

LCA of state-of-the-art joining technologies

Erasmio Cadena*, Léo Staccoli, Jose Gutierrez,
Antonio Barona
VERTECH GROUP, France

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Context



Objectives

Global trends are forcing industry to manufacture lighter, safer, more environmentally friendly, more performant and cheaper products: the manufacturing systems engineering sector is aiming at better performing machine components.



Impact

Due to its excellent thermal and electrical properties, copper is the 3rd most frequently used raw material in the world. JOIN'EM directly aims at decreasing the consumption of this high cost material by partially substituting it with aluminium.



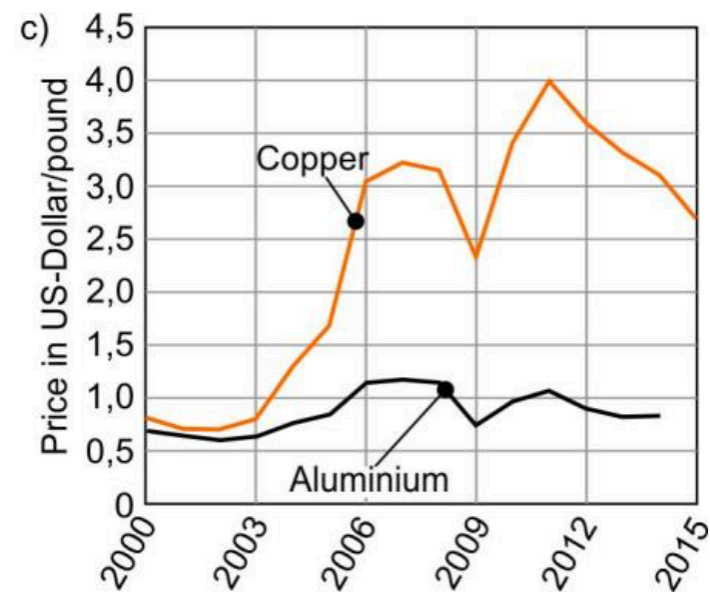
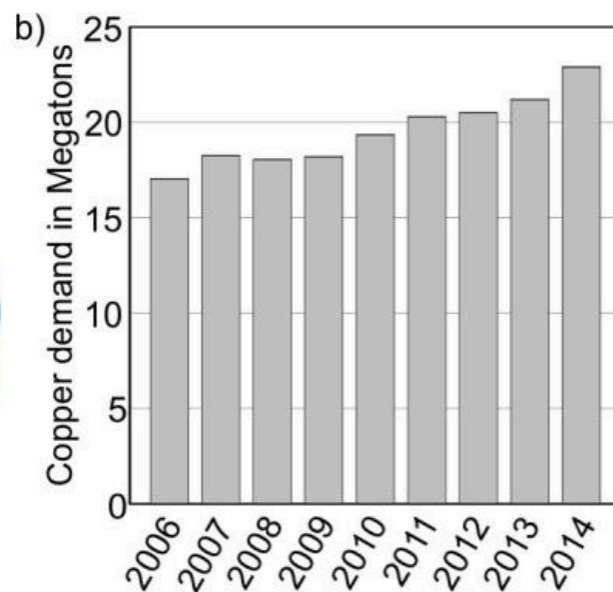
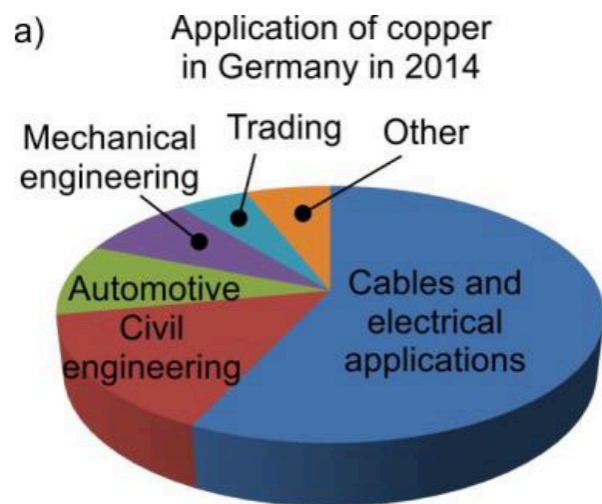
Implementation

JOIN'EM is oriented towards an integrated data exchange, with 6 mainly technical and 3 additional more organisationally-oriented work packages focussing on implementation, dissemination, exploitation, and project management.





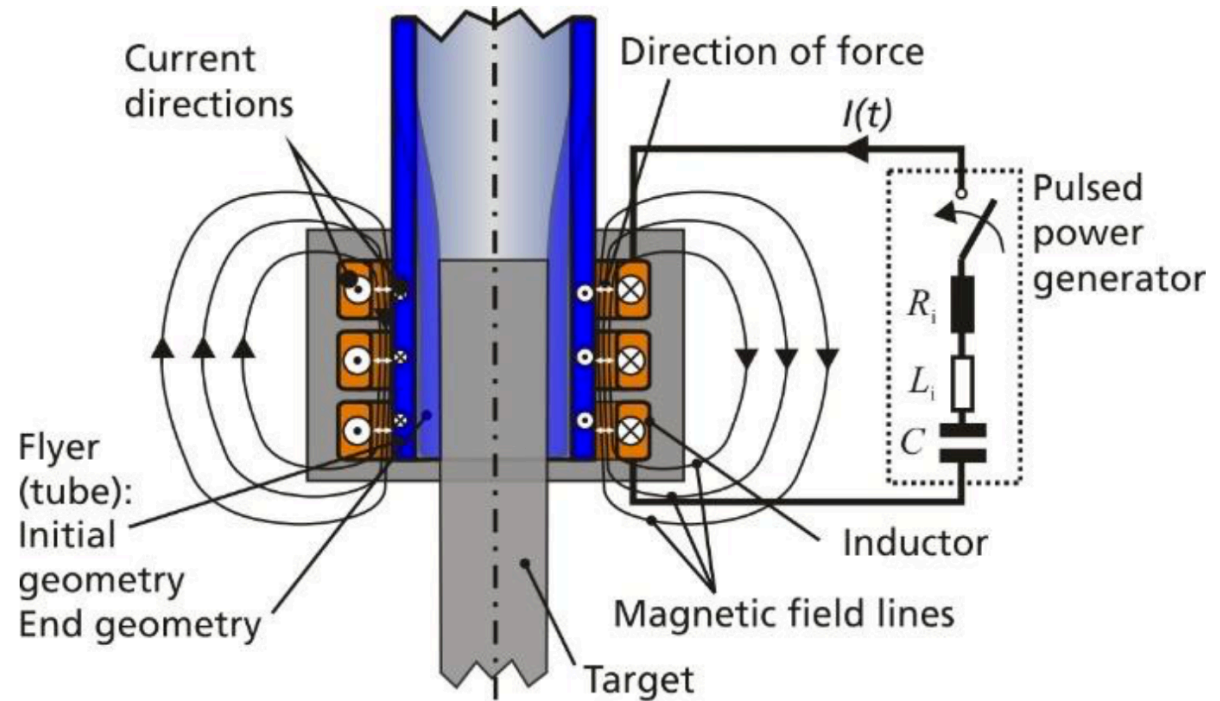
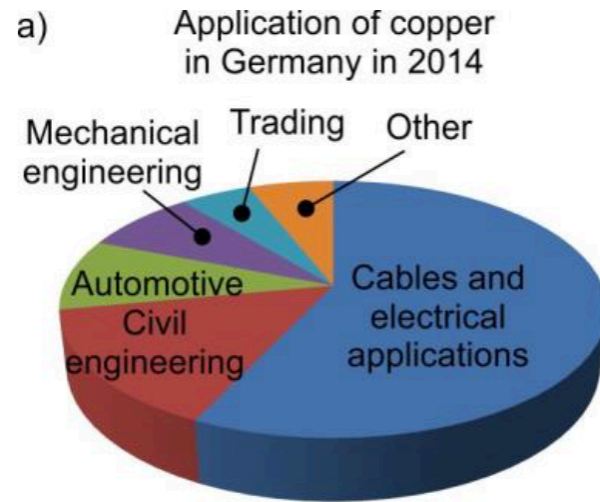
Context



Copper demand, price and application (<http://de.statista.com>).



Context



Process principle of magnetic pulse welding



Context



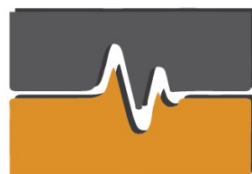
Fraunhofer

IWU



PHIMECA

SOLUTION
FOR ROBUST
ENGINEERING



JOIN'EM

INDUSTRIAL TECHNOLOGIES FOR ADVANCED JOINING AND
ASSEMBLY PROCESSES FOR MULTI-MATERIALS





Context



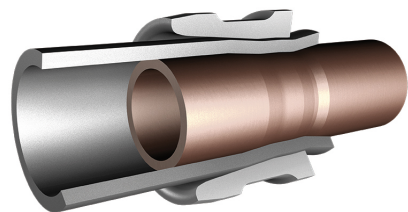
VERTECH GROUP is a leading French environmental Engineering company with over 300 partners in different economic sectors.

We create value by supporting organizations to improve the Profitability and Sustainability performance, minimizing their impact on the environment.

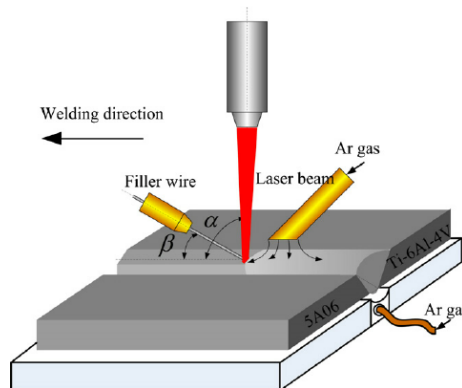




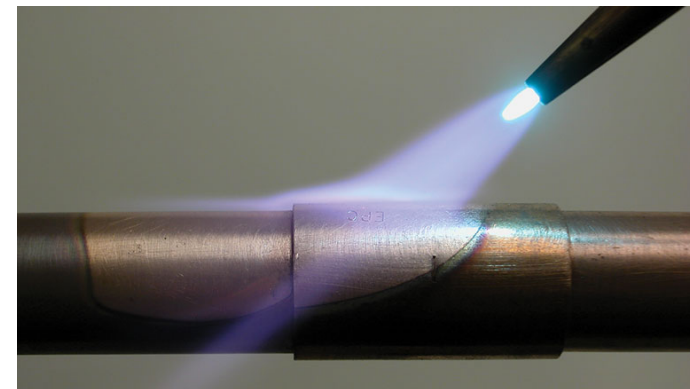
Methodology



Vulkan lokring



Laser beam welding



Flame brazing



Adhesive bonding



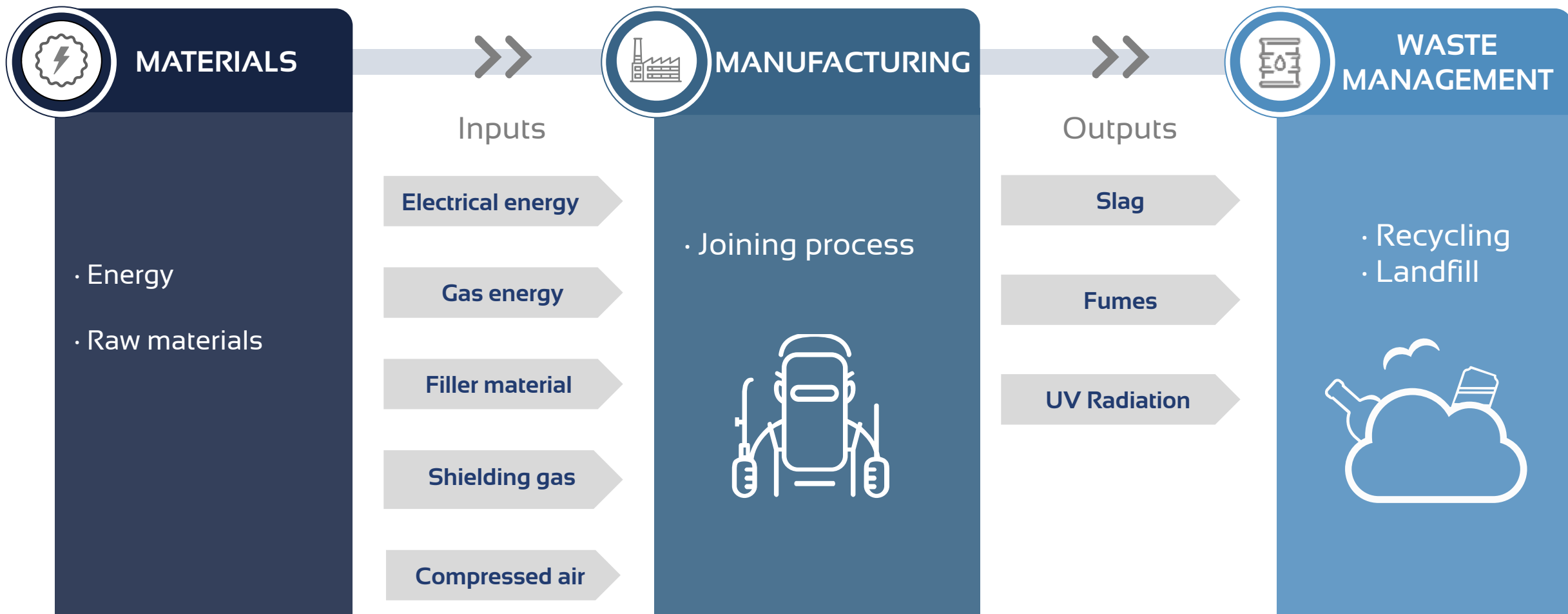
Gas welding



Arc welding



Methodology

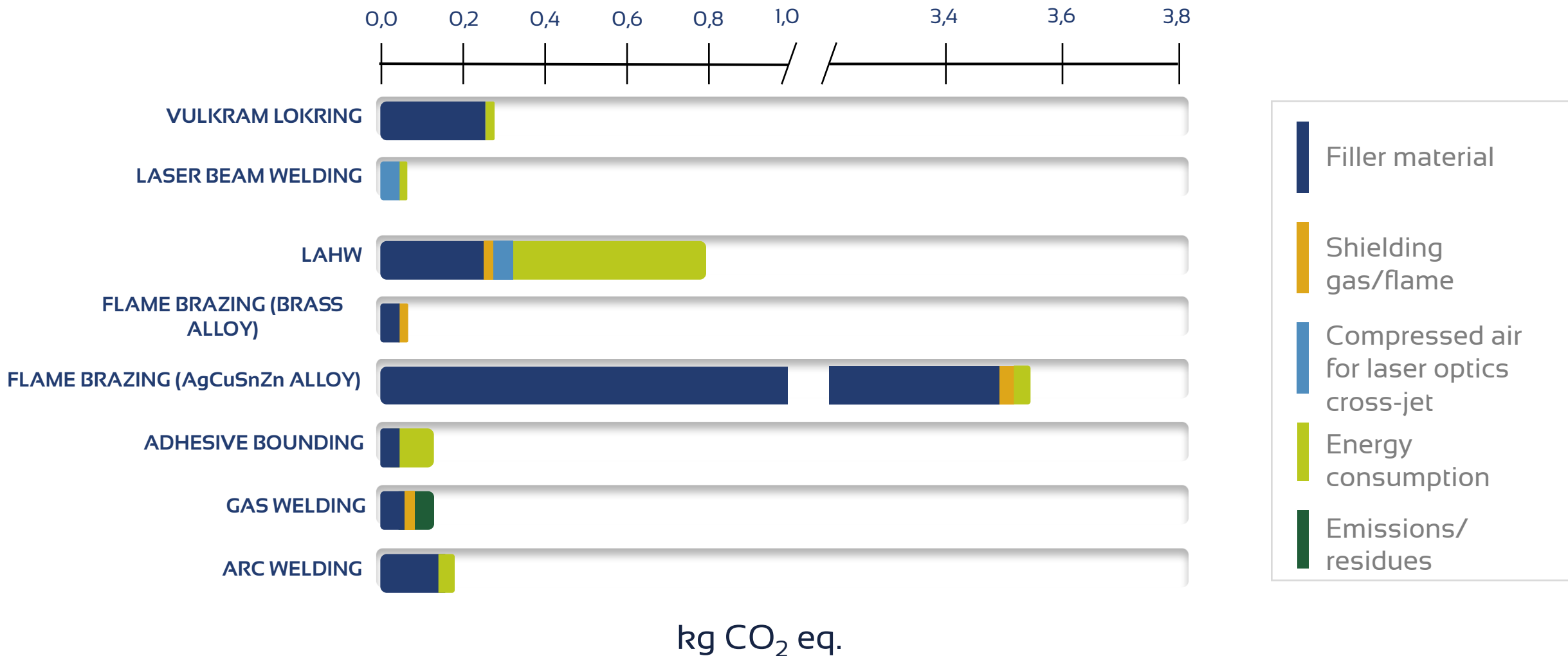


F.U.: 1 m of joined material.



Results

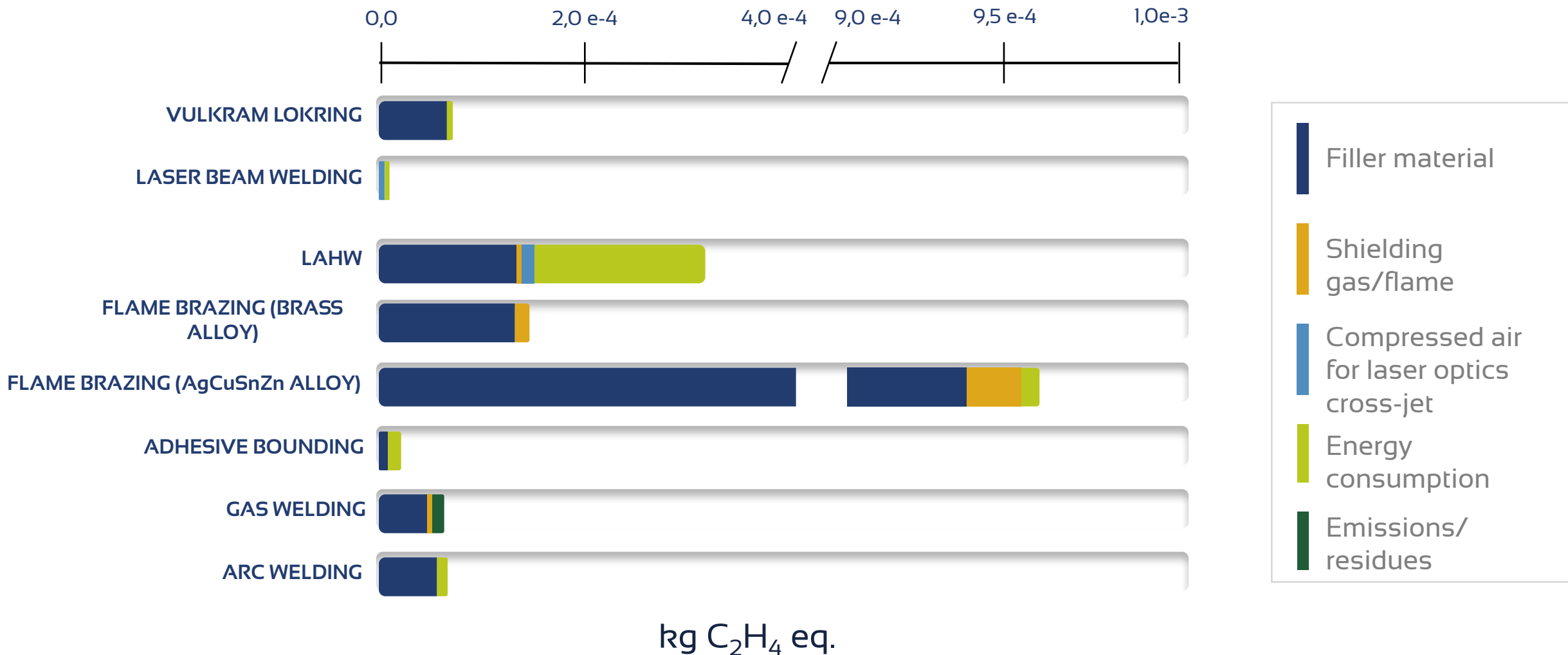
Global Warming Potential





Results

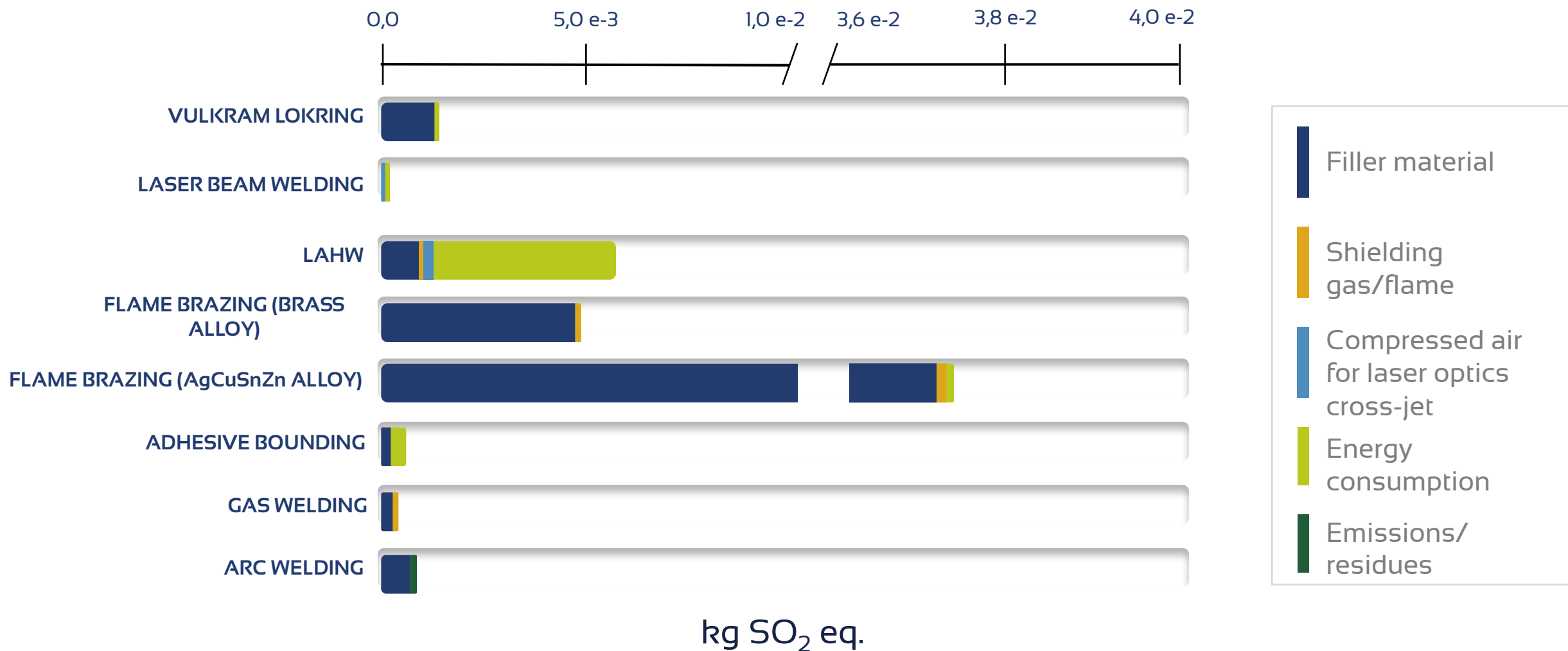
Photochemical Oxidation Potential





Results

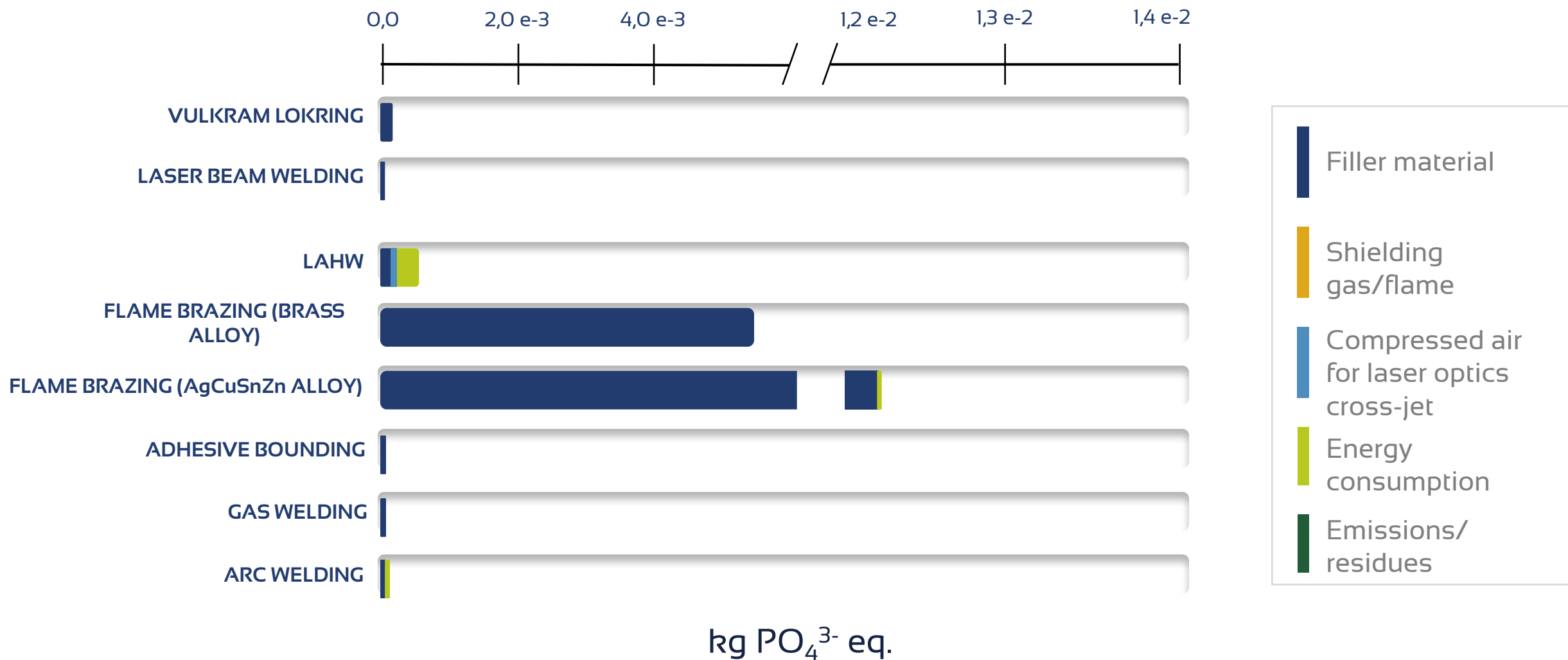
Acidification Potential





Results

Eutrophication Potential





Conclusions

- Laser Beam Welding was the best process from an environmental perspective;
- Flame brazing presented high environmental impacts, mainly due to the filler material;
- Vulkan Lokring or Adhesive Bounding were quite environmentally friendly, however, showed some limitations (e.g. industrial applications and high volume production).



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VERTECH GROUP, France

erasmo.cadena@vertech-group.com
www.vertech-group.com
www.join-em.eu