



The cool way of machining

CRYOGENIC MACHINING with carbon dioxide

Innovate and develop novel lubri-coolant systems is a pending challenge in nowadays manufacturing technology. Therefore, **HRE Hidraulic**, the **University of the Basque Country** and **TECNALIA** are working to develop a feasible and industrial cryogenic unit using CO₂.

ECO₂ MACHINING economic and ecoefficient friendly

From an economic and environmental point of view, CO₂ is obtained from a primary process. Thus, instead of exhausting CO₂ to the atmosphere directly, it is captured and used a second time as cutting fluid in the cryogenic machining processes.

WHY cryogenic machining

Due to the high worldwide competitiveness, it is necessary to reduce manufacturing costs and environmental impact.

Eliminate or minimize the use of conventional cutting fluids is the key fact to achieve success and **Cryogenic Machining** seems to be the best option.

ECONOMIC savings

Cutting fluids, which are based on mineral and synthetic oils, can suppose around 5-15% of the total manufacturing costs.

Additionally, treatment and disposal costs in the EU are around 2-4 times their purchase price. With **Cryogenic Machining**, traditional cutting fluids are removed.

ECOLOGIC benefits

Around 30% of cutting fluids consumed, is lost through leakage of circuits and particles attached to the machine.

Moreover, long expositions are harmful to workers health. With **Cryogenic Machining** these problems disappear.

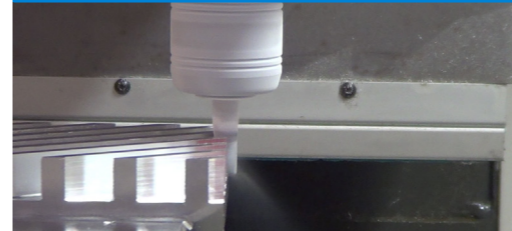
MAIN applications

Cryogenic machining is mainly indicated for heat-resistant superalloys and hardened steels. In these difficult-to-cut materials, controlling

thermal effects which cause a premature tool wear is the key for obtaining a successful machining process.

DEVELOPMENTS on cryogenic machining

STAND ALONE SYSTEM



co₂ internal cooling

Useful when the thermal wear is predominant. This system is based on introducing the CO₂ through the spindle. In this way, CO₂ reaches the cutting area in liquid phase. **Heat dissipation** is bigger than using external injection systems.

CRYOGENIC MQL



external cooling

Minimum Quantity Lubrication and Cryogenic technology are combined. The aim of this system is **remove traditional liquid coolants** of workshops. This “Plug & Play” system can be used in any machine.

CRYOGENIC TURNING



co₂ internal cooling

Applied in both tool faces at same time. This system is based on using a high pressure tool holder with two outputs, one directly to the rake face and the other to the clearance face. **CO₂ reaches the cutting zone efficiently.**



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