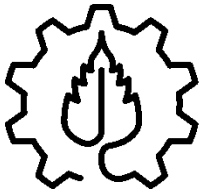

CENTRO DE ESTUDIOS DE
FABRICACIÓN AVANZADA
Y SOSTENIBLE

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Sustainability-Focused Multi-Objective Optimization of a Machining Process

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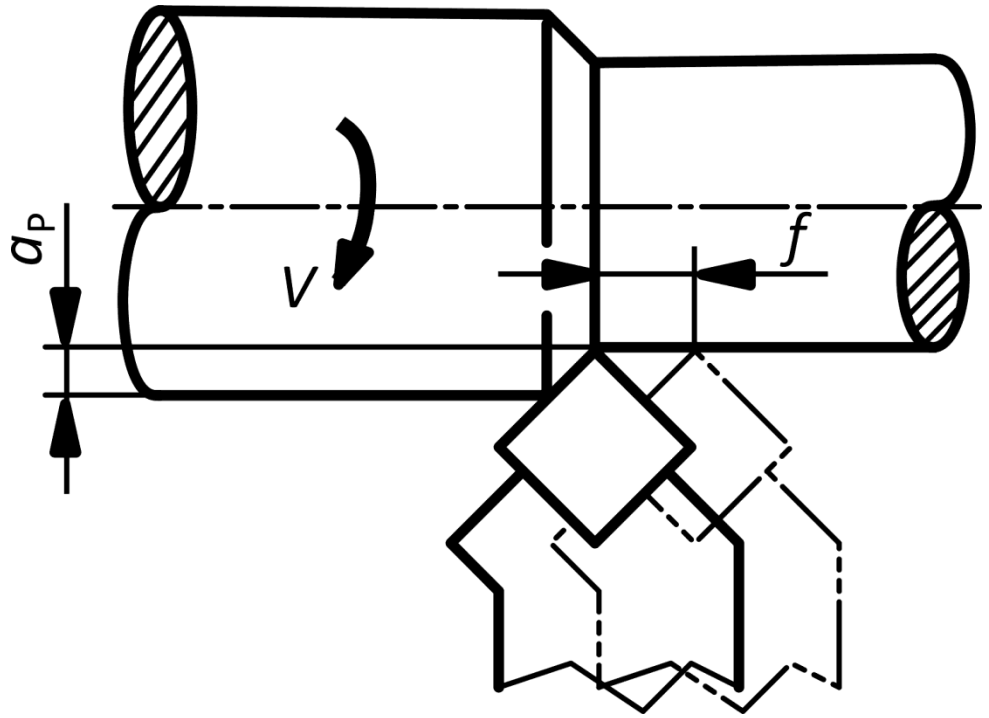
Decision Variables



Cutting speed

$250 \text{ m/min} \leq V \leq 400 \text{ m/min}$

Feed

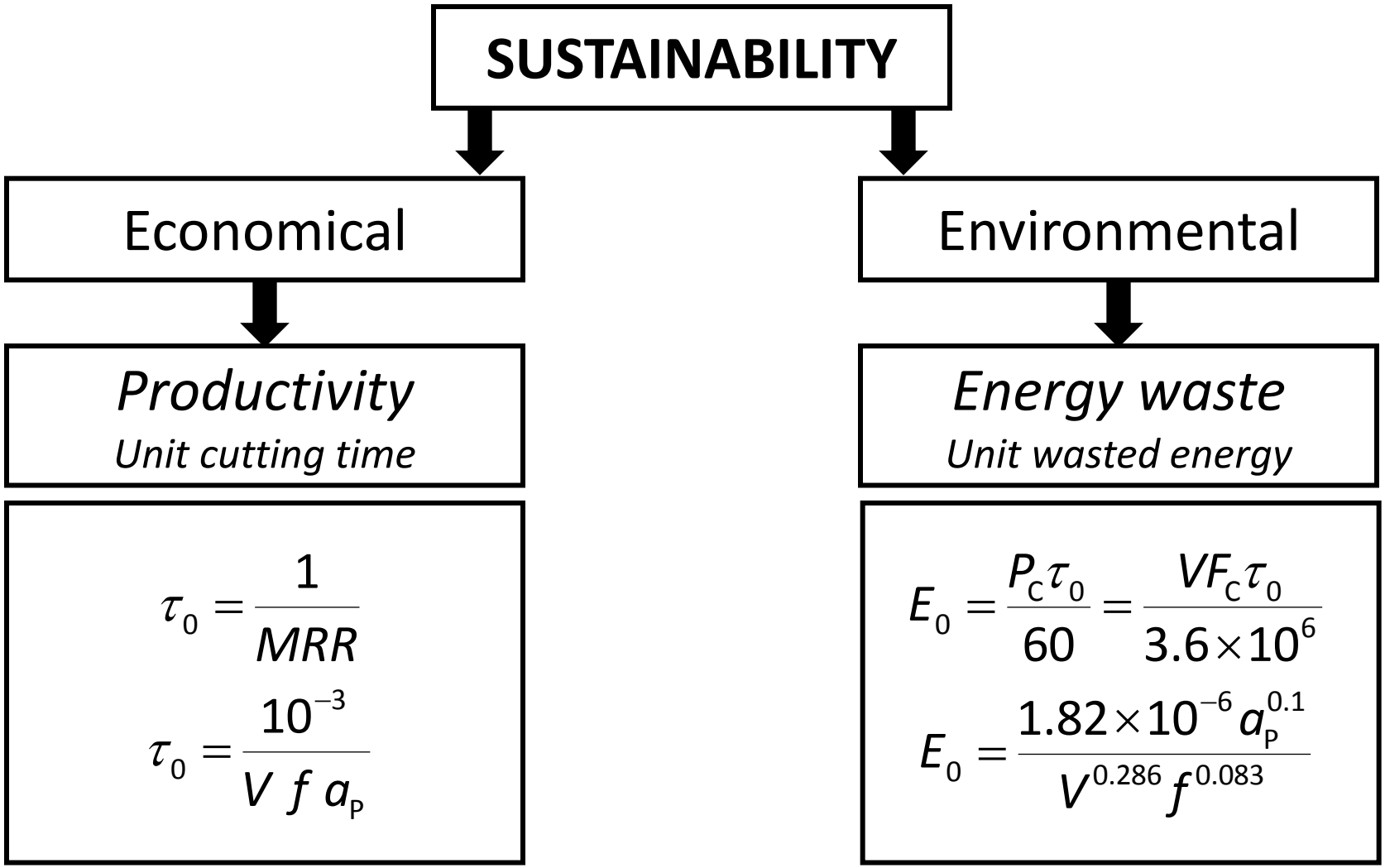
$0.15 \text{ mm} \leq f \leq 0.55 \text{ mm}$

Depth of cut

$0.5 \text{ mm} \leq a_P \leq 6.0 \text{ mm}$

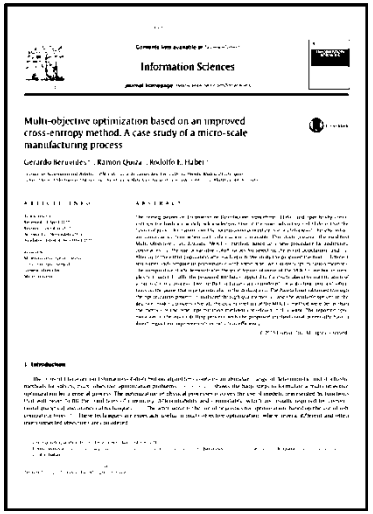
Empirical cutting force model: $F_C = \dfrac{6560\, f^{0.917} a_P^{1.10}}{V^{0.286}}$

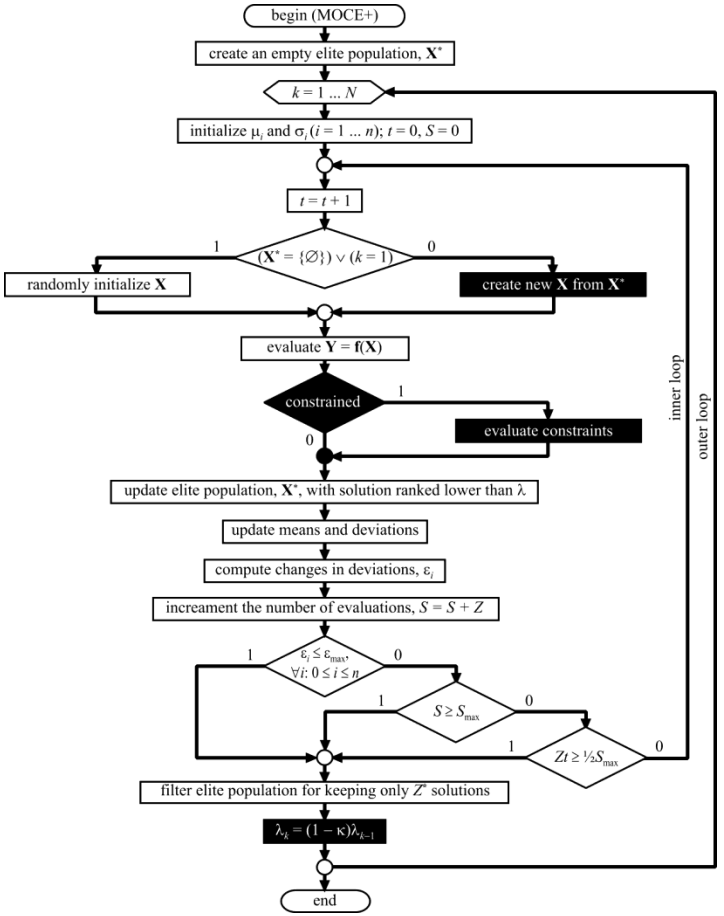
Optimization Objectives



Optimization Algorithm

Improved Multi-Objective Cross-Entropy (MOCE+)

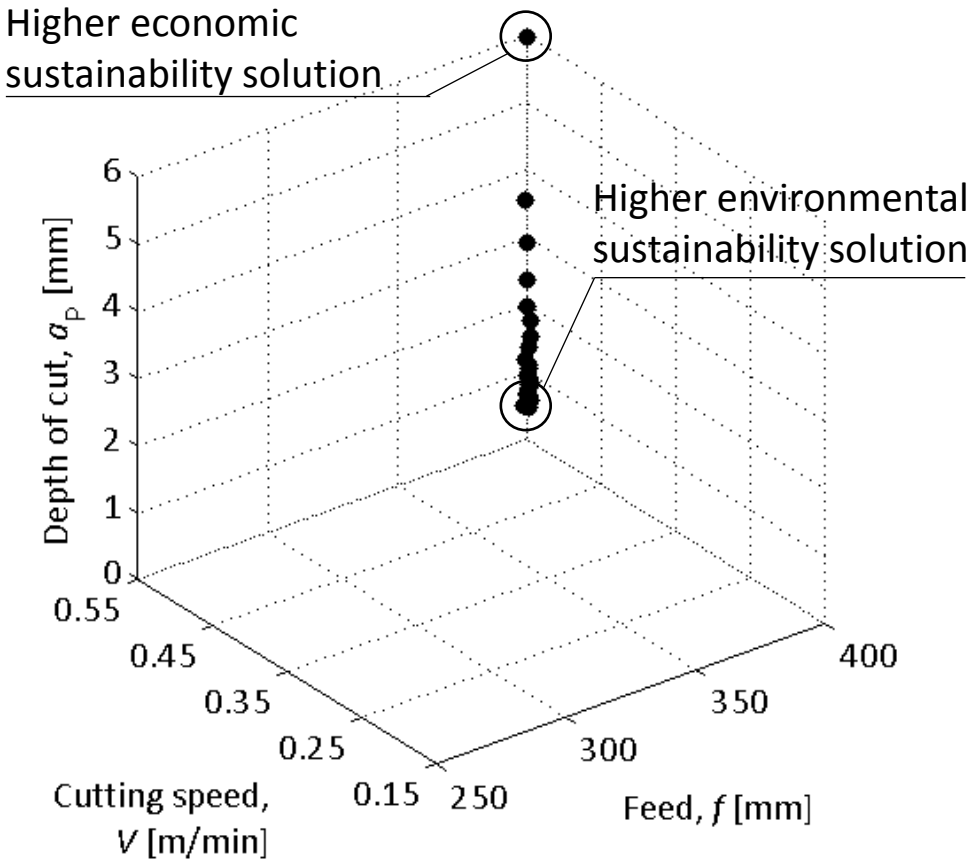




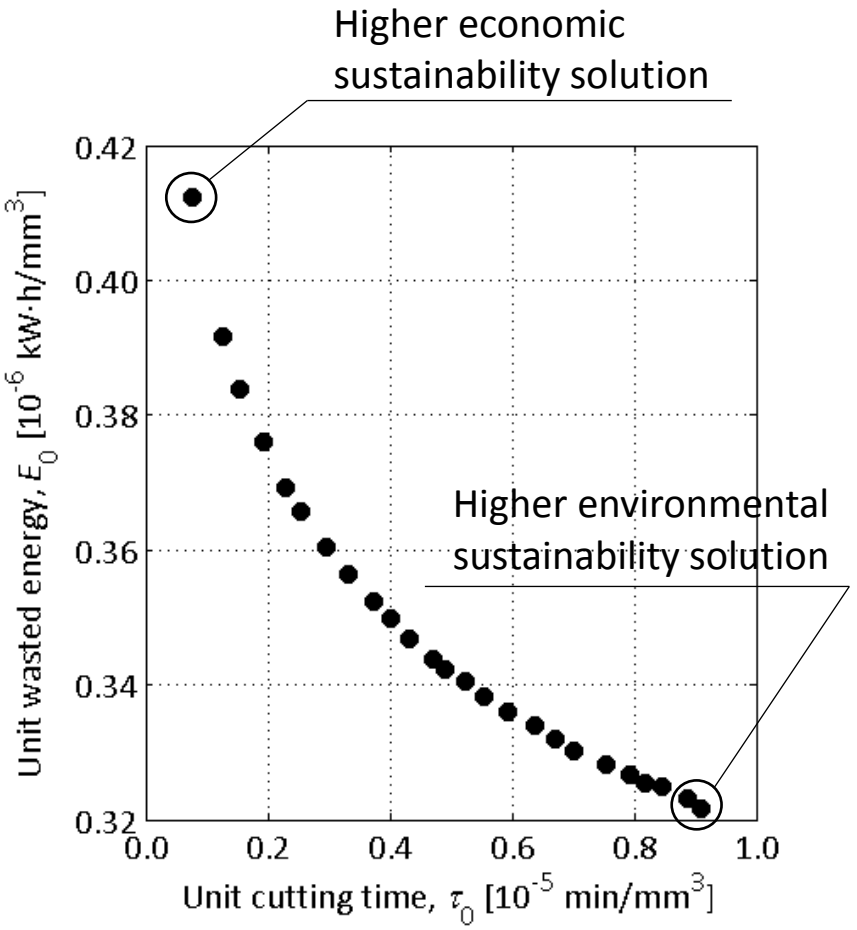
G. Beruvides, R. Quiza, and R. E. Haber, "Multiobjective optimization based on an improved cross-entropy method. A case study of a micro-scale manufacturing process". *Information Sciences*, vol. 334-335, pp. 161-173, 2016.

Outcomes

Pareto set



Pareto front



Conclusions

- ✓ The proposed approach allows to consider the most important aspects of the economical and environmental sustainability in the turning process.
- ✓ The MOCE+ algorithm probes to be effective for obtaining the Pareto front, in the considered problem.
- ✓ By using the obtained Pareto front, the most proper solution can be chosen, depending on the specific workshop conditions.