

- **A knitting machine small scale demonstrator;**
- **a wear resistance tester small scale demonstrator.**

3.1.2 The MACH-to main objectives

Both the above mentioned demonstrators had a good feedback from ITMA fair and their entering into the market would potentially bring great advantages to the involved SMEs. MACH-to first goal was to customize the concepts developed within the Nu-Wave project onto a full scale industrial machine (already used by the end users of MACH-to) and evaluate the performances increased.

Three main objectives have been established by the consortium, for granting the success of the project:

- **To design and realize a set of Retrofit Kits.** Starting from the experience gained with the prototype shown in ITMA and based on the components and concepts developed within Nu-wave, two knitting machines (one of Selcom and one of Alge) will be provided with the MACH-to Retrofit Kit.
- **To perform an intensive test campaign and stress test on the demonstrators** (the retrofitted machines), to get important feedbacks on reliability, durability, maintenance and performance. Basically the objective is to be reached by linked efforts of SELCOM and the end-user Alge, with the constant support of NAVETA;
- **To develop a business model,** to support the introduction the MACH-to Retrofit Kit (M2RK) into the market: entering price and strategy, dissemination and promotion, main figures against competitors (especially Far East companies), target customers for the first set of M2RK, possible improvement (technical and non-technical) required by the market and, in particular the strategy for distributing the M2RK in the market.

All the objectives have been accomplished thanks to joint efforts of the four involved SMEs, supported by ITA, VUTS and DAPP in those activities which are not “core” for them and where they lack of experience (e.g. carbon braiding, materials and coatings, business models development).

3.1.3 Performed work and achieved results

In line with the above mentioned objectives, MACH-to partners worked on three main objectives, namely:

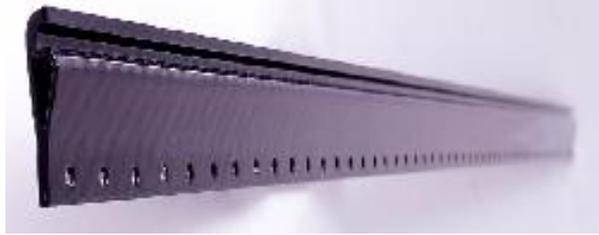
- To design and realize a set of Retrofit Kits;
- To perform an intensive test campaign and stress test on the demonstrators;
- To develop a business model, to support the introduction the MACH-to Retrofit Kit (M2RK) into the market.

MACH-TO RETROFIT KIT DESIGN AND PRODUCTION

Within the project, two retrofit kits (M2RK) have been developed by the consortium, one for each project pilot.

M2RK for ALGE

Composite pattern bar



Guiding stem parts



Titan pins



M2RK for SELCOM

Composite push rod



Thread guides



The developed components have been tested before, during and after the implementation (and use) in the selected pilot machines installed in ALGE and SELCOM facilities.

The M2RKs developed will be the basis for further activities. The medium-term objective of the MACH-to team is, in fact, to develop a set of Retrofit Kits, customized for an increasing number of textile machines, that allow end users to quickly and effectively replace the components responsible of energy waste and losses in general. The MACH-to Retrofit Kits will definitely bring several advantages to the customers in terms of: production speed increase, noise and vibration reduction, less maintenance, energy saving, reduction of facilities costs and extension of machine specification.

INTENSIVE TEST CAMPAIGN AND STRESS TEST ON THE DEMONSTRATORS

Early test on scaled up components

The developed components have been tested in order to characterize them from a mechanical point of view. Early test on scaled up components were also foreseen aiming at confirming the repeatability of the design and production process. The following tests have been performed:

- **Early test of ALGE machine pattern bar.**
- **Early test of needle blocks**
- **Needles surface finishing**

Pilots tests campaign

Fully in line with expectations and plans, at the end of the project the test campaign both for ALGE and SELCOM machines were designed and performed. Input on M2RK performances have been collected. Both the ALGE and SELCOM test campaigns have been conducted by specialized technicians, supported in remote by VUTS and INVENT people. Design of Experiment approach has been followed.

Two videos showing the machines in use is available both on Youtube (<http://goo.gl/OUwA7w>) and in the media section of the project website (<http://www.mach-to.eu/media>).

After usage tests on scaled-up components -pilot @ selcom and alge

Fully in line with expectations and plans, all the M2RK components were tested also after the implementation (and use) within the two selected pilots. In particular, the following tests have been performed:

- *Measuring on the Alge machine SNB/EL-800*
- *Measuring on composite patter bar*
- *Non-destructive inspection with Ultrasonic technique*
- *Surface damaging of guiding rods (pins) measuring – after application*



Figure 1 - Push rod on a Selcom machine (frontal)

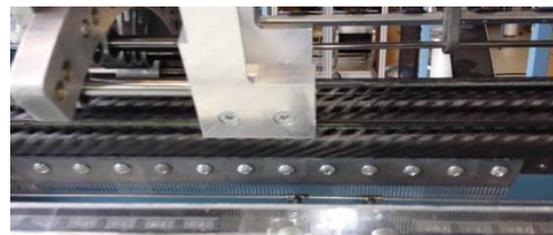


Figure 2 - Pattern bar and stem parts on Alge machine (frontal)

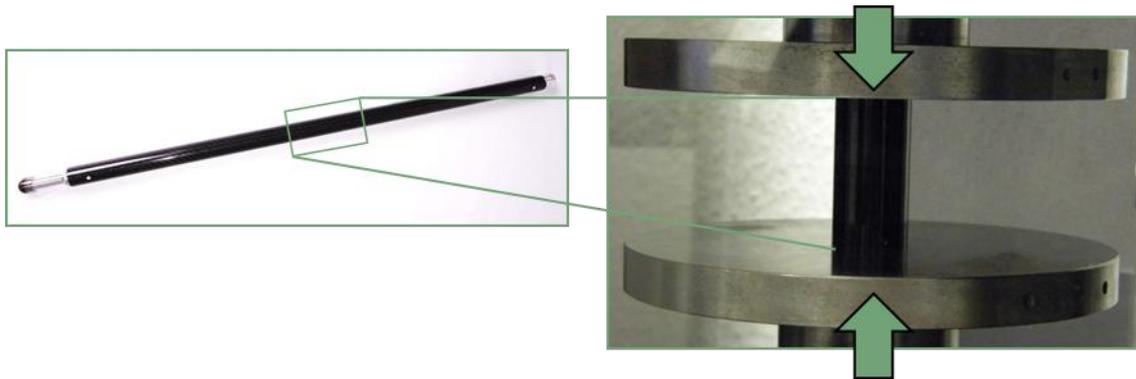


Figure 3: Compression test of SELCOM pattern bar push rod

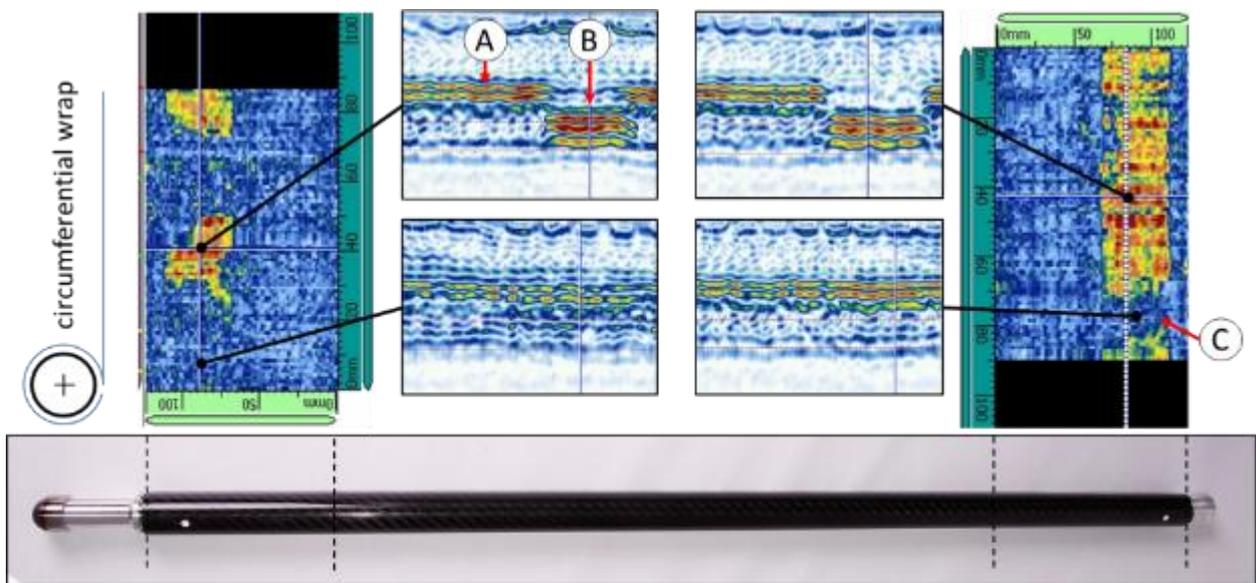


Figure 4: CF-composite push rod ultrasonic scans

MACH-TO BUSINESS MODEL

The MACH-to project generated valuable knowledge, and partners intend to exploit the results in the future in many ways, as can be seen in the IPR and exploitation matrix. This is a positive sign, which reflects the enthusiasm about the innovations developed and the short term revenue generation prospects.

All the specific actions that the project partners will take to maximise the exploitation of the project results have been defined in cooperation with the whole consortium during an Exploitation Strategy Workshop organized ad hoc.



Figure 5: MACH-to Business Model

3.1.4 Expected final results and their potential impact and use

Participant SMEs benefits:

- INVENT will become the main supplier of the MACH-to Retrofit Kit to textile producer and will get the direct economical benefits of such B2B commerce. INVENT will develop a new branch for design, production and supply of special parts of textile machinery and will enlarge the actual network of supplier-customers. In the framework of MACH-to, INVENT will also have the chance to get familiar with the highly specialized textiles made by Selcom and could even cross-fertilize its traditional sectors. INVENT will be supported by VUTS as concerning the production of metallic components.
- SELCOM and ALGE will be the first industrial partners to experience the benefits and savings of MACH-to Retrofit Kit.
- NAVETA will sell the wear resistance testing desk developed.

Industrial impact

The MACH-to Retrofit Kits developed definitely bring several advantages to the customers in terms of:

- **Production speed increased up to 20% respect to the present system.** The test campaign performed during the project showed an increase of productivity of about 20% thanks to the new lightweight components;
- **Noise and vibrations reduction.** The lower masses and the characteristics of the components decreased both noise and vibration with an immediate positive impact on workers environment and on the product quality;
- **Energy saving.** According to the preliminary tests performed during Nu-Wave project, the energy consumption of a knitting machine actuation system could decrease up to 80%, thanks to the reduced friction and the decreased mass;
- **reduction of facilities costs** (rent, energy consumption, ...) due to the decreasing of the volume occupied by the machines (thanks to the increase of productivity);
- **Extension of machine specification.** The novel components additionally alter the ability of the machine to handle, e.g., an extended range of yarns, allow for the manufacturing of different patterns and potentially allow for an increased yarn tension. As such, the end user of the machine can offer a wider product portfolio.

Employment

Based on the expected initial market penetration of the system in the global market, altogether the proposers expect that potentially 6 new job opportunities will be created by the end of 2017, based on the industry norm of 150 kEuro of sales per employee and a MACH-to turnover of around 1 M€ in the short term. Furthermore, it has to be considered that the success of the project will represent the basis for INVENT to initiate the creation of a brand new business division, specialized in textile machinery: this would represent a job opportunity for people highly qualified in textile mechanics. If we consider the long term period scenario and the entering in new markets as specified in the previous section, based on the same industry norm, we may expect the potential creation of further 15 additional jobs at the SME's through the sales of extra components and at the consortiums end users through the increased productivity as well as through the wider range of final textile products offered.

European dimension and impact in community social objectives

Italy, Germany, Czech Republic and Austria have a long tradition in textile and textile machinery and only those countries, together, could really give a boost to European and worldwide innovation. The intended transnational approach will allow companies from different European Countries to

