SOUNDCAST

VACUUM-ASSISTED HIGH PRESSURE DIE CASTINGS WITH REDUCED POROSITY AT LOW COST

D6.4: Final Plan for use and dissemination of the knowledge

Instrument	Collaborative Project – Research for the benefit of SME		
Grant Agreement No.	315506	Call identifier	FP7-SME-2012-1
Start date of project	1/11/2012	Duration	37 months
Prepared by	Marco Bibas	Company	EURECAT
Review	2.1	Date of preparation	18/03/2016

DISSEMINATION LEVEL

Dissemination Level (choose the suitable option)	
X	**PU** Public
	PP Restricted to other programme participants (including the Commission Services)
	RE Restricted to a group specified by the consortium (including the Commission Services)
	CO Confidential, only for members of the consortium (including the Commission Services)

DOCUMENT MODIFICATIONS CONTROL

Review	Date	Modifications	Author/Organisation
1.0	31/07/15	First draft	Marco Bibas / EURECAT
2.0	08/03/16	Second draft	Marco Bibas / EURECAT
2.1.	18/03/16	Revision	A. Fernández / IK4-AZTERLAN

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1. Introduction

The following document is a revision of the interim PUDK and has been updated properly according to the progress of the project.

The objective of this Final PUDK is to analyse three aspects within SOUNDCAST project so as to assess its impact onto the market and forecast the potential sales and profits for all partners. This document put on the table three aspects that have been discussed by all partners to ensure a successful exploitation of the project.

Firstly, there is an approach on how it is expected to carry out the exploitation plan and distribution of Intellectual Property Rights and what criteria are to be set the fair and reasonable conditions of use, dissemination and access to background, including the conditions for access to the results.

Secondly, it has been designed a dissemination plan which includes internal and external communication, an action plan and the dissemination deployment.

Thirdly, doing a course regarding the technology is essential to ensure its market uptake. RTDs will train SMEs delegates with a commercial purpose and End Users with a practical purpose. Special meetings will be arranged for that objective at the end of the project; previously it will be necessary to design the courses that will be offered.

2. Dissemination plan

Our communication strategy pursues to reach a vision that differentiates us from our competitors in a positive way. It encompasses overall direction as well as the many detailed activities that occur in the project. For this reason we have defined our strategy based on customer needs, determine the customer base we wish to serve, its needs, and then only meet the needs of those customers, foregoing all others.

As a result, the communication strategy includes the following key factors that are deployed in detail the following precise action to reach our goals:

2.1 Identifying market needs:

The aim of SOUNDCAST project is to provide an innovative technology package which allows the production of sound and weldable vacuum-assisted HPDC (VPDC) components at low cost by using secondary alloys with enhanced mechanical properties and to establish a VPDC control system that assures casting quality. Our message aims to make public the benefits of the new process.

Therefore our communication plan focuses on:

- Positioning our solution in the market as something innovative and creative.
- Divulging its economic benefits and technical advantages.
- Promoting the product to our clients (national and European).
- Publishing the R+D results in scientific media in order to gain stakeholders support.
- Promotional material will make reference to the EU support.

2.2 Project duration

No one strategy can last forever and any corporative strategy needs to be reviewed on a regular basis, not only to ensure it is still relevant but to also ensure that the original strategy has not become blurred by misconceived operational responses to threats and opportunities that are not in keeping with the original strategy. So our message has been focus on the technological advantages of the new process in order to create a lasting impressing on the industry during this 37 months project.

2.3 Focus group

It is necessary that our message reaches the stakeholders in order to accomplish with our commercial goals:

- Industry: it refers to the European casting sector of non-ferrous alloys.

- Public Administration: until now its financial support has been vital.
- Scientific community: they are who will assess our technology and improvements and, as opinion makers, they can influence the market.
- Media: efforts should be mainly focus on specialised media because our client is the industry so that we have to identify which media is more effective in order to bear our message to our potential clients. It is not discarded it to use other media to reach the public.

2.4 Message

The communication plan is designed to deliver our message with commercial connotations (its purpose is to sell SOUNDCAST technology) and technical references (its purpose is to spread the technological benefits of our product). This message should include the following:

SOUNDCAST technology allows the manufacture of sound and weldable vacuum-assisted HPDC (VPDC) components at low cost by using secondary alloys with enhanced mechanical properties and to establish a VPDC control system that assures casting quality.

2.5 Geographical area

The potential consumption of this technology encourages us to sell this product in the European high pressure die casting industry as the main market.

2.6 Dissemination deployment

- **The Project Web Site:**
  The project web site is available since the beginning of SOUNDCAST project. It is accessible at: http://www.soundcastproject.eu/

  Once the project is ended, the website is to be available at least one year.

- **Partners Web Sites:**
  To increase visibility of SOUNDCAST project, several partners implemented within their own website a link to project website and several news.

  VDS: http://www.vdssa.ch/en/index.php

  EURECAT (former ASCAMM): http://www.ascamm.com/2013/03/20/ascamm-desenvolupa-tecnologia-per-al-proces-de-fosa-de-metalls/

  TU-BS: http://www.ifs.tu-braunschweig.de/forschung/laufend/leichtmetall-druckguss/eu-315506/

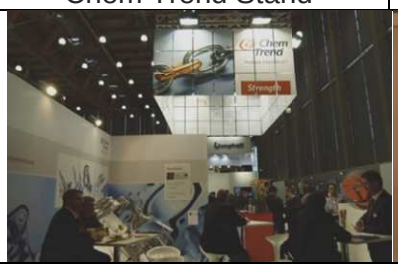
IK4-AZTERLAN:

- http://www.azterlan.es/en/difusion_tecnologica.aspx
- http://www.azterlan.es/en/actualidad_ficha.aspx?origen=actualidad&id=6d63a410-5a76-415f-89e6-be0295750cfb&pagina=0
- http://www.azterlan.es/en/actualidad_ficha.aspx?origen=actualidad&id=a407a285-5204-40ca-bc54-23f931ea5d02&pagina=1

- **Exhibitions:**

- **EUROGUSS 2014, the International Trade Fair for Die Casting,** took place from 14th to 16th of January in Nürnberg (Germany). The 10th EUROGUSS Fair closed with a high participation: 470 exhibitors and 11.187 trade visitors. It is remarkable that more than half of the exhibitors (51 per cent) and over 30 per cent of visitors were international.

  About half of the visitors belong to the automotive industry, i.e. car and vehicle manufacture and their component supply industries, but machinery and plant construction, the electrical and electronics industry, mould making and die casting foundries also demonstrated great interest in the event. **VDS Chem-Trend, and EURECAT had a stand in EUROGUSS 2014.**

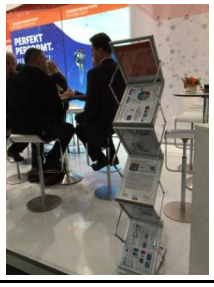
Chem Trend Stand	VDS Stand	EURECAT Stand
		

- **10th METEF 2014, the International Expo of customized technology for the aluminium & innovative metals industry,** was held from 11th to 13th of June in Verona (Italy). The 10th METEF fair had a successful participation with more than 400 exhibitors and 10,000 international visitors**. VDS and Chem-Trend had a stand** including video and/or a flyer of the Soundcast project.

- **GIFA, International Foundry Trade Fair,** took place from 16th to 20th of June 2015 in Düsseldorf (Germany). The 13th GIFA Fair closed with a high participation: 2.214 exhibitors and 78.000 visitors from 120 different countries. It is remarkable that more than half of the exhibitors (51 per cent) and over 56 per cent of visitors were international. **VDS, Chem-Trend, IK4-AZTERLAN and EURECAT had a stand in GIFA 2015**.

VDS stand	Chem-Trend stand
	
EURECAT stand	**IK4-AZTERLAN stand**
	

- **Recent participation in the 11th EUROGUSS, 12th -14th January 2016 in Nuremberg (Germany).** The International Fair for Die Casting took place from 12th to 14th January 2016 in Nuremberg (Germany). Schmale & Schulte, VDS and Chem-Trend had a stand in which were available the final SOUNDCAST project results.

SCHMALE &SCHULTE	VDS	CHEM-TREND
		

- **Publications:**

  - IK4-Azterlan's bids for the development of structural automotive parts at low prices, Empresa XXI, 01/04/2013. There is a circulation average of 8,418 copies per issue.

  - Ascamm develops technology for the process of casting metals, 03/04/2013, Interempresas, read article. Estimates reveal that there were 22672 visits in the news section.

- Interview with Manel da Silva, project manager of the Light Alloys Unit at Ascamm, Interempresas, 09/04/2014, read article

- Ascamm heads research for new technologies focused on casting metal process, Interempresas, 10/04/2013, read article. Estimates reveal that there were 24,568 visits in the news sections.

- ASCAMM develops technology for casting metal process, Revista FUNDIPress issue 47 page 14, April 2013, read article

- IK4-Azterlan promotes the development of structural automotive parts at low cost, Interempresas, 17/05/2013, read article. Estimates reveal that there were 18,645 visits in the news sections.

- Development of a new aluminum alloy from second melting and high performance injection industry, IK4News Research Alliance, 04/06/2013. The publication circulated between 1,200 researchers and technicians.

- IK4_Azterlan announces that “Soundcast project is the answer to the need for democratization of high integrity light weight structural castings” published at European parliament journal, Regional Review, page 20. The same publication can be found On-line on the Parliament Magazine website, October 2015, read article. Printed copies were delivered to all 751 MEPs and the publication has been circulated throughout the European Commission, Committee of the Regions, the European Council and for the 6,000 regional and municipal delegates attending the Committee of the Regions’ OPEN DAYS Week of Europe’s Regions and Cities. On the other hand, Parliament Magazine website is receiving 75,000 visits per month from institutions, companies, NGO’s, charities, regional governments and development agencies all over the European Union.

SOUNDCAST PROJECT IS THE ANSWER TO THE NEED FOR DEMOCRATIZATION OF HIGH INTEGRITY LIGHT WEIGHT STRUCTURAL CASTINGS

Global warming and resource shortage have lead to an urgent demand for reducing vehicle weight. Since the first AUDI A8 was introduced in 1994 structural aluminium parts have been successfully manufactured by vacuum assisted High Pressure Die Casting (HPDC) technology. However, it is still an expensive solution and only affordable for upper class cars.

Soundcast project offers an opportunity for car manufacturers (in particular of electric or hybrid vehicles) to exploit the advantages of the technologies developed in the project.

"If we can reduce just a few kilos of metal from a massive automobile weight, we can deliver an impact that is multiplied by millions," said Ana Fernández, Project coordinator, SOUNDCAST.

AN OPPORTUNITY FOR SME FOUNDRIES

It is worth to mention that Soundcast technology is perfectly suited to small and medium foundries. At the present this advanced technology is in the demonstration phase in two SME foundries located in Germany and Spain.

Headquartered in Durango, Spain, IK4-AZTERLAN is a non profit research centre with more than 40 years of experience providing and promoting knowledge that strengthens the metal casting industry in Europe.

The project has received funding from the European Union's Seventh Framework Programme, Research for Benefit of SME 2012, under grant agreement No. 315506.

The Soundcast project aims at the **democratization** of high integrity light weight structural castings by the combination of different technologies:
- the use of low cost, **portable vacuum systems** easy to fit to medium range HPDC machines
- the use of cheaper and environmental friendly **secondary aluminium alloys**
- the development of a **new laser welding technology** adapted to the casting process

ALTERNATIVE SECONDARY ALLOY

The use of secondary alloys, which are cheaper than primary, does not only reduce the fabrication costs but also lead to a reduced energy and CO2 emissions. The production of secondary alloys **requires 95% less energy than the one required for primary alloys** [EAA, 2012 Key facts and figures]. Additionally, the higher Fe content typical of secondary alloys, reduces significantly die soldering and thus **die maintenance costs**.

Chemical composition, melt and heat treatment of the new secondary alloy have been fully optimized for manufacturing high integrity light weight structural castings by HPDC. A similar procedure had already been successfully applied by IK4-AZTERLAN to another new secondary alloy, patent EP 2471987, employed for other automotive applications such as suspension and brake components. However, the **spread of use of secondary alloys for high integrity castings need an additional driving force to overcome market barriers typical for recycled materials**. Policy makers could help in this promotion.

AN OPPORTUNITY FOR LIGHT WEIGHT DESIGN

In the automotive industry, it is essential to lower manufacturing costs as well as reduce CO2 emissions by lighter weight designs. Vacuum assisted HPDC is very suitable for manufacturing thin walled high integrity castings with a significant weight reduction.

For more information of the project please visit WWW.SOUNDCASTPROJECT.EU

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IK4 AZTERLAN

NEWS/ANALYSIS

European authorities must work together to find cross-border solutions to common problems

Macro-regional strategies offer new, more cost-effective forms of territorial cooperation, writes **Mercedes Bresso**

"It is clear that a unique model of MRS does not exist. We need to avoid the one-size-fit-all approach"

- Blog release at IK4-AZTERLAN web page 25/06/2015: http://azterlan.blogspot.com.es/2015/06/need-for-high-integrity-light-weight_25.html. Title: "Need for high integrity light weight structural castings"

- **Congresses**

  - **Participation in NADCA: Die Casting Congress & Exposition 2012**. VDS presented the article "Something New in Vacuum Die-Casting: ProVac® Ultra Sonic Vacuum Valve". The congress took place in Indianapolis, USA, from 8th to 10th of October, 2012 and its audience consists mainly of International people from Scientific and Die Casting industries.

  - **Participation in 71st World Foundry Congress**: IK4-Azterlan and Eurecat (former Ascamm) presented the paper "Microstructural features of primary and secondary ductile high pressure die casting alloys for the automotive industry" in the 71st World Foundry Congress. This publication is part of the development of a new secondary alloy for HPDC carried out in the Soundcast project.

  - **Participation in 71st World Foundry Congress**: TU-BS and Chem-Trend presented the paper "Increasing the weldability of die parts by minimal lubrication" in the 71st World Foundry Congress.

    The 71st WFC was held in Bilbao, from 19th to 21st May 2014. The WFC was a gathering place where materials experts can share research,

network, and grow professionally. The WFC had more than two hundred abstract and posters from thirty countries with a global assistance of 1100 foundry professionals. http://www.71stwfc.com/

- **Participation in XIII Congreso Nacional de Materiales**: Eurecat (former Ascamm) presented the paper "Efecto de la composición en la microestructura de piezas inyectadas con aleaciones de aluminio de primera y segunda fusión". The congress was held in Barcelona, from 18th to 20th June 2014 and 276 national scientific & technical people from the materials sector were gathered.

- **Participation in ICALEO® conference 2014: International Congress on Applications of Lasers & Electro-Optics.** TU-BS presented the article "Possibilities of improving weld seam quality in laser welding of aluminum die cast". The ICALEO conference 2014 was held, from 19th to 23th October 2014, in San Diego, California (USA). More than 500 international people from the laser sector took part in the congress.

- **Participation in European Conference on heat Treatment 2015 & 22nd IFHTSE Congress.** IK4-AZTERLAN presented the paper "Heat Treatment optimisation of Secondary AlSi10MnMg (Fe) test parts fabricated by vacuum assisted high pressure die casting technology." The congress and conference took place in Venice (Italy) on 20th - 22th May 2015 gathering 260 international Scientists & experts involved in the heat treatment and surface engineering route.

- **Participation in Aluminium Two Thousand World Congress and International Conference on Extrusion and Benchmark**. IK4-AZTERLAN and EURECAT (former Ascamm) presented the paper "Effect of microstructure and casting defects on the mechanical properties of secondary AlSi10MnMg (Fe) test parts manufactured by vacuum assisted high pressure die casting technology". The congress was held, from 12th to 16th May 2015, in Florence (Italy). More than 500 international people related to Scientific & Aluminium technologies assisted to the congress. At the same time, the paper was published at Materials today proceedings Elsevier.

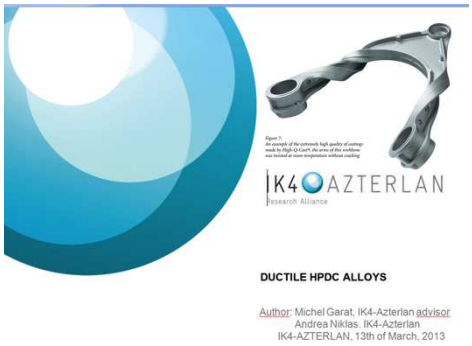
- **Scheduled participation in the High Tech Die Casting 2016 congress.** RUFFINI, IK4-AZTERLAN and EURECAT have submitted the abstract of the paper "A new secondary AlSi10MnMg (Fe) alloy for manufacture ductile aluminium parts by vacuum assisted high pressure die casting technology". The High Tech Die Casting 2016 congress will be take place, from 22th to 23th June 2016, in Venice (Italy).

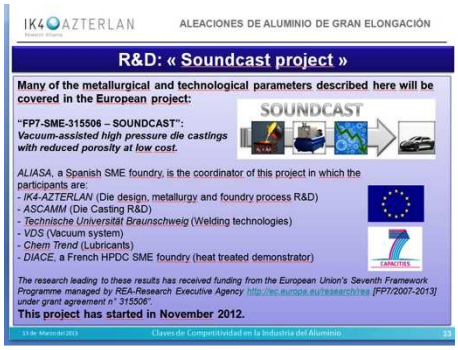
- **Scheduled participation in the INALCO 2016 13th International Aluminium Conference.** IK4-AZTERLAN and EURECAT will present the paper **"**Microstructure and mechanical properties of a new secondary AlSi10MnMg (Fe) alloy for ductile high pressure die casting parts for the

automotive industry". The Conference will be held, from 21th to 23th of September 2016, in Napoli (Italy). INALCO 2013 conference, the last edition, gathered more than 800 people from the aluminium industry. The paper will be published on the peer reviewed journal "Advanced Materials Research".

- **Conferences, seminars and workshops:**

  - On 13th November 2012 and 13th March 2014, IK4-AZTERLAN delivered a Technical conference inside the "Competitive keys in aluminium industry" held at Tabira Institute, Durango (Spain). 90 delegates assisted to the first session and due to the high demand it was repeated with another 82 assistant from France, Sweden and Spain. Most of them work for HPDC aluminium foundries and supply chain.





English version

Spanish version

Image 3.1.2 IK4-AZTERLAN presentation at Tabira Institute

- **III International Technical Forum on High Pressure Die Casting: "Key innovations factors in High Pressure Die Casting for Structural components".**

  - As a part of a whole technical conference regarding to structural parts for HPDC, IK4-Azterlan, Chem-Trend and Ruffini took part in the new edition of this international event on the 26th of November in the Automotive Intelligence Center (AIC), Boroa, Spain.IK4-Azterlan trained the audience regarding the metallurgical key points of Soundcast technologies, Chem-Trend presented the best procedures of lubrication and Ruffini (Esteve Roset and Jordi Cuadrat) participated in the discussion.More than 130

technicians from 62 different companies from seven different countries have taken part.

- **Distribution of leaflets:**

  - All the partners have distributed leaflets to clients and in fairs and exhibitions. Leaflets were customized according to each partners needs, the evolution of the project's result and the changes in the consortium. Download leaflets: Chem Trend at Euroguss 2014 & 2016 and Metef, VDS at Euroguss 2014 & 2016 and Metef, EURECAT at Euroguss, 71st WFC, GIFA, AZTERLAN at GIFA and WFC, Schmale and Schulte at Euroguss 2016.

- **Project Videos:**

  - **Soundcast melt treatment and procedures for achieve high mechanical properties are described in a** video released in Youtube and Soundcast Website. The full Soundcast process is described, including melt treatment and all the steps of vacuum assisted HPDC process. In the video it is mentioned that the research leading to these results have received funding from the European Union's Seventh Framework Programme. View video.
  - A **video showing the main project results** was presented at IK4-AZTERLAN stand at International Exhibition at 71st World Foundry Congress
  - **Laser beam welding of a high ductile secondary HPDC aluminum alloy at reduced ambient pressure** is described in a video uploaded at Youtube https://www.youtube.com/watch?v=5zZreovw9mU and also at Soundcast Website: The video depicts the welding process with a solid state laser. Two high pressure die casting parts, made of a high ductile secondary HPDC aluminum alloy, are welded together here. In a first approach, the welding process is established at ambient pressure. In a second approach, a reduced ambient pressure is enabled for the welding process. The results clearly point out that hereby, a narrow and porosity reduced weld can be achieved.

- **Training activities**

  - Young Students´ Seminar at 71st World Foundry Congress, on 21st May 2015 in Bilbao (Spain). 82 students and technicians from international Universities, research centre, foundries and supply chain industries exchange experience and information regarding materials and foundry technology

  - An open house session at EURECAT. The 19th of November 2015 an open house session will be held at Cerdanyola del Vallés (Barcelona) with one presentation of each partner: "Advances in the development of

structural part at low cost". A total of 23 technicians from HPDC foundries and supply chain industries attended to the event.

- An open house session at TU-BS is scheduled for the 1st of December 2015: "Welding of HPDC based on practical approach".

3. IPR management

3.1 Protection of the results

If the results of the research were not properly protected dissemination and exploitation actions would only lead to a situation whereby imitation would have flourished and reduced the rewards accruing to this EC funded research and development effort. Given that the results of this project were intended to be launched onto the market, protection procedures were taken.

All publications, patent applications filled up to now and hereafter by or on behalf of a participant, or any other dissemination relating to results, include a statement that the Results concerned was generated with the assistance of financial support from the Community.

Finally, note that SME participants are direct beneficiaries of the project results. RTDs are subcontracted to carry out most of the research and demonstration activities and have received the technological know-how in return that was needed to develop SOUNDCAST technology.

Table 3.1.1 Distribution of IPRs between partners according to the new arrangements

Table with exploitable results					
Exploitable product	**Proposed value**	**Sector(s) of application**	**Timetable, commercial use**	**Patents or other IPR exploitation (licences)**	**Owner & Other Beneficiary(s) involved**
(1) SOUNDCAST technology package	Innovative process to produce sound and weldable vacuum-assisted HPDC (VPDC) components.	HPDC Industry, Automotive	2016	Trade Secret	Ownership: VDS Internal use (*): AZTERLAN, TU-BS, EURECAT
(2) Know-how based on the development of SOUNDCAST Technology	Know-how applied to sound and weldable vacuum-assisted HPDC (VPDC) components	HPDC Industry, Automotive	2016	Not possible	Ownership: VDS Internal use(*): AZTERLAN, TU-BS, EURECAT, RUFFINI, SCHMALE & SCHULTE
(3) New recycled alloy	New recycled alloy(s) for structural applications in the automotive industry	HPDC Industry, Automotive	2016	Patentable. Owner is responsible of a detailed analysis.	Ownership: RUFFINI Internal use (*): AZTERLAN, DIACE, SCHMALE & SCHULTE
(4) Quality control system	Control software that validates the quality of components produced	HPDC Industry	2016	Copyright	Ownership: VDS Internal use (*): EURECAT, AZTERLAN, DIACE, RUFFINI, SCHMALE & SCHULTE
(5) New welding process	Innovative welding process suitable for components	HPDC Industry, Automotive	2016	Trade Secret	Ownership: SCHMALE & SCHULTE Internal use (*): TU-BS, DIACE, RUFFINI
(6) Know-how based on the development of new welding process	Know-how applied to welding process suitable for VPDC components	HPDC Industry, Automotive	2016	Not possible	Ownership: SCHMALE & SCHULTE Internal use (*): TU-BS, RUFFINI

(*)*The RTD Performers:* The RTD Performers shall be granted by the SME Partners Access Rights to Results on royalty-free conditions to conduct further research (Article 50.5 RfP). Access Rights for internal research and for research in areas other than those targeted by the Project, as well as for teaching purposes, shall be granted royalty-free on request.

3.2 Protection of the results

The consortium always has had a clear idea on how it is organised IPR ownership and user rights (e.g. licences, royalties) among them. First of all, this project will follow the default regime in terms of Intellectual Property rules for Research for SMEs projects, whereby the SME participants will receive full ownership and exploitation rights of all the results generated by the project.

Hence, to ensure a successful exploitation of SOUNDCAST project results, SME partners will exploit their results according to their corporate strategy and dedication, because each and every member within the consortium has a clear economic interest.

The consortium aim is that the agreement described below shall last as long as it is legally possible.

Table 3.2.1 Distribution of IPRs between partners and commercial alliances

PARTNERS		Rights	Obligations
SME	**VDS**	Owner of the developed SOUNDCAST technology package and quality control system for manufacturing and commercializing worldwide.	A Manufacturing Supply Agreement to RUFFINI and SCHMALE & SCHULTE was established. Responsible for support and maintenance of its results.
	DIACE	Special market conditions for the acquisition of the results 1, 3, 4 and 5	Non-disclosure agreement.
	RUFFINI	Owner of the new recycled alloy (result 3) for manufacturing and commercializing worldwide. Special market conditions for the acquisition of the results 1, 2, 4, 5 and 6.	Non-disclosure agreement. Responsible for support and maintenance of its result.
	SCHMALE & SCHULTE	Owner of the new welding process (result 5) for manufacturing and commercializing worldwide. Special market conditions for the acquisition of the results 1, 2, 3 and 4.	Non-disclosure agreement. Responsible for support and maintenance of its result.
RTD	**AZTERLAN**	Technical collaboration. Technical support. Improvement contract: a) Own improvements to others b) Others improvements to own use	Non-disclosure agreement. Usage of technology at internal level of the entity in question.
	TU-BS	Technical collaboration. Technical support. Improvement contract: a) Own improvements to others b) Others improvements to own use	Non-disclosure agreement. Usage of technology at internal level of the entity in question.
	EURECAT	Technical collaboration. Technical support. Improvement contract: a) Own improvements to others b) Others improvements to own use	Non-disclosure agreement. Usage of technology at internal level of the entity in question.

Summary of results:
1. SOUNDCAST technology package
2. Know-how based on the development of SOUNDCAST Technology
3. New recycled alloy
4. Quality control system
5. New welding process
6. Know-how based on the development of new welding process

4. Exploitation plan

4.1 Market needs

The necessity of preserving resources and the reduction of environmental pollution makes **lightweight concepts and recycling highly interesting for structural components in the transportation market**. In this sense, aluminium is the most widely used because of its high strength weight ratio. Aluminium structural components require very low porosity in order to fulfil ductility, impact resistance and weldability requirements.

At present, structural aluminium components of vehicles are produced by expensive high vacuum die casting processes such as Vacural, BDW or AVDC (ALCOA Vacuum Die Casting) processes. These technologies are clearly too expensive for SME foundries.

Moreover, the alloys normally used for producing structural components are of primary production and very different from the basic HPDC AlSi9Cu3/AlSi12Cu2 alloys (80% of the HPDC production). **The possibility of using recycled (secondary) alloys, which are much cheaper than primary, will reduce the production cost as well as taking other great advantages such as saving energy and reduction of CO_2 emissions and water consumption. To produce secondary alloys requires 95% less energy than required for primary alloys.**

HPDC today accounts for approximately 60% of the total production of aluminium castings, the rest being predominantly Permanent Mould ("PM") followed by Sand Casting. Lost Foam, Squeeze Casting, Semi Solid Casting and Investment Casting have only minor market shares. Around 80% of the HPDC sector's SME could benefit by this cost reduction and enhanced casting quality due to the know-how developed in this project.

4.2 Value proposition

SOUNDCAST aims at providing the SME foundries a complete technology package optimizing the whole fabrication process (vacuum application including numerical simulation, die design and lubrication, welding, melt preparation and heat treatment of new recycled alloy(s) and quality control tools.

The following shows the main advantages that SOUNDCAST technologies offers to the industry:

Measures	Optimization Average respect State of the Art
1. SOUNDCAST Technological package	
- Porosity reduction	95-98%
- Enhanced ductility	500%
2. New recycled alloy	
- Raw material cost reduction	10%
- Die life increase	10%
- Heat treatment energy consumption saving	65%
- Recycling alloys energy consumption saving	95 %
- Enhanced ductility	100%
3. Quality control system for low cost VPDC process	
- Reduce casting defects	15%
- Reduced process variations	30%
4. New welding process	
- Reduced blister formation	95-100%

4.3 Market research

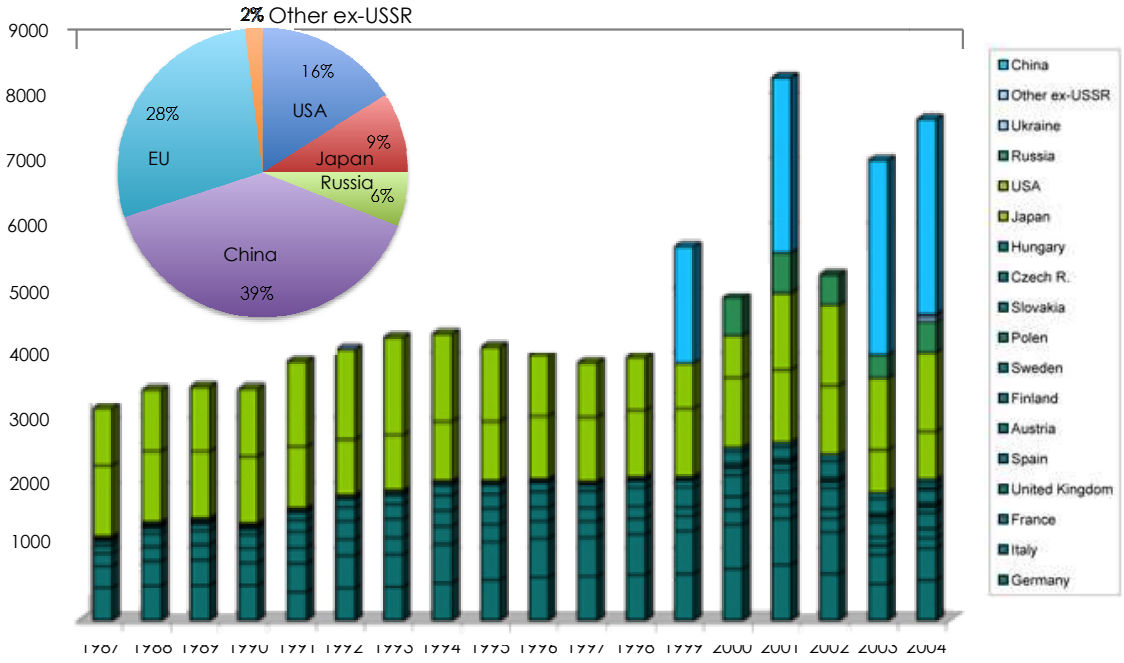
Recycled aluminium demand

Aluminium is endlessly recyclable without loss in quality. According to the European Aluminium association, Europe enjoys high recycling rates: more than 95% in mobility and construction, around 60% for packaging and even 70% for beverage cans. Recycling saves 95% of the energy needed for the primary production.

Recycled aluminium production (refining and re-melt) in Europe reached around 4.3 million tonnes in 2010, 2.2 million of which produced by refiners. Worldwide, some 7.7 million tonnes were produced by aluminium refiners which market value is €36.8 billion.

The picture below shows the main casting alloy production per country in 2010:

2010 World Casting alloy and desox production



Source: European Aluminium Association http://www.european-aluminium.eu/production-recycled-aluminium-production-source-oea/

China leads casting alloy production with 39% market share, Europe ranks second (28%) and USA is third (16%).

Consumption of recycled aluminium parts by end-use market
In 2014, Transport and construction were the main end-use market for the aluminium casted products in Europe.

Transport: its unique combination of strength and lightness, corrosion resistance, excellent recyclability, improved safety and design flexibility. Aluminium is widely used in cars, trucks, buses, coaches, trains, metros, ships, ferries, aircraft and bicycles.

Building: it is the material of choice for curtain walling, window frames and other glazed structures. It is extensively used for rolling blinds, doors, exterior cladding and roofing, suspended ceilings, wall panels and partitions, heating and ventilation equipment, solar shading devices, light reflectors and complete prefabricated buildings.

Packaging: It can contain, protect, decorate or even dispense products as diverse as soft drinks and soaps, pet foods and snack foods, tobacco and toiletries, chocolates and chilled foods, tablets and take-away meals – even tennis balls and welding rods. Aluminium packaging has become part of everyday life.

Engineering: many industrial machinery manufacturers choose aluminium because of its design flexibility, its easiness to machine, and its low density offers particular advantages in many applications. Also, the use of aluminium in electrical and thermal applications is due to the good electrical and thermal conductivities of the alloys. Almost all electric lights, motors, appliances and power systems depend on a vast grid of aluminium wire.

Consumer durables: the use of aluminium in design, domestic and office applications is often due to the highly decorative and fashionable design appearance of aluminium, for example in furniture, utensils and decorations, climbing hooks, cycles, camping equipment, furniture design, pots, pans, cutlery, lamps, picture frames or handles for cupboards, jewellery, badges, coins.

Main end-use markets for aluminium casted products in Europe 2014

Source: European Aluminium Association, http://www.european-aluminium.eu/thealuminiumeffect/#4thPage

Sector analysis

The activity of the casting of metals (NACE Group 27.5) was carried out by 6.7 thousand enterprises across the EU-27 in 2006. From a turnover of EUR 37.6 billion, these enterprises generated EUR 11.8 billion of added value in 2006, which was the smallest contribution (4.8 %) to the value added of the metals and metal products manufacturing (NACE Subsection DJ) sector. The casting of metals sector employed an estimated 270.0 thousand people in the Member States in 2006, about one in every twenty (5.3 %) of the EU-27's metals and metal products manufacturing workforce which was a slightly higher share than that recorded for basic precious and non-ferrous metals (NACE Group 27.4).

The casting of iron (NACE Class 27.51) and the casting of light metals (NACE Class 27.53) were the two largest activities within the casting of metal, together providing about three quarters (73.3 %) of the EU-27's value added in 2006.

	Non-ferrous metal casting			
Countries	**Number of foundries (Production units)**	**Employment in the foundry industry**	**Total Production (in 1000 t)**	**Production value (in Mio. €)**
Austria	39	3920	149,1	911,5
Belgium	7	276 [2]	1,2	-
Czech Rep.	40	5500	87,5	-
Denmark	11	357	4,7	-
Finland	16	464	7,8	68,9
France	311	13079	371,8	2693
Germany	344	32146 [3]	974,8	5444
Hungary	92	3520	105,2	210
Italy	914	15000	978,3	-
Norway	9	432	7,0	67
Poland	245 [1]	-	279,2 [1]	-
Portugal	39	-	24,4	305,6
Slovenia	52	1800	34,9	-
Spain	53	4602	132,4	778,4
Sweden	78	2750	57,2	-
Switzerland	41 [1]	-	24,4	-
Turkey	395	7500	170,5	298,8
United Kingdom	210	9500	135,1	-
Total	**2896**	**68710**	**3266,3**	**10777,2**

[1] Estimated [2] only workmen [3] foundries > 50 empl.

Source: The European Foundry Association http://www.caef.org/downloads/kategorie.asp?kat=9

The three largest European producers are Germany, France and Italy with a total annual production of over two million tons with a market share of 36.8%, 16.2%, 10.6% respectively. In recent years Spain has overtaken Britain in the fourth position, both with an annual production of one million tons. Together, these 5 countries that accounts for more than 80% of the total European production.

5. Business plan

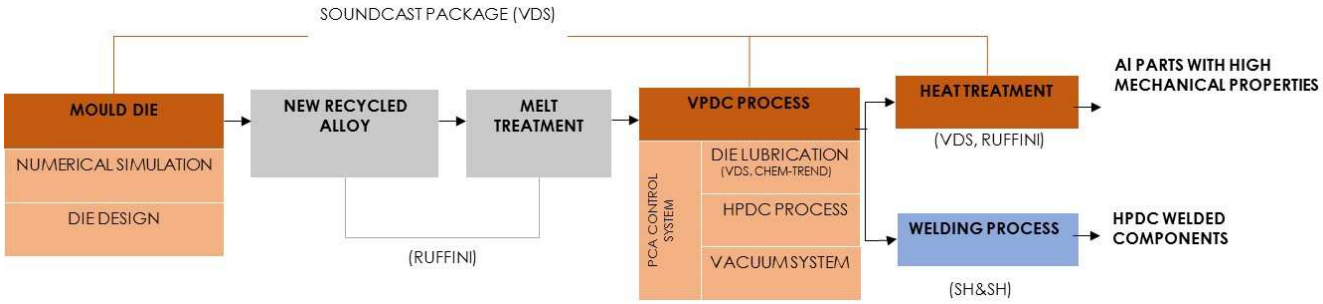
5.1 Business model

The exploitation plan will seek to attain results that can bring real change at the European aluminium foundry industry, especially SMEs, dedicated to high pressure die casting. All beneficiaries agree that due to the good fit of VDS's technical capabilities and expertise; it is the most adequate partner to exploit the new SOUNDCAST technology, in order to improve their existing equipment and provide an integral service to their customers.

To achieve broad adoption, the right mechanism would be through a commercialization plan to persuade foundry SMEs, publishers or other commercial concerns to take up the Soundcast technology. It is important to keep the results visible and available, especially through websites, thus target audience can access the information, and adapt them to their own needs.

The participation of partners in Soundcast project brings a clear benefit for the consortium as project results directly impact on the core of their organisational activities. The picture below summaries the involvement of partners and commercial alliances through licensing (see Table 3.2.1 Distribution of IPRs between partners and commercial alliances) in order to bring technology to the market:

Involvement of partners and commercial alliances



Source: own elaboration

5.2 Impact of the technology on the market

VDS SA

The company is located near Montreux on the Lake of Geneva, Switzerland. For more than 25 years the firm has manufactured and marketed a complete range of high-speed vacuum shut-off valves and associated control systems with very high performance and excellent reliability, as well as high quality chill vents for lower-cost no-maintenance operation. The ProVac® vacuum system is designed on a modular basis and it is used throughout the world.

VDS aims to produce hi-tech vacuum systems with ever improving performance, and towards that end makes extensive use in development of numerical simulation backed up by testing and measurement. Furthermore, it not only profits from its many years of experience in the practice of vacuum pressure die-casting, but also takes account of the feedback from its customers and other commercial users of this technology.

VDS has the products to satisfy every need in vacuum technology and offers a full range of technical support. Moreover VDS is the holder and inventor of unique advanced technologies such as the VAMP and international patented inventions such as Actuated high-speed vacuum shut-off valves, One-sided ProVac® Ultra EASY and Ultra SONIC vacuum valve with unequalled aspiration capacity, Typhoon valve and new system of quick-change bushes in order to reduce the costs of overhauling the valves.

VDS distributes its components through its sales department. However, it has representatives in Europe, Asia and North America from which it commercialises its products. The following describes the geographical coverage:

- Europe: Deutschland, Spain, France, Portugal, Italy, Norway, Denmark, Finland, Sweden, Hungary, Taiwan, Croatia, Bosnia, Serbia, Slovenia, Turkey, Russia
- Asia: China, India, Japan
- North America: USA, Canada

VDS will not commercialize a specific equipment developed from the SOUNDCAST project results, it will use SOUNDCAST technology to improve its existing vacuum equipment and provide a better service to the final costumer.

Distribution: Our prediction is to include the results based on SOUNDCAST technology in the vacuum equipment by 2016. All new equipment sale from VDS will integrate the benefits derived from SOUNDCAST project, including the new statistical data recording software. The commercialization of the technology will be worldwide from the beginning. Sales forecast including revenues, production costs, gross profits, operating costs, net income and ROI for the next five years have been calculated. The table of **sales forecast** is not included in the present deliverable due to confidential issues, but it will be included in the final report and in the presentations at the final review meeting.

Promotion: Our promotion scheme is to be developed in accordance with our target group that includes potential clients and stakeholders. Thus it has been previously drawn up a roadmap to ensure that our message will reach them accurately. Logically, any action or distribution of promotional material must be focused on the accomplishment of the strategic goals as it is outlined below:

- Scientific press: any innovative result has to be published in specialised magazines and reviews.
- Distribution of catalogues and brochures to potential clients.
- Demo workshops: this activity will be presented in three different formats according to the characteristics of the assistants (press, clients and scientific groups) who will be invited.
- Trade fairs: Attending international exhibitions such as (METEF International aluminium exhibition, Aluminium (Germany) and Euroguss International Trade Fair for Die Casting) may boost sales.

SCHMALE & SCHULTE

Schmale & Schulte is a company devoted to the development and production of sophisticated products from die-cast aluminium, zinc die casting and gravity casting aluminium. It also supports the manufacture and supply of pre-finished cast components.

Nowadays its main customers are ABUS, BM, Siemens, Continental, Magna, Miele, Lenze, Hueck, Takata, Brose and Thyssenkrup.

It has been considered that the company will get a new reference with high weldability due to the new capabilities gained in the SOUNDCAST project. The figures of the **sales forecast** have been projected from the average income that the company has one production project. Sales forecast table includes revenues, production costs, gross profits, operating costs, net income and ROI for the next five years.

RUFFINI

RUFFINI, S.A. is an aluminium foundry that focuses on the development, production and commercialization of high quality cast metal parts, mainly to the automotive sector. Automotive industry market sales as primary and secondary level suppliers comprises 77 % of its activity. The domestic appliance sector accounts for 15 % and various other industrial sectors cover the remaining 8 %.

RUFFINI sales activity (2014) amounts to a turnover of EUR 15.4M. The forecast for 2015 is EUR 21.3M. From the total turnover, 81% is for export supplies and the remaining 19 % corresponds to the national market.

Its facilities have a total floor area of 22,000 m2 where there is a machine with closing forces ranging from 500 to 2,500 tonnes. Moreover, its furnaces have a melting capacity of 12,000 tonnes of aluminium per year. To ensure the quality of the molten aluminium, it is used spectrometer, degassing through impeller device, etc.)

RUFFINI main costumers from the automotive industry are Audi, Bowden S.A.S, Mercedez-Benz. Nissan, Seat, Skoda, Delphi, Ford, Suzuki, Volkswagen, ZF and Honda.

It has been considered that the company will get a new reference due to the new capabilities gained in the SOUNDCAST Project. The figures of the **sales forecast** have been projected from the average income that the company has one production project. Sales forecast table includes revenues, production costs, gross profits, operating costs, net income and ROI for the next five years. It is not included in the present deliverable due to confidential issues, but it will be included in the final report and in the presentations at the final review meeting.

CHEM-TREND

Chem-Trend is a market leader in process chemicals in various industry segments. Thus the company and its products are well known to end users. Its customers are placed in the HPDC industry and are OEM´s, TIER1 supplier and the foundries that mainly supply the automotive industry.

Chem-Trend has a known position and a good market share in the industry. Soundcast did underline, that Chem-Trend is an innovative organisation and a major driver in developing new products/services for their customers. Chem-Trend did gain some new business with the SOUNDCAST product, but compared with our market share it is not recognizable now.

Chem-Trend will offer in accordance to the Soundcast exploitation plan SL-1697S and PL-766 for manufacturers of structural parts. It has to be observed, that in the automotive industry very often a homologation of used products by OEM´s is required, mainly when they are chemical products.

Chem-Trend has in his markets a well-established application and sales force and maintains a functional network of distributors and dealers. With this network the project results will be implemented into the market. Furthermore the network of the Soundcast consortium will be embedded in the market penetration, e. g. VDS. The strategy is, to address HPDC-Foundries, who are manufacturing structural parts. Those parts are casted under vacuum and are welded/bonded or heat treated very often.

Chem-Trend will present the technology to our existing customers in form of workshops and general presentations. In the second step Chem-Trend will present the interested clients our products in the foundry.

AZTERLAN

AZTERLAN is a metallurgical research centre highly specialised in casting technologies. RTD activities are focused on solidification in casting process, new techniques for predictive metallurgical quality control, development of new alloys with improved performance and intelligent control of casting processes.

EURECAT (former ASCAMM)

EURECAT is the largest provider of industrial technology of Catalonia. At present, there are working 450, mostly researchers, in over 100 R&D projects. The Technology centre recently reported revenues of €38M. Today the metal manufacturing team works in several specific metal material transformation areas such as forming and transformation of sheets, plates and tubes, light alloy injection and advanced and micro-machining.

TU-BS

The institute of joining and welding at the university of Braunschweig deals with questions of joining technology from all areas of machine, vehicle and plant construction in the full range of this special field in research and education such as metallurgical characterisation of materials, aluminium die casts or welding-technological processing in general.