

Figures to describe the main S & T results/foregrounds

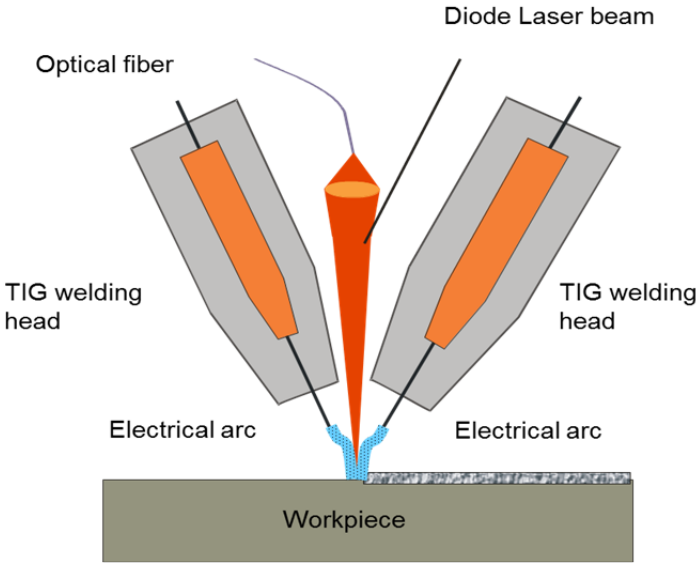


Figure 1: Schematic model of the double TIG laser welding head

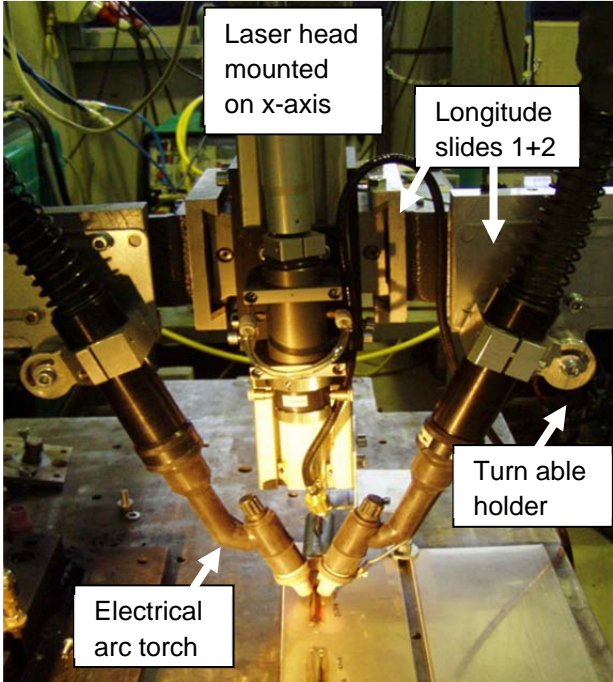


Figure 2: Function model for process development

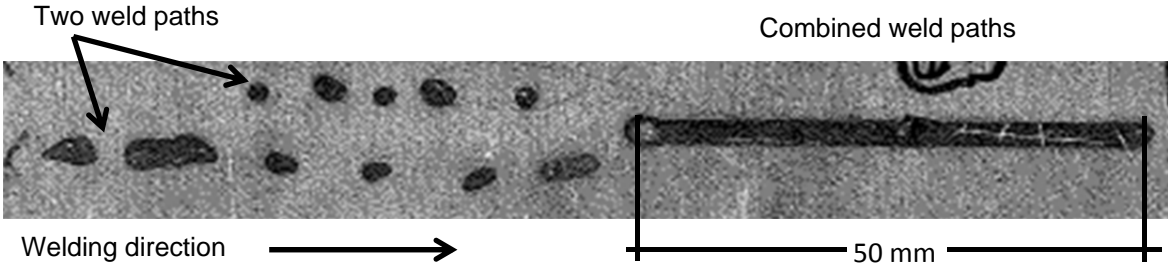


Figure 3: Guiding two electrical arcs on one foot point

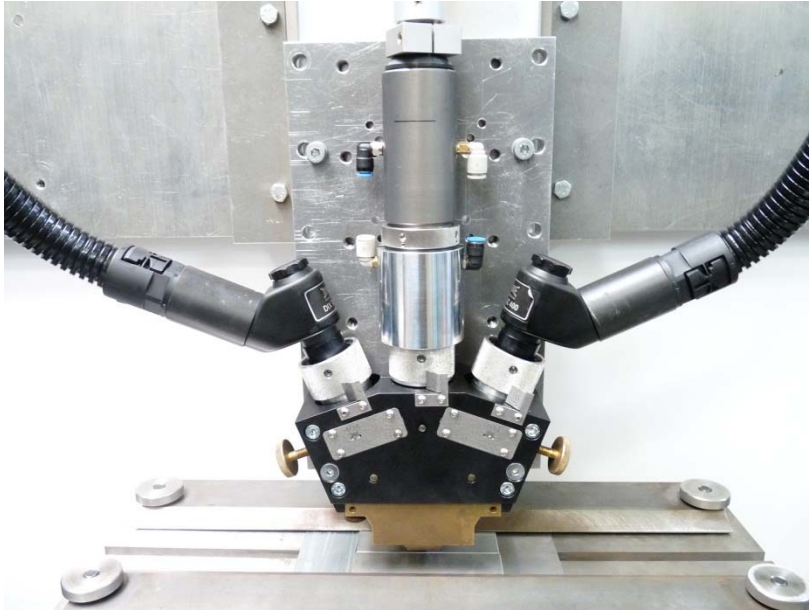


Figure 4: *Prototype of double TIG laser welding head*

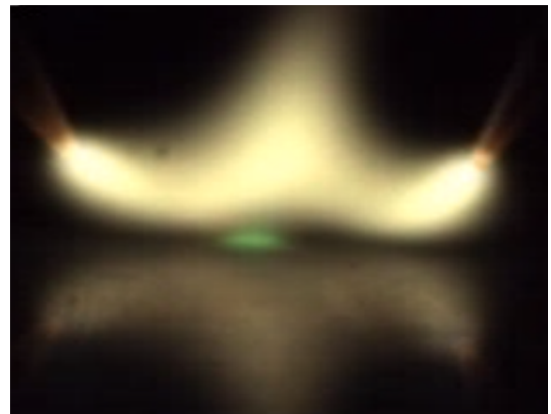
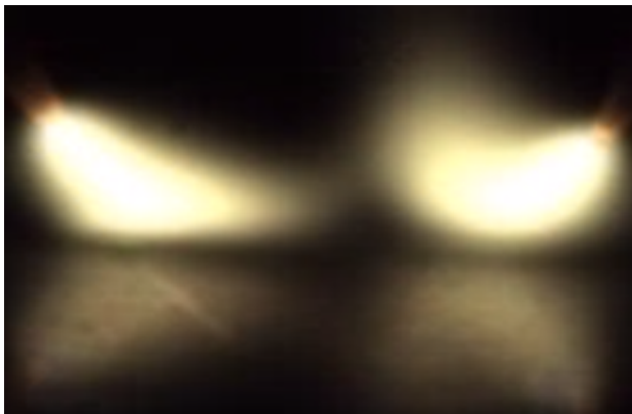


Figure 5: *Influence off the laser radiation on the electrical arcs*

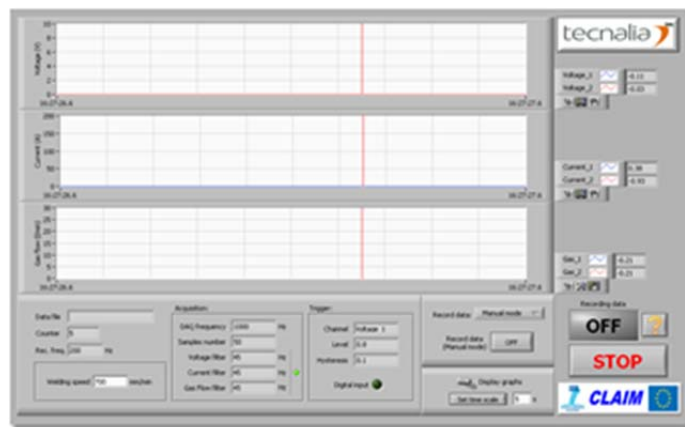


Figure 6: *Data acquisition system (hardware right and software left side)*



SEVENTH FRAMEWORK PROGRAMME

Research for SMEs Call 3

FP7-SME-2010-1

Grant Agreement No. 262449

Description of potential impact

Version: 1.0

Project acronym:

CLAIM

Project full title:

Customised Laser-assisted Plasma Arc Welding of Light Alloys and Steels

Work package:

Responsible participant:

TECNALIA

Date:

2012-09-27

Dissemination level: **CO**

1 Dissemination activities

The CLAIM dissemination activities aim, on one hand, to encourage the knowledge transfer between the CLAIM partners and, on the other hand, to inform the wider scientific community and industry about the project results. The activities are detailed below.

1.1 International exhibitions

During the project the consortium members participated in several public events, scientific conferences and fairs. A detailed description is made in Table 1.

Name	Date	Country	Partners involved
WIN: World of industry	February 2011	Turkey	MERKLE
DIE ZULIEFERERMESSE Z	March 2011	Germany	LasTech
Lecture forum of MERKLE	April 2011	Germany	MERKLE
HMI: Technology fair for industry	April 2011	Germany	LZH
International Laser world of photonics: Fair and congress for components, systems and applications of optical technologies	May 2011	Germany	LZH
SCHWEISSTEC/BLECHEXPO: international trade fair for sheet metal processing	June 2011	Germany	MERKLE
Merkle Product Seminar New Welding Processes	October 2011	Netherland	MERKLE
SPIE Photonics West 2012: Common booth as member of the SECPhO cluster.	January 2012	USA	TECNALIA
WIN: World of industry	February 2012	Turkey	MERKLE
HMI: Technology fair for industry	April 2012	Germany	LZH
WELDING: Technology fair for welding, joining and cutting	May 2012	Czech Republic	LasTech
BIEMH: Biennial Machine Tool	May 2012	Spain	TECNALIA/TMT

Table 1: Participations of the CLAIM consortium members

1.2 Individual dissemination

All partners, especially MERKLE (who offers the most complex product obtained) have made a dissemination of the developments they are doing within the project on their web page, in presentations to visitors or other customers that might be interested in the specific results of the project, and publications.

1.3 Publications on International conferences

The LZH presented the project results at the Photonics West Conference 2012 in San Francisco. The aim of this presentation was to present the project outputs and acquired knowledge to the international community and to provide a forum for discussion of the project outputs in an international environment.

1.4 User workshops

According to an analysis of the European Commission's IPR Helpdesk, personal contacts and presentations are ranking top of the list of the most popular channels. Therefore a one day public workshop was organised by FORMENG in Turkey. Approximately 50 different companies followed the presentations with great interest. In addition, project flyers were handed out and a poster was presented.



Figure1: Workshop in Kocaeli (Turkey, April 8th, 2011)

1.5 CLAIM website

A website has been set up since 2011-01-17 to present the main benefits from CLAIM in terms of technical and industrial achievements:

<http://www.claim-project.eu/>

The main goal of the website is to support the dissemination of the project outputs and documentation, and to provide project partners access to working documents and restricted information within the project. It is regularly updated with news items and activities.

The web page is divided into two different sections:

- A public area, available to all users, implies general information about the project (objectives, technologies, results, consortium, etc), publications, forum and events.
- A private area, where each partner can access the information restricted to the consortium.

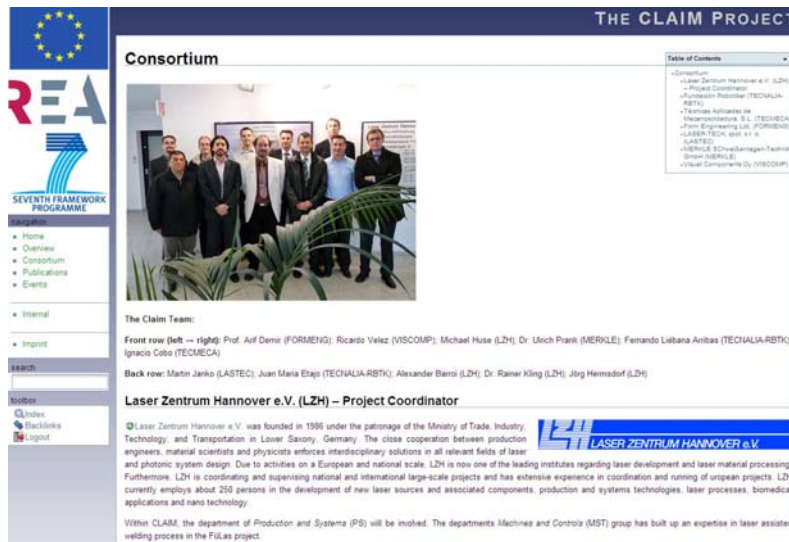


Figure2: Screenshot of CLAIM web portal

1.6 Advertising of the project

To present and promote achievements of the CLAIM Project and to support trade shows and international conferences, all partners have the following resources:

Posters and flyers

Ad hoc posters and/or flyers have been distributed at external meetings and events to industrial end-users, media representatives, etc.

MERKLE presented the CLAIM poster in Istanbul with the goals of the project and 120 copies of the poster/invitations in A4 format were handed out to interested visitors at the show.

In the workshop in Kocaeli (Turkey, April 8th, 2011), flyers were also been distributed.



Figure3: Project flyer for the workshop in Kocaeli, Turkey

Demonstrators

Demonstrators which result from the project are one of the most efficient ways to advertise the achievements of the CLAIM project. Tangible evidence of the benefits and

power of the development technology proves the applicability of the new process in industrial tasks, resulting in increased confidence and safety of industrial end-users.

Partners have selected representative work pieces welding by double TIG assisted by laser technology developed in CLAIM project, that help to support the project at international exhibitions and conferences.



Figure4: Welded probes

Video

Promotional videos are very efficient dissemination tools. LZH has coordinated the recording process and the editing of the video to obtain an attractive presentation about the laser stabilized process and the CLAIM project for dissemination. LZH has promoted the CLAIM project with this film on fairs and over the internet.

2 Exploitation of results

The following activities have been developed during the project to define the exploitation plan.

2.1 Identification of exploitable results

Below is shown a table of the exploitable results obtained at the end of the project and the intellectual property right and exploitation right of each partner.

Exploitable result	Intellectual property Rights		Exploitation Rights	
	Partner(s)	Share %	Partner(s)	Share %
Laser assisted TIG welding process for high strength steels	TMT	50	TMT	100
	FORMENG	25		
	LASTEC	25		
Laser assisted TIG welding process for light alloys	TMT	50	TMT	100
	FORMENG	25		
	LASTEC	25		
Portable monitoring camera based system	MERKLE	100	MERKLE	100

Laser+double TIG welding system with adapted characteristicly curves	MERKLE	100	MERKLE	100
Laser-double TIG coaxial head	MERKLE	100	MERKLE	100
System for laser-TIG welding	TMT	25	TMT	100
	FORMENG	15		
	LASTEC	20	MERKLE	100
	MERKLE	40		
Portable machine for welding parameters supervision	TMT	55	TMT	100
	FORMENG	20		
	LASTEC	25		
Offline programming system	MERKLE	100	MERKLE	100

Table 2: Exploitable results and IPRs

2.2 Risk analysis

Below, is described the main risks identified during the project development and their classification in terms of impact and likelihood. Later we have analyzed those that have occurred throughout the project and the actions that have been carried out to solve them.

2.2.1 Risks identified

Risk		Impact (I)	Likelihood (L)	Value
Management risks				
1	Changes to original objectives	1	2	Low
2	Inadequate communication among partners.	2	1	Low
3	Leaks of confidential information.	3	2	High
Partnership risks				
4	An industrial partner leaves the project	2	2	High
5	Disagreement on ownership rules	3	1	Low
Market risks				
6	Nobody needs it	3	2	High
7	The product is too expensive	3	2	High
8	Unsuitable sales force	2	2	High
Legal risks				
9	IPR: We are sued for patent infringement.	3	1	Low
10	IPR: Patent application rejected	3	1	Low
Technological risks				
11	IPR: Earlier patent exists	2	3	High
12	Results are not as good as expected	3	2	High
13	The life cycle of the new technology is too short	1	2	Low

Table 3: Risk identified

2.2.2 Main risks and Actions to solve them

- **Partnership risk: An industrial partner leaves the project:** During the project implementation, VISCOMP decided to leave the consortium. The development of its tasks was assumed by MERKLE and LZH, so the impact of this risk has been low.
- **Management risk: Changes to original objectives:** At the beginning of the CLAIM project, a market analysis showed the potential for plasma+laser process, but the need of the SME partners was focused on the development of an innovating laser+TIG process with higher productivity. To overcome the limits of TIG welding like slow welding speed and distortion of the work pieces, it was decided to develop a double TIG+laser process with patentable welding heads. This outcome has further strengthened the market position and has generated a strong impact for all SME partners.

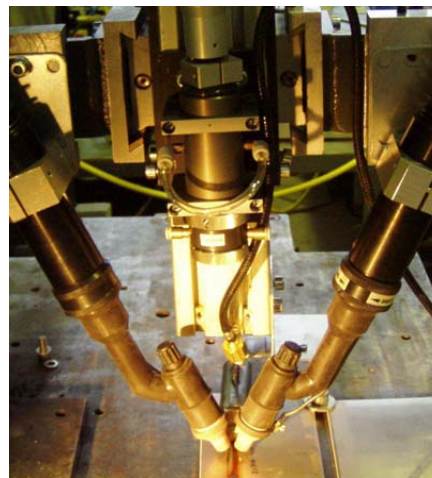


Figure5: Configuration of double TIG+Laser process

- **IPR: Earlier patent exist:** The intention of the consortium was to protect significant innovations developed in the project. To do so, it was foreseen to patent some of technical innovations, at least in the country in which the development will take place. LZH checked the patent situation for the double TIG+laser welding head and the welding processes for aluminium and stainless steel. The LZH found several similar setups in the literature. Most of them focus on hybrid welding processes. Because of this and the foreseeable costs of patenting and economic exploitation of the patent, Merkle decided not patent the double TIG+laser welding head. Furthermore, the consortium agreed upon publishing the results on the ICALEO conference in 2012. The partners are still better position on the market because they already know how to work with the needed system technology and they have the experiences what kind of results they may expect. According to the forementioned patent research of the LZH the project partners have the option to practice the inventions of the project in future. Other technical innovations developed in the project as the portable machine for welding parameters supervision and the offline programming system will be exploited and will be used with other materials and technologies, but they will not be patented.

- **Technological risks: Results are not as good as expected:** The results of welding high strength steels by double TIG assisted by laser have not shown additional benefits compared to single TIG laser welding. Although the quality of the weld has been slightly increased, the additional cost of the installation does not compensate the obtained improvement. In this case it will be much more interesting to work with the single TIG-laser process. This process offers all the advantages which were invented during the project. The results of welding light alloys by double TIG assisted by laser have shown an increased in welding speed and the quality of the beam. For this reason, partners will mainly exploit the results for light alloy applied to high-value welds. In the current situation it is not known that any other enterprise are working with laser assisted processes. Competing welding technologies beside the conventional arc processes are laser welding or hybrid welding which are much more expensive because of the high acquisition cost. Laser welding itself requires careful preparation of the welding partners.

The remaining exploitable results have been developed without changes, so they will exploit as expected.

2.3 Customer profile and market opportunity

Three different lines for market penetration have been identified:

- **Production of goods for joining (joining machinery and systems, joining equipment):** With nearly 43% of production value, Germany is the biggest manufacturer for welding technology in Europe. MERKLE will penetrate the European market as provider of all kind of welding machines. The new welding process will increase its market by offering new welding system customised for the different client specifications.
- **Production of services to the consumer (complementary goods like gases, auxiliary wire, protection wear and ventilation and testing machines, and further education):** MERKLE will enter the market with the service of off-line programming applications for the newly developed processes and will support all industrial end user requirements, and improvements on workflow. Fundación Tecnalia Research&Innovation will step into the service market to offer the supervising system as a complementary good of support the customer. LZH will offer the further education for the new welding process.
- **Application of joining technologies:** TMT, FORMENG and LASER-TECH will penetrate the commercialization and integration of the new welding system in their process lines.

Through the combined efforts of the consortium with local and European trade associations we will commence a targeted marketing campaign in year 5. Based on our sales forecasts we expect that we will need to establish licensing agreements with machine manufacturers and equipment suppliers.

3 Socio-Economic impact

3.1 Positioning

The socio-economic impact for the partners of CLAIM project is difficult to assess because of the different economic situations in each country.

TMT, LASTEC and FORMENG are interested in the future commercialization and integration of the new welding system in their process lines.

The integration of the new product line in 2013 would open a new division with special dedication to the new process. The division could start with 6 dedicated persons for design, technical assistance, assembly and manufacturing (apart from taking benefit from the already existing workshop and staff of the companies). The products could follow the usual demand curve with a low demand during the product introduction (~1 year, until 2014, 15~20 services per month are considered), followed by a fast growing demand that will be important because the product will constitute a cost effective market alternative for very expensive welding processes specially in the aeronautic industry.

The actual economical crisis situation demands new production processes matching with the quality requirements but saving costs being more efficient. The market grow should be important during the next 5 years, probably duplicating the number of orders every year during this period. The division will need more personnel if this expectative is achieved with more technical persons (1 per year) and more production staff (growing together with the production from the initial number of 3 employees for this activity).

The new product division should be constituted by more than 20 persons and will invoice an average of 16% of the companies' turnover by year 2016. The expected companies' turnover will grow at higher rates (from a linear 5% assumed with the current product line to a 15% by year 2016 including the new division). Aiming to keep an important role in the new segment, a 10% of additional investment in RTD expenses is contemplated by year 2016.

The SME **MERKLE** will increase its market potential by offering a new welding system customised for the different client specifications. It is scheduling the exploitation of the new process though an extension of their product line. The economic benefit will be 25 more orders in 2013 with a growth up to 50 orders in 2018. If this expectative is achieved MERKLE will need 2 more technical people and more production staff (growing together with the production for this activity).

By the year 6-10 after the project starts, we expect to have established a solid foothold in several European countries. We will now consolidate these markets and start pan-European expansion. It must be noted that the specific markets that are going to be targeted will largely depend on local, national or cross boarder industry. Over this period we will also consolidate and strengthen the CLAIM manufacturing system to prepare it for rapid growth towards year 8 – 10 and beyond.

3.2 Environment impact

Double TIG+Laser process is profitable, applied to the production of high-value workpieces (where the cost per part (€/part) is higher), and/or for higher production rates (high number of manufactured parts per hour).

We have examined in detail both the environmental implications (energy consumption) of the new welding process such as recycling processes too.

The laser radiation leads to a voltage reduction of 2 V in the TIG welding process. Consequently, the energy input of the welding TIG sources also reduces about 20 %. This will practically compensate the energy input of the laser with the advantage of higher process speed of about 50 % without compromising the welding depth.

In addition, the process increases the weld quality in terms of reduction of pores, cracks, and improving geometry, external appearance, etc. Consequently, it reduces the rework, scrapped and end customer parts rejections. It follows that the number of defective parts to recycle will be reduced, as the processing scrap costs.