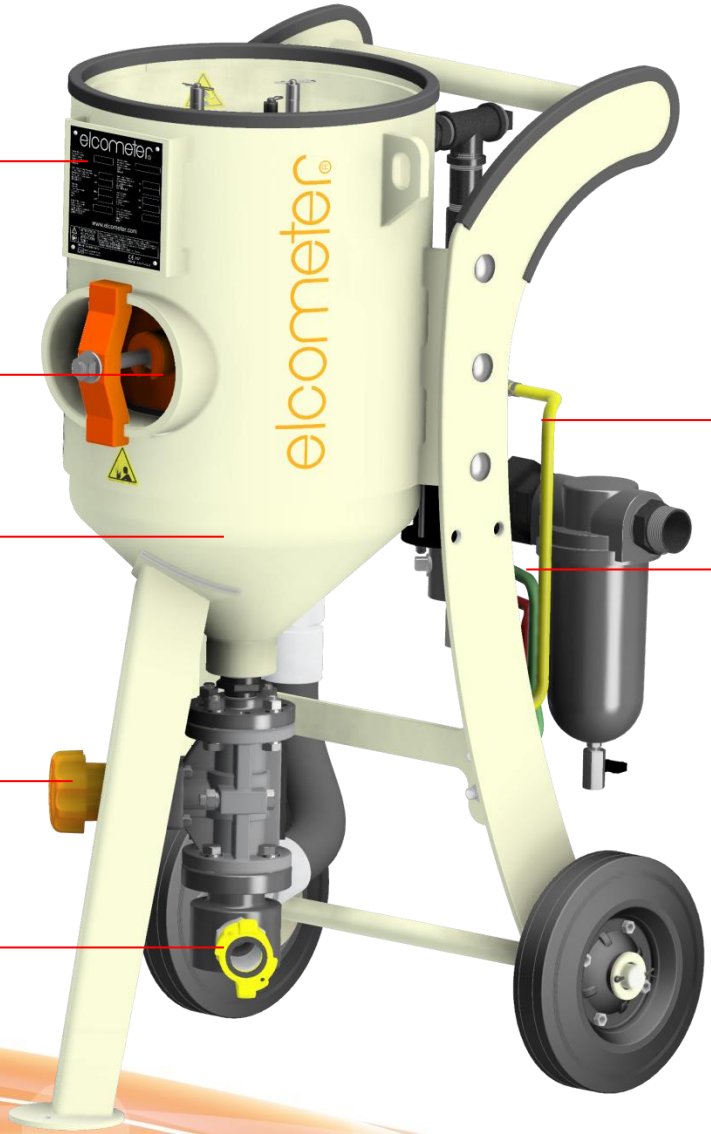
Pressure Rating Plate (Test Plate)

Vessel Door & clamp/Yoke

Pressure Vessel

Grit Valve

Nozzle Hose Connection



Dead Man's Handle hose connections

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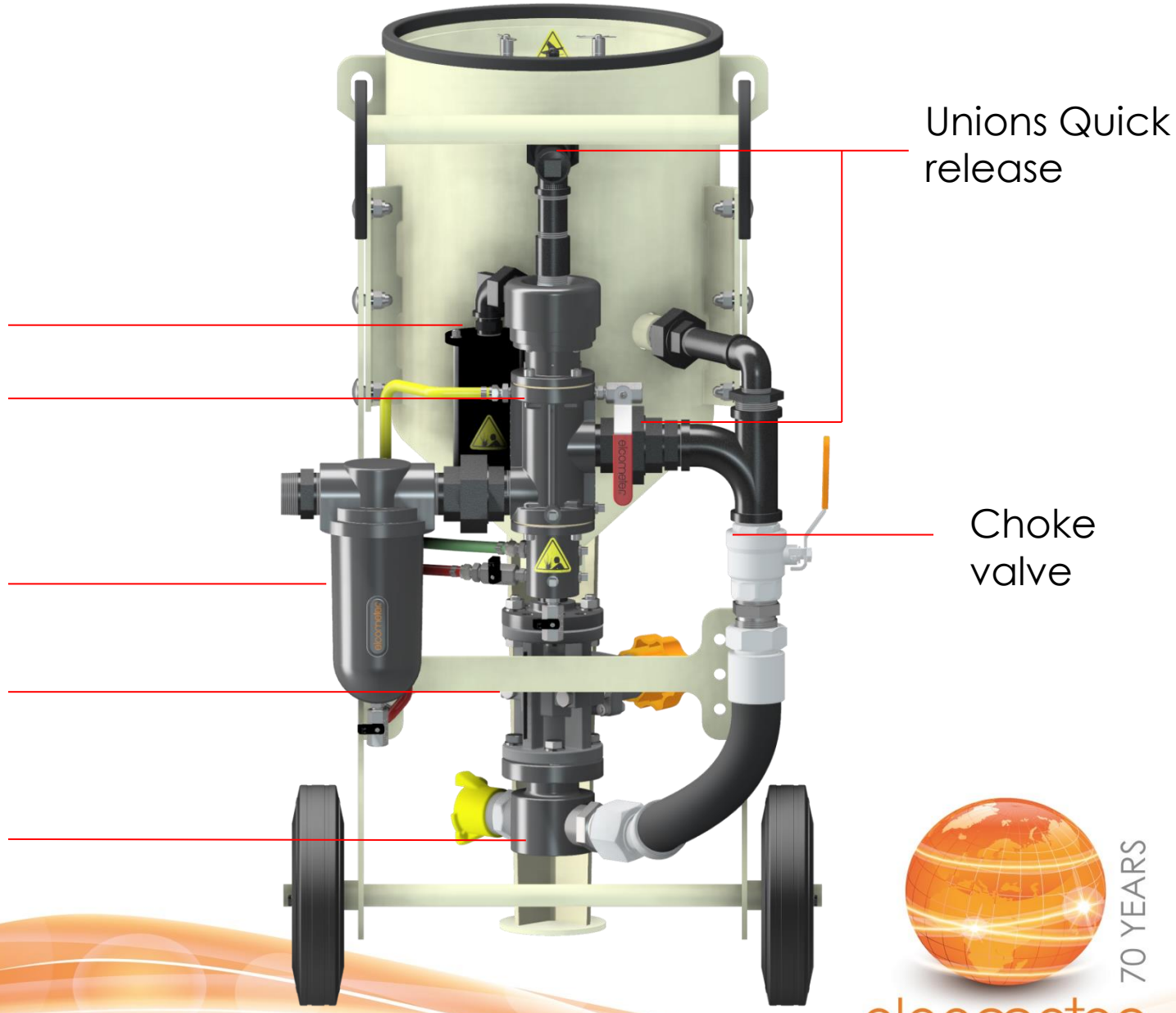
The Elcometer Blast System & USP's



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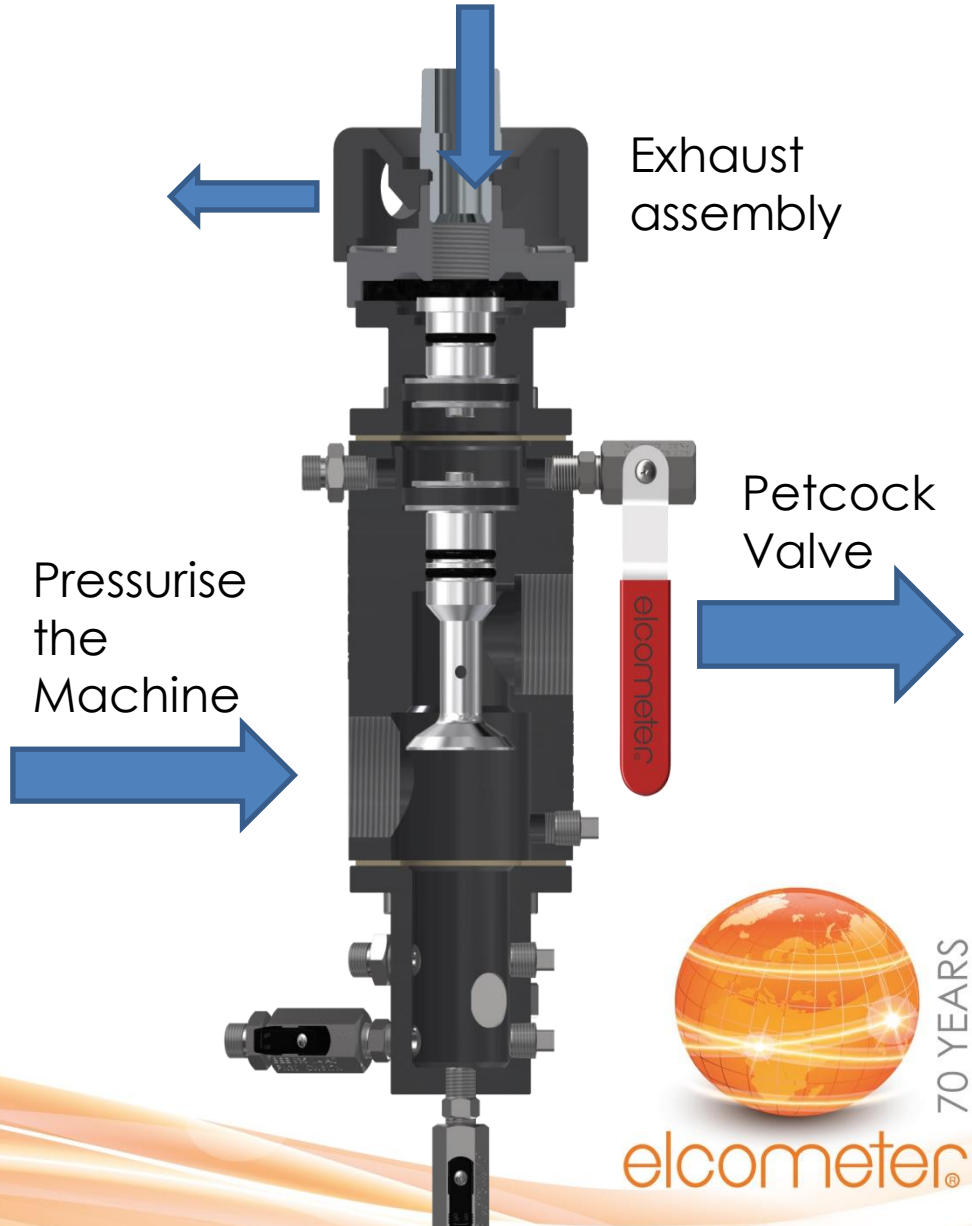
Safety & Reliability

Remote Control Valves

Reduced air loss remote control valve

The Elcometer RCV4000 & RCV4000+ Remote Control Valves allow you to safely control the blast machine at the nozzle. The high flow exhaust manifold allows air to exhaust quickly, depressurising the blast machine



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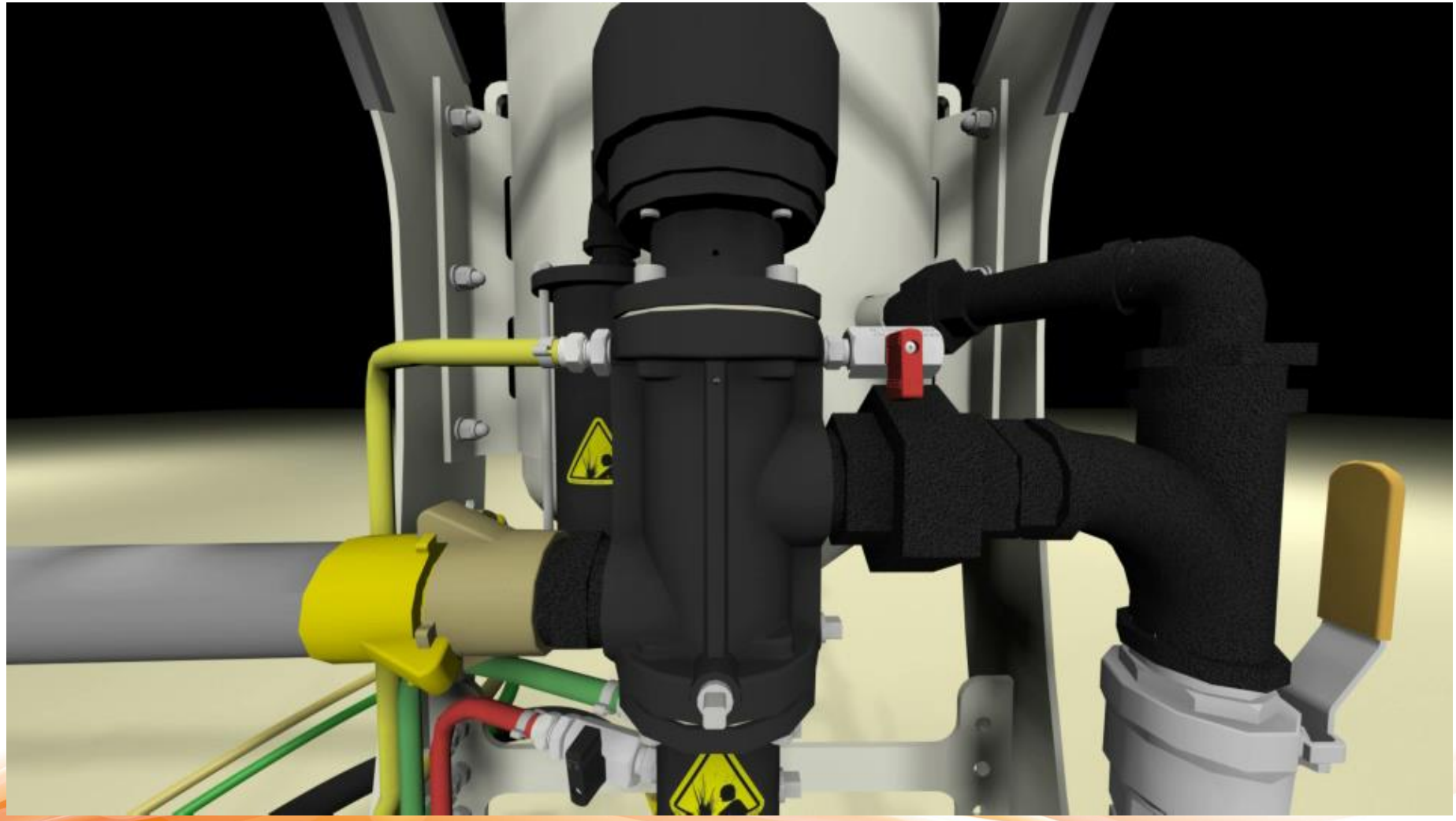
Remote Control Valve

Reduced pressure loss remote control valve



Grit Valves

Grit Valve (GV)

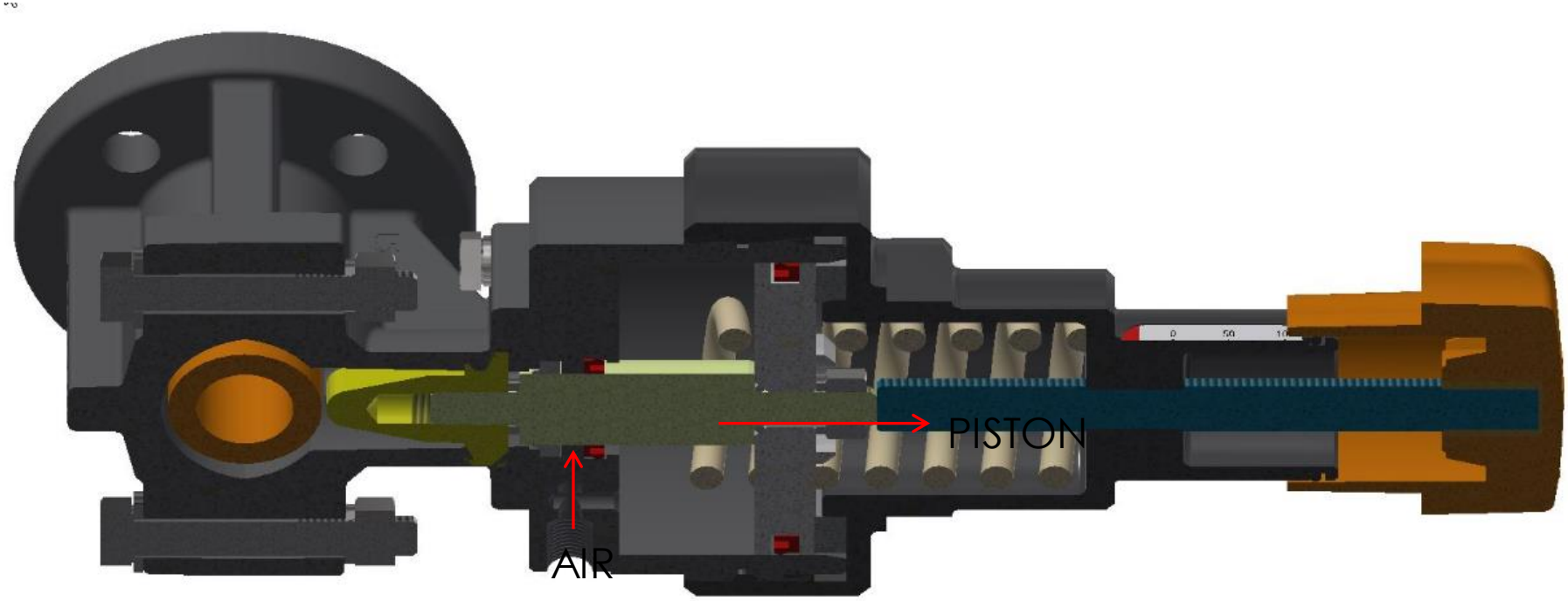
- Replace the liner without removing from the ABM
- Liner wear indicator
- Valve position indicator

Automatic Grit Valve (AGV)

- Automatically shuts off the media flow when the RCV is open
- Liner wear indicator
- Valve position indicator

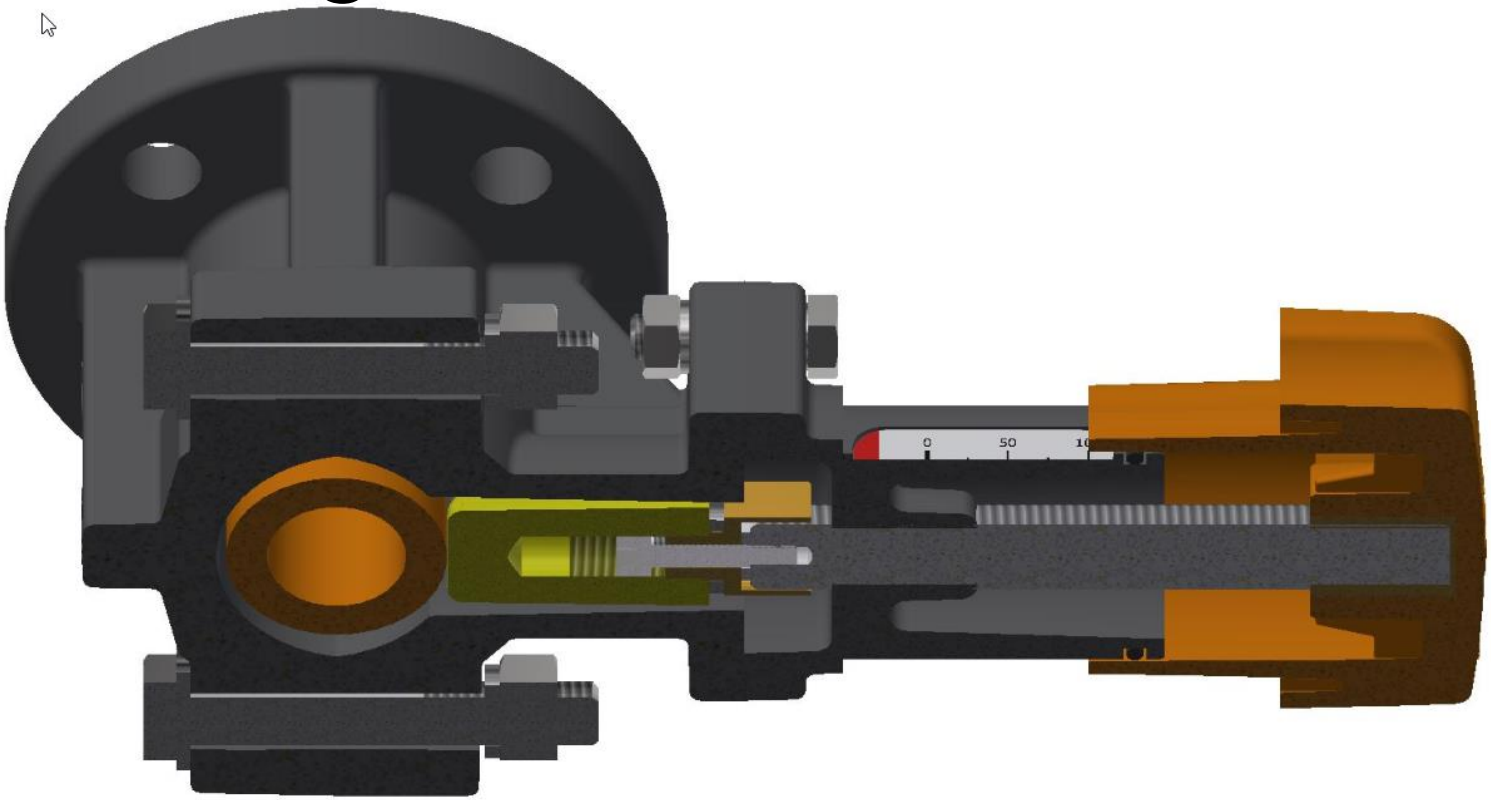
Grit Valves

Automatic Grit Valves



Grit Valves

Setting Indicator



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Grit Valve long life liner

The Elcometer elcoTOUGH Grit Valve liner always returns to it's original position without becoming distorted

It lasts 3-6 times longer than the competitors' liners

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Maximising Uptime

Understanding and Maximising the characteristics that influence Efficient Blasting

Questions?