

# INTEFIX Project - Intelligent Fixtures advance machining processes



## What is the main purpose of the project?

The INTEFIX project aims to increase the performance of the machining processes by the use of intelligent fixture systems, allowing the monitoring, control and adaptation of the process to obtain suitable results according to precision, quality and cost requirements.

## How does it translate to the manufacturing practice?

Normally, the main function of fixtures is to securely hold and accurately locate the workpiece considered as an undeformable body. Nowadays, the required high precision and the need for increasing the manufacturing process' performance make various characteristics of the fixtures important, taking into account aspects like deformations, vibrations and distortions in the workpiece during processing. Furthermore, the machining system (machine-fixture-workpiece) cannot be considered as a stable system due to its dynamic behaviour and geometrical shape variations along the process. In that context, adaptive fixtures can be used to control and adapt the machining system's behaviour in order to obtain adequate results in manufacturing precision, quality and cost.



**Oscar Gonzalo**  
(Project Coordinator, TEKNIKER)

## What can you say about development of intelligent fixtures and machining methodologies able to manufacture highly slender ribbed parts?

Manufacturing these parts usually involve high material elimination (up to 90-95%) by machining processes that, together to an unsymmetrical geometrical configuration of the part, can generate significant distortion on the part after the release of the clamps used during the machining process. Under the INTEFIX framework, we have been dealing with the development of specific fixtures addressing specific problems reported by one enduser concerning aeronautical structural parts made of aluminium alloys.

The developed solution's capabilities have been evaluated by comparing its results to the results obtained from the actual manufacturing process from the enduser, yielding the following:

- Improved part accuracy from 2 mm distortion to 0.3 mm distortion thanks to the application of the distortion minimization procedure.
- Reduced machine time from 4 days to 2 days due to the avoidance of chemical clamps.



**Iñigo Llanos (IDEKO)**



## What was said:

**" Digitalization is delineating new paths for manufacturers across the world. Its changes are already visible in a large number of industrial practices. As innovation stems from research, Europe must focus on this area and mobilize all research funds needed to sustain the digital evolution of one of the long-standing pillars of its economy, the machine tool industry. "**

Xabier Ortueta, General Manager, AFM

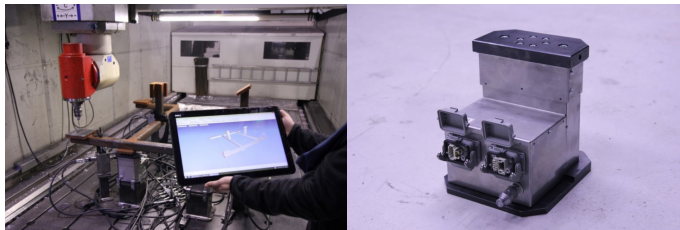
**Your research center was involved in the development of a low time consuming workpiece clamping system with low requirements for the operator. What are your conclusions?**

We have been developing and testing a comprehensive solution that makes the workpiece adjustment process automatic with the help of active fixture units. This approach is more effective than manual setting and also reduces the risk of errors. In addition, the developed solution allows the workpiece's automatic clamping in adjusted position and pre-deformation, if necessary.

The developed active fixture units can offer a stroke of 50 mm with a positioning accuracy of 0.006 mm and a maximum load of 5,000 N per unit. For better stiffness during machining and machining force compensation, units are equipped with a hydraulic brake implemented directly to the guide bars.

Leveling and clamping tests of the developed solution were performed with the demonstration part on the TYC FPPC 250/6 CNC machining center with a Heidenhain iTNC530 control system. This solution decreased the idle time for workpiece clamping by more than 70%.

**Testing in TYC FPPC 250/6 CNC machine tool and a detail of the active fixture unit**



**Jiří Švéda**  
(Research Center of Manufacturing Technology at the Czech Technical University)

Moreover, technical and economic aspects were also compared on another industrial case study. It has been proven that solutions developed by INTEFIX decreases idle time, but the initial investment is higher. Nevertheless, the investment return period is 20 pieces in the case of the train side panel. In essence, the fixtures can be used as an intelligent universal clamping solution. It means that the investment return period is computed for specific parts, not only for the train side panel. The main advantage of the developed fixture system is its universality that enables us to easily use the fixture for a variety of applications. ■

***\*Innovative, highly configurable, fast, accurate and durable fixture systems are a perfect solution for demanding advanced industries who need workpieces that can withstand a complicated shaping process with minimal distortion. The INTEFIX project results will hopefully reach the market to open new opportunities for sectors like aerospace or windmill as a start.***

This project is co-funded by the European Union



**What was said:**

**"The strength of European manufacturing lies in its knowledge base spreading across multiple industrial fields. Yet, with new actors entering the global stage, Europe cannot have the luxury to be complacent. Investing in research to nurture the talent of Europe's workforce remains the key to hold success in such an evolving and fast-paced context."**

Oldřich Paclík, General Manager, SST