No.	Period	Number of Contract	Title	Acronym	REPORT Number	Abstract	Main Relevant Topic	Further topics	Relevant sub-topics
2	01/11/1995 - 31/10/1998		Control of liquid slag carry away and entrapment in the CC mold for a better surface and subsurface quality: numerical and experimental study.	-	EUR 19360	The main aim of the project was to determine the mould conditions that improve slab surface and subsurface quality. This has been studied by mould flow and free surface simulations using the software package FIDAP and physical model trials. At Raahe Steel Works, modelling work and plant trials have been concentrated on a new slab caster which underwent first hot tests in Dcember 1997. Diffent outlet configurations of a submeged entry nozzle (SEN) have been modelled in order to optimise the surface waviness and the penetration depth of the liquid steel. A new SEN has been designed utilising these modelling results. To search for inclusions of mould slag origin samples were taken. Most of the inclusions found were alumina and manganese sulphides. No inclusions of mould slag origin were found. At IRSID , experimental trials with physical models have bieen performed i.e. using a $ZnBr_2$ model, a water model and a vortex hydraulic model. The characteristics of vortex fomation and slag carry-away phenomena have been investigated . The trials on the physical models have shown that the slag carry-away occurs with two different mechanisms, by a vortex fomation or by the eintrainment of slag through the shear stress efffect. Thes effects of certain process parameters and slag properties have been characterised in terms of a critical velocity and a critical metal flowrate leading to slag entrainment. According to the investigations the slag viscosity has a strong influence on the vortex characteristics. The depth and the diameter of the vortex. as well as the size of he droplets dragged off, increased stongly when the slag viscosity inreased. a tentative analytical model has been dveloped in order to predict the effect of slag viscosity on the critical verloctiy leading to the slag drag-off by th shear stress effect.	2	5	T2.1, T5.1
3	01/07/1999 - 31/12/2002		Castability & surface quality of steels microalloyed with Ti or TiNb in continuous casting of slabs, thin slabs and beam blanks				3	5	T3.4, T5.2
4	01/07/1999 - 30/6/2003		New secondary cooling patterns for peritectic and micro alloyed steels.				2	5	T2.1, T5.1
5	01/09/2003 - 28/02/2007	RFSR-CT-2003-00003	Improvement, control & prediction of cast & rolled products through development & application of novel engineering monitoring techniques.	CASTDESMON	23853	The aim of the project has been to develop improved means of defining, monitoring and assessing the effects of caster design, condition and operation on slab, bloom and rolled product quality in order to enable better control of the process and to provide the required data for quality prediction. The project has determined the effect of mould taper, wear, metal level, heat transfer and friction under steady state and dynamic conditions; relationships with product quality data have been established together with means of predicting and controlling caster condition. New and existing engineering and operational monitoring techniques (both on- and off-line technologies) for the mould and strand support areas have been delivered. Relationships between engineering and operational parameters, monitored under both steady state and dynamic conditions, and cast product quality have been defined. An understanding has been developed using mathematical modelling and plant trials of mould taper and how its incorrect choice and loss affects the quality and shape of the continuously cast semi; this has included the development of improved off- and on-line taper measurement. The effect and extent of mould wear on surface and subsurface quality has been defined. Improved methods for wear measurement have been developed. Improved means of predicting and controlling caster condition and cast product quality have been delivered. These have included the development and application of data-based methods for quality prediction of cast and rolled product. Potential areas of exploitation for the results from this project have been highlighted.	5	3	T5.1, T2.1
6	01/09/2003 - 28/02/2007		Enhanced steel product quality & productivity by improved flux performance in the mould through optimising the multiphase flow conditions & special regard to melting & entrapment.	FLUXFLOW		The technical objective of the project was to validate the ability of multplexed eddy-current arrays to fulfill the requirements for corner crack detection on as-cast products. Regardless of the oscillation marks, presence of scale, or produckt temperature. The potential benefits are estimatrd to about 15 M€/a if the whole European steel industry was able to take otimised assignment decisions as the product exits the caster. Moreover, integrated plants could then invest in logistics and improve the direct hot charging rate to the hot mill which could result in considerable ernergy savings and reduction of greenhouse gas emissions.l	2, 4		T2.1, T4.1
7	01/07/2004 - 30/06/2007		Multiplexed eddy current arrays for the detection of corner cracks on as cast products in the inspection yard & at the exit of continuous casting.	EDDYCAST	EUR 24181	The technical objective of the project was to validate the ability of multplexed eddy-current arrays to fulfill the requirements for corner crack detection on as-cast products. Regardless of the oscillation marks, presence of scale, or produckt temperature. The potential benefits are estimatrd to about 15	5		T5.1
8	01/07/2005 - 30/06/2009		Direct casting of small sections beam-blanks thanks to meniscus free casting technology.	Beam-blank MFC					

9	01/07/2005 - 31/12/2008	RFSR-CT-2005-00011	Enhanced as-cast product quality by optimised mould taper design.	SOLIMOULD	24176	The goal of this project was to investigate how the taper in combination with shrinkage, operational parameters and other mould conditions (wear and distortion) affects as-cast product quality for different semis formats, namely billets and slabs. As a result, it was possible to gain crucial information for optimising mould design and operational parameters, with the aim of improving ascast product quality. Plant trials were supported by mathematical modelling for early solidification and the interaction between solidified shell and mould. Work involved data collection for flat and long products by the industrial partners, followed by assessment of cross section profiles and correlation with production parameters. Corus focused on slabs and billets, while Sidenor concentrated on billets, and CSM and VDEh-BFI on the development of numerical methods for the simulation between mould and as-cast product. Analysis and the elaboration of theories concerning the interaction between as-cast product and mould for the standard casting practice were defined. It allowed the characterisation of the as-cast material results in terms of shrinkage, cross-section shape and quality results for the standard casting practice. Special attention was paid to the formation of oscillation marks, the phenomenon of binding between billet and mould, and the deformation of mould tubes due to thermal conditions and physical constraints, and its effect on the as-cast material transversal shape. On the other hand, the 2D in-mould solidification numerical model developed during the project was applied to simulate the solidification of the steel inside the billet moulds. From the calculated steel shell displacements, an ideal taper profile was derived, describing the way the length of the billet cross section perimeter changes from the meniscus level to mould exit.	2	3	T2.1, T3.1
10	01/07/2005 - 31/12/2008	RFSR-CT-2005-00012	Optimising slag film properties and determination of operational windows for lubrication, mould heat transfer and shell formation.	SLAGFILMOWL	24988	This collaborative project aims to improve the surface quality of continuously cast semis through the development of and understanding of the events and conditions ta the meniscus that affects slag infiltration and conditions in the mould strand gap resulting from the properties of the slag film. This understanding ha been achieved in two ways. The first is via the characterisation of the mould top slags and mould strand slag films from the industrial casters of the partners and the correlation of these samples with plant operational and surface quality data. The second is via numerical modelling of early solidification and the effect of deformation and stresses on the shall and slag infiltration into the mould strand gap. From the developed understanding, operational windows for lubrication, mould heat transfer and shell growth are being developed. Achievement of the objectives will result in an improvement of as-cast surface quality.	4	3	T4.1, T3.2
11	01/07/2005 31/12/2008		Precipitation behaviour of microalloyed steels during solidification and cooling.	PRECIPITATION			1	2,3,4	T2.2, T3.2, T4.1
12	01/07/2006 30/06/2009	RFSR-CT-2006-00018	Grain size control in steel by means of dispersed non metallic inclusions	GRAINCONT	24993	This was a collaborative project involving Kungliga Tekniska Högskolan, Helsinki University of Technology, Centre de Recherches Métallurgiques, ArcelorMittal and ComdiCast AB. Stiftelsen for Industriell og Teknisk Forskning was also participating as subcontractor. The project objectives were to create and improve fundamental knowledge of grain size control by means of dispersoidic inoculants in the steel microstructure and to develop and establish a new addition technique applicable for steel continuous casting.Thermodynamic studies and modelling of potential inoculants yielded results which could be utilised during the progress of the project. Laboratory testing of inoculants systems and evaluation of the as-cast samples gave information regarding the potential grain refining effects. Ingots for further processing were produced. Research regarding production of inoculants alloys, both with exogenous particles and ferroalloys for in situ formation of inclusions (e.g. particles) in steel, was carried out. Grain refining effect of produced inoculants alloys was tested. An injection technique for addition of inoculants alloys powder directly in the continuous casting mould through a special submergedentry nozzle was developed and tested in pilot plant scale. Grain refining effect on as cast material was evaluated and samples for further processing was also here produced. A selection of the various steel samples produced in the project underwent hot and cold rolling simulation tests and the effects of grain refining on microstructure and mechanical properties of final products were evaluated.	1	2, 3	T1.2, T2.3, T3.3

13	01/07/2007 - 31/12/2010	RFSR-CT-2007-00013	Innovative non contact non destructive sensors for automatic detection of surface and internal defects in hot continuously cast products	NDTCASTING	25092	The focus was to develop innovative non-contact, non-destructive sensors for automatic detection of surface and internal defects in hot continuously cast products. BFI has developed a technique, based on the ultrasound pulse-echo method. BFI's technique uses non-contact EMATs to both generate and receive ultrasonic signals. BFI has investigated the use of the developed phased-array system for surface and sub-surface defects. The inspection system can find defects on steel products, even if the surface is rough and contains oscillation marks and scale oxide. Tata Steel has carried out work to develop a prototype Laser-EMAT system. This has been installed on the pilot caster at Tata Steel. Extensive trials have been carried out on cold steel samples below the Curie temperature with good results but hot steel trials have been of limited success. The Laser-EMAT device has been equipped by SSSA with complete software for data visualisation and analysis and BFI has also developed the necessary tools for ultrasound data interpretation. ArcelorMittal worked in the extension of the application field of its CH system. As a result, defects such as very thin and zigzag cracks can now be reliably detected. A system to check the quality during and after scarfing was developed and integrated in the plant. A software tool for tracing slabs through the mill was developed, allowing downstream evaluation of the defects	5		T5.1
14	01/07/2008 - 31/12/2011	RFSR-CT-2008-00007	Integrated models for defect free casting.	DEFFREE	25874	The objective of the project was to develop a new modelling-based optimisation and quality control system for continuous casting. The concept was based on studying critical parameters affecting steel quality and finding safety ranges for them to ensure good quality in continuous casting. Several fundamental and semi-empirical models were developed in the project. The critical features affecting steel quality were defined through mathematical modelling and industrial casting trials. Both good quality casts and casts with some defects were simulated to find features which have an effect on steel quality. Cracking indices, fluid flow parameters in the mould and segregation severity parameters are examples of critical parameters defined in the project. Safety ranges inside which the critical parameters had to stay during casting were determined in steady-state casting conditions. If a critical feature could not be adjusted on-line during casting, for example, surface velocity of liquid in the mould, this feature was expressed as a function of casting parameter, e.g. casting speed, which can be controlled and modified during casting. For optimising and controlling steel quality during casting the following online models were developed in the project: transient 2D centreline segregation model, dynamic 3D heat transfer model and inverse mould heat flux difference model. These models can be applied also to other casters for online simulation, once the caster has been set up and casting process data is available.	2	3	T2.1, T2.3, T3.2
15	01/07/2008 - 31/12/2011	RFSR-CT-2008-00008	Reduction in surface cracking in as cast low sulphur and calcium treated steels.	LSSEMIQUAL	25885	The objective of this proposal is to investigate why certain low and very low sulphur content and calcium treated steels are more prone to longitudinal face, transverse face and corner and network type cracking in the as-cast surface. Tata Steel, RIVA, ArcelorMittal and RWTH are involved in industrial and laboratory tests to investigate the effects of sulphur on hot ductility, surface metallography and defect investigations. The statistical analysis of different casting conditions and steel chemistries is also being considered to obtain a deeper understanding to the cracking phenomenon. BFI is involved in the mathematical modelling and physical simulations to investigate dynamic behaviour at the meniscus. Thermodynamic and Numerical modelling of inclusion formation and chemistry as well as thermomechanical and oscillation conditions of strand down the caster were evaluated by different partners. The statistical analysis of the defect data for as-cast and rolled product and the hot ductility testing near liquidus temperature down to below α-ferrite temperature did not show an obvious relationship between sulphur level in steel and surface defects. It is, however, noted that casting parameters such as long delay in ladle furnace operation, high casting speed, high superheat etc. as well as level of C in the peritectic range and precipitation of AlN in steel have some influence on crack formation with low level of S in steel.	1	2, 4	T1.1, T1.3, T4.1
16	01/07/2010 - 31/12/2013	RFSR-CT-2010-00006	Intercolumnar cracking and its relationship to chemistry and applied strain.	ICCRACK	27078	The ultimate aim of the project is to reduce the intercolumnar (IC) cracking in the continuously cast semis of different formats ranging from slab to small section billets and to optimise the properties of the rolled product. In order to achieve this goal, the work programme in this project is divided into three main areas of research and development: i) Industrial trials to establish and characterise the relationship between in-mould and below mould casting parameters including steel chemistries with the intercolumnar cracking. ii) To establish the levels of mechanical strain causing the intercolumnar cracking. iii) To establish a complete picture of combined effect of steel chemistries, casting parameters and thermo-mechanical strains to cause IC cracking. Plant trials on several industrial casters, covering a variety of formats and grades, together with newly developed and existing mathematical models, have identified key parameters that affect the level of IC cracking. Through a combination of direct measurement techniques and modelling, the levels of mechanical strain that result in IC cracking have been characterised. Some threshold strain levels, above which IC cracking occurs, have been established. Where possible, changes to casting parameters, steel chemistry and total strains within a caster have been trialled and have led to substantial improvements in the levels of IC cracking. The exploitation and impact of the results have been discussed	1	2, 3	T1.1, T2.1, T3.2

17	01/07/2011 - 31/12/2014		Development of a toolbox for direct defect prediction and reduction through the characterisation of the meniscus slag bed behaviour and initial shell solidification in CC.	DIRECT DEFECT TOOLBOX-DDT					
18	01/07/2011 - 30/06/2014		Kinetics of precipitation during continuous casting of plate steels.	KINPCC			1	2	T1.3, T2.3
19	01/07/2012 - 31/12/2015		Influence of composition and continuous casting parameters on the precipitation of microalloyed particles of B microalloyed steel grades and Mn alloyed steel grades.	PMAP			1	2, 3	T1.1, T2.2, T2.3, T3.2
20	01/07/2008 - 30/06/2011	RFSR-CT-2008-00005	Mastering billet casting through integration of innovative mould sensoring and on line billet surface quality monitoring.	MASTERBILLET	25862	Within the research, two sets of equipment were developed with innovative sensors to improve billet casting monitoring, one based on mould steel level and powder layer thickness measurements and one on thermal field at mould top. For the first, CSM together with CNR-IFIJT cared the molten steel level	5		T5.1, T5.2
21	01/07/2009 - 31/12/2012		Identification of optimal mould lubrication conditions through an innovative hot and cold simulation method.	LUBRIMOULD					
22	01/07/2012 - 31/12/2015	RFSR-CT-2012-00011	Investigation of innovative methods for solidification control of liquid steel in the mould.	INNOSOLID	29549	The aim of the project was to improve product quality with two innovative concepts for an optimised heat transfer for slab casting of ultra low carbon and peritectic steels. Industrial trials were carried out aiming at adjusted heat transfer in the mould. Two concepts were investigated: one focussing on the "cold" side of the mould – referred to as local and dynamic cooling concept (LDCC) – and the other focussing on the "hot" side of the mould - referred to as structured copper plate concept (SCPC). Both concepts were accompanied by physical modelling, numerical modelling with CFD as well as FEM codes and laboratory trials. The industrial trials of the SCPC were prepared by pilot plant trials. A novel fibre optical temperature sensor was successfully applied to the industrial caster of SALZF. The LDCC was developed by numerical modelling and tested in an industrial trial. The expected temperature increase in the copper walls was measured but the trials had to be aborted because the mould sealing was damaged. However, no significant difference to standard production could be proven. Examination of SCPC data measured during pilot plant trials suggested a decrease in heat flux around the meniscus. Assessment of the pilot plant cast product indicated a significant improvement in surface quality. However, VASL decided after weighting of all arguments not to proceed with an industrial trial.	2	3, 5	T2.1, T3.1, T5.1
23	01/07/1995 – 30/06/1999		Optimisation of the straightening process in continuous casting.						
24	01/07/2009 – 31/12/2012		Effect of transients on quality of continuously cast product.	TRANSIENT	EUR 26399	The aim of this project was to improve the understanding of the causes and effects of the transient conditions on suface and internal quality during the continuous casting slabs, bluooms and billets. An on-line strand surface temperature monitoring system and a mould powder monitoring system were developed. Both systems were built up, tested and installed in the plant. Plant trials of the mould powder monitoring system showed complex interactions between stirring, mould powder and melt. With stereo imaging sensors and image adopted processing software it is now possible to detect upcoming mould powder break ups, their frequency, their intensity and their position over the whole mould area. An installed traffic light warning system is an advisor for operators. The strand surface temperature monitoring system was installed in the secondary cooling zone area. Transient numerical computations of melt velocity, temperature and solidification were performed. The transient conditions included casting speed variations, strand stoppages, flow rate changes, ladle changes, flying tundisch changes, start and end of casts, and grade changes. Solidification results could be validated with a theoretical law for solidification and a caster dependent machine constant.	5	2, 4	T5.1, T2.1, T4.2
25	01/07/2009 – 31/12/2012	RFSR-CT-2009-00033	Development of an integrative plant, process and quality supervisory system at CC by the intelligent combination of sensors, data analysis and decision support techniques.	SUPSYSCC		SUPSYSCC project has been focused on the development of concepts and methods for an integrated plant, process and quality supervisory system for continuous casting by means of the intelligent analysis of results from process and quality measurement devices combined with higher level supervisory tools like decision support systems. The consortium used several innovative approaches to measure and model the process and quality parameters of different casting products. BFI applied methods for checking the plausibility of data, the analysis of relationships between process and plant parameters and product quality features, and the estimation of product features by data-based models. Results were implemented into online applicable tools and validated under operational conditions. ArcelorMittal developed a system for the on-line monitoring of the continuous caster motors paying special attention to the mould oscillators and the line drive system. Lucchini and CSM developed a supervisory system for square billet production of microalloyed resulphurised steels. The system was useful to improve product quality by giving the production staff prompt reporting about process deviations which helped improve plant and process set-up. Aalto developed soft-sensors for predicting the billet surface quality which were integrated into an on-line supervisory system able to control the secondary cooling performance.	5	3	T5.2, T3.2

26	01/07/2007 – 30/06/2010	RFSR-CT-2007-00012	Improvement to steel cleanness, castability and surface quality through the application of magnetohydrodynamics during pouring and solidification.	MAGNETOHYDRO	25123	The objective of this research was to improve steel cleanness, including improvement of the size and distribution of inclusions in the cast product, and to improve its final properties. The processing conditions and segregation were aimed at improving the use of conventional single mode and modern multimode mould electromagnetic stirring for long and flat products. The characterisation of the data and cast industrial samples at Tata Steel, Sidenor, VASD and ArcelorMittal using modified stirring, laboratory ductility investigations, offline and in-mould measurements of meniscus velocity, temperature, flow and surface waves height have helped to optimise the casting conditions for different casting formats. The improved steel cleanness, minimised powder entrapment and energy savings were achieved using practical information on flow and inclusions, supported by numerical and physical modelling by BFI, ArcelorMittal, TKK and Sidenor. The numerical models were validated with the practical information on inclusions and meniscus flow. The novel application of EM forces to control the meniscus flow and flow in the SEN was also investigated. Laboratory-based feasibility studies using the trial facilities at Forschungszentrum Dresden-Rossendorf (FZD), Germany, and the numerical and physical modelling by BFI, TKK and ArcelorMittal Research have shown that the rotational frequency of the external stirrer changed the flow within the SEN and in the mould. This has opened the way to assess the practical application of this technology on a larger scale casting	6		T6.2
27	01/07/2004 – 30/06/2007		Application of fibre optical thermal monitoring at CC billet mould for improved product quality.	FOMTM		The aim of this pilot & demonstration project was to develop and demonstrate an improved control of the initial solidification process at meniscus level to enhance surface quality of as-cast products. Therefore, the innovative fibre optical temperature measuring technique (FOTS) was applied at billet moulds of a six-strand caster. Forty temperature measurement positions were spread onto four faces of each mould. Two moulds were equipped and about 340 heats were measured. No significant indications of wear caused by the harsh environment at the caster could be observed at the fibres, even not after the mould revamping procedure. An online operating software was developed to visualize information on the process behaviour in the mould, especially regarding the thermal profile, and alarm values for unwanted process situations. Investigations with different steel grades, mould powders and the impact of varying powder quantities were carried out. It was demonstrated how different casting parameters and strategies of powder addition affect the surface quality. Additional effects could be observed especially during start of casting when the rim is being settled. For example, the analysis of the cast samples in relation to FOTS data showed the dependence of longitudinal crack formation and further surface defects on temperature behaviour. Regarding to this, optimised operating procedures and alarm values were developed and tested successfully.	5	2, 4	T5.1, T5.2, T2.1, T4.2
28	1/07/1995 - 31/12/1999	7210-CA/182	Improvement of internal quality by controlling the microstructure of microalloyed cast steel		19491	Since failures originating from insufficient internal quality are most often not detected before the final product stage, production costs can be reduced significantly by controlling macro- and microsegregation and internal porosity. These effects are related to the microstructure of the cast steel. Measures improving the segregation index, such as casting with low superheat, are often related to a deterioration in steel cleanness. An objective of this project is to systematically investigate the origin of defects related to microstructure and to investigate those parameters which control the development of the solidification structure and the centre segregation with a high residual level of steel cleanliness under industrial conditions. Therefore, coordinated plant trials, numerical modelling and laboratory experiments will be performed.	1	2	T1.2, T2.3
29	1/12/1995 - 30/11/1998	7210-CA/905	Optimisation of mould powder performance in casting long products			The main objectives of the project are to improve the quality of as-cast billets and blooms, adopting two differing approaches: • improvement of casting and casting flux behaviour for long products; • investigation of the potential to use pre-heated and pre-molten casting powder and to develop the technique to melt and distribute molten casting flux.	4		T4.1
30	1/07/1997 - 31/12/2000	7210-PR/012	Control of the dendritic structure of the initial frozen shell in continuous casting		20185	Despite considerable progress in the field of continuous casting, problems still arise concerning surface and sub-surface quality. This variability limits productivity and flexibility if a direct rolling process is to be used. Much work has been done and continues to be done to optimise casting processes but innovative techniques also play a role. This project aims to determine and quantify the effect of non-conventional mould geometry on first frozen shell dendrite formation as a means of reducing the incidence of sub-surface defects.	2	3	T2.1, T3.1

31	1/07/1998 - 31/12/2001	7210-PR/082	Self condition monitoring of continuous casting machines		20626	In the continuous casting process the effectiveness of plant condition monitoring methods is restricted by the severe conditions which make most of the measuring methods unreliable or expensive to maintain. The aim of this project is to develop new techniques and to improve existing techniques of monitoring and to improve the condition of continuous casting machines on both an on-line and regular off-line basis. This will provide reliable cost-effective methods to ensure an improved maintenance program for billet, bloom and slab casters, which will also indicate when casting machine condition is starting to deteriorate to the point where cast product quality suffers. The information obtained will be processed by the development of rule-sets and modelling to enable the installation of reliable and accurate plant condition monitoring systems, to assist prediction of maintenance requirements and thereby improve semi-finished product quality.	5	2	T5.1,T2.1
32	1/07/1998 - 30/06/2002	7210-PR/084	Determination of high temperature surface crack formation criteria in continuous casting and thin slab casting		20897	Surface cracking is a serious problem in continuous casting. Although several investigations have been carried out in the past and have lead to considerable improvement, there is still a strong need to further reduce surface cracking. This research aims at determining surface crack formation criteria in continuous casting and thin slab casting. This will enable to use rules for the choice of << process with reduced cracking risk >> for as-cast products. The work will combine laboratory studies, mathematical modelling and industrial trials. The work in this project is performed in conjunction with the start-up of three most advanced casting machines currently built in Europe. Cracking problems, which may occur in the initial phase of these casters, can be immediately analysed with the numerical and physical simulations developed in this research This could help optimise casting parameters and cooling strategies	1	2,3,6	T1.3,T2.1, T3.2, T6.1
33	1/07/2013 - 31/12/2016	RFSP-CT-2013-00004	Innovative non-contact, non-destructive prototype system for automatic detection of surface and subsurface defects in slabs	NDTSLAB	28901	The quality of slabs is the basis of good quality for all other steel products in the downstream production process. The automatic on-line detection and logging of surface and subsurface defects e.g. for the controlling and optimization of the scarfing process and for use during continuous casting is an important improvement for steel production. A prototype test system based on EMAT (Electro Magnetic Acoustic Transducer) and Phased-Array-technology will be developed to detect these defects. Nevertheless there is no commercial systems available. It is highly desirable that sensors and instruments used in this environment are noncontact, capable to work at high temperatures and to function reliably for an extended period of time in a harsh industrial environment. To date, the EMAT technique is designed for steel with a surface temperature below 760°C - the Curie point. This inspection system uses surface waves (Rayleigh waves). The RFCS project NDTCASTING of BFI, TATA and ArcelorMittal have shown the possibility of the EMAT system on hot surfaces with oscillation marks and scale. The carried project showed that sensitive flaw detection under these difficult conditions is possible - defects with a length less than 10% of the chosen wavelength (λ = 14 mm) can be repeatedly detected. The project deliverables will lead to the following industrial benefits: improved productivity, improved product quality, saving of energy, material, work time and reduced production costs. The final goal of the project is a conceptual design and specification of an automatic inspection system useable under industrial conditions. The on-line inspection of cast products is of very high interest to the steel industry and also for the project industrial partners Salzgitter AG and VOEST Alpine. The developed systems could also be made commercially available. If the project will be successful the integration of this technology in many European steel-plants will be probable.	5		T5.1
34	01/07/2016 - 30/06/2019	709830 (2016)	Improvement of the continuous casting through a new system for the real-time measurement of Shell Thickness in several locations of the casting strand	SHELL-THICK	n.a.	Shell-Thick project aims at developing an innovative induction tomography system for metal solidification process. It provides a real-time and reliable measurement of the shell thickness in three billet cross-sections in the final region of the strand and the value of the metallurgical length for a better control of the process. Based on this information, the project will also implement a tool for the on-line and non-destructive detection of different surface defects and potential fails in the process. This will introduce a step change in solidification process with significant benefits in terms of quality, safety, productivity, costs and ultimately of competitiveness.	5		T5.1