



SEWING

IST-2000-28084

System for European Water monitorING

Deliverable 21 v.2:

Dissemination of the results, exploitation plan

Version:	2 nd
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Project Co-ordinator:	Politechnika Warszawska, Poland
Partners:	Politechnika Warszawska - PL, Instytut Technologii Elektronowej - PL., Technical University of Lodz - PL., Valtion Teknillinen Tutkimuskeskus - FI, Centre National de la Recherche Scientifique - F, MICROSENS - CH, Universitat Politecnica Catalunya - E, Institut fuer Wasserversorge, Gewaesserekologie und Abfallwirtschaft - A, SYSTEA- I.



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DELIVERABLES SUMMARY SHEET

Project Number: IST-2000-28084
Project Acronym: SEWING
Title: System for European Water monitorING

Deliverable N°: 21 Dissemination of the results, exploitation plan (version 2)

Due date: 31.12.2004

Delivery Date: 15.1.2005

Short Description:

Deliverable no.21 was realised during the whole duration of the project through contributions on conferences, publishing articles, organising stands on professional conferences, participating in thematic EU Commission meetings, giving materials on CORDIS pages and organising the SEWING WEB page. Contacts with other institutions, being interested in the results of SEWING were also done.

All contributions are available on SEWING WEB page <http://www.sewing.mixdes.org>. So here only the list of these contribution is presented with statistical data and some information on exploitation plan.

During 40 months of SEWING realisation 42 international and national conferences were attended by partners and 67 contributions were presented. Conferences EUROSENSORS, MIXDES and AutMoNet were attended regularly.

During AutMoNet 2002, AutMoNet 2004 and Eurosensors 2004 conferences an exhibiting booth was organized to promote to the international scientific community and to any potential commercial partner the results of the project, with the support of a commercial flyer describing the aim of the project and prototype devices.

In the home page of Systeas's SME partner a link to the project's home page was inserted; Systeas's main scientific Customers and commercial partners were regularly updated about the developments done in the research project.

During other exhibitions where Systeas attended a preliminary market survey was done to identify the main technical specification, price target and main application areas of the forthcoming new industrialized product coming out after the end of the project.

Two local Polish conferences had contributions about SEWING. All were published and information about the project was inserted in the texts.

Six papers were published in international journals, presenting partial results of SEWING project. Other interesting ways of disseminations: two notes in bulletins edited by FP5, information on CORDIS page (No 58428) and a lecture (in Polish) on the academic WEB page ATVN.

On seven seminars or meetings organised by the Commission or other FP5 or FP6 projects contributions about SEWING were presented. Cluster and concertation meetings were the most important. On a Polish-Italian seminar near Warsaw, on governmental level, SEWING was presented to potential end-users.

The SEWING WEB page with the address <http://www.sewing.mixdes.org> consists of two parts. One open for public with the following topics: home, what is SEWING, research partners, project synopsis, project presentation, conferences, papers and dissemination and use plan. Reports and minutes of meetings are under a password, available to all partners. Many contacts with potential end-users were done thanks to that WEB page. 18500 persons visited this page. This page is permanently updated.

Two unsuccessful FP6 NoE projects were submitted on the basis of SEWING, disseminating SEWING among about 50 partners of these projects.

The exploitation plan is in more details described in Deliverable 23: Technological Implementations Plan (TIP). In this document the policy and perspectives of future activities are described. The solutions used in the prototype proved their usefulness from technical point of view, but more activities are needed to get the industrialised version of the system. Perspectives of doing that and getting funds are shown.

Partners owning: WUT, SYSTEAS

Partners contributed:

Made available to: Mr. A. Barbas, Project Officer.

Deliverable No 21: Dissemination of results, exploitation plan

In this deliverable the list of dissemination activities is presented.

At first the conferences, on which the members of SEWING consortium presented papers and contributions are listed. They are all available on SEWING WEB page:

<http://www.sewing.mixdes.org>.

Some of them in the "archive" files.

<i>Date</i>	<i>Type and Title/Scope</i>	<i>Number of persons attended + other information</i>
18-23 February 2002	TCSET'2002 Lviv-Slawsko, Ukraine	5 papers presented by partners from TUL, Poland
22-25 April 2002	Int. Conf. on Modelling and Simulation of Microsystems	San Juan, Puerto Rico. A paper presented from TUL
21-22 May, 2002	Int. Conf. on Automation in Water Quality Monitoring, Vienna	First papers with SEWING results were presented. A stand with SEWING posters and technical details was organized inside the conference.
27-29 May 2002	New Development of Sensors for Environmental Control, Lecce, Italy	WUT presented a paper about measuring equipment for ISFETs
5-8 June 2002, Rzeszow, Poland	VIIth National Conference on Optoelectronic and Electronic Sensors-COE'2002,	WUT/ITE presented a paper on the application of new designed back-side FET structures in flow analysis: <i>"Novel Back-side Contact ISFET Structures for Flow analysis"</i> .
20-22 June 2002	MIXDES'2002 Conference	Special session for SEWING was held, with 14 papers about our works
SEFI Annual Conference	8-11 September 2002, Florence, Italy	PW presented a paper disseminating the SEWING project: "Impact of 5th and 6th Framework Programmes on Transdisciplinary Education", A. Filipkowski
15-18 September, 2002	EUROSENSORS XVI, Prague, Czech Rep.	PW presented a paper : "Morphology Based Sub-cooled Water Detection in Dew Point Hygrometer" J. Weremczuk, Z. Wawrzyniak, R. Jachowicz, pp. 1267-1270
16-19 September 2002,	The 4th International Symposium on Humidity and Moisture, Taipei, Taiwan,	PW presented a paper: "New Methods of Super-cooled Water Detection in Dew Point Hygrometers" J. Weremczuk, R.Jachowicz, pp. 405-412
ICSSES' 2002	25-27 September 2002, Swieradow, Poland	WUT presented a paper: "Electrochemical modeling of CHEMFET sensors", L. Opalski, pp. 275-280

<i>Date</i>	<i>Type and Title/Scope</i>	<i>Number of persons attended + other information</i>
25-28 Sept. 2002	ERB2002 Conf. on interdisciplinary approaches in small catchment hydrology, Demanovska Dolina, Slovakia	IH SAS presented a paper on the SEWING application in the measurement of retardation factor
13-18 October 2002	Int. Conf. on Electrochemical Sensors, Matrafured, Hungary	WUT presented an invited paper: Modification of polymer membranes towards advanced chemical sensors, Z. Brzozka
4 November 2002	IECON'02 28th Annual Conf. of the IEEE Industrial Electronics Society, Sevilla, Spain	UPC presented a paper: "An on-line water monitoring system using a smart ISFET array", G. Bedoya, S. Bermeio, V. Parisi, J. Cabestani.
20-22 November 2002	6th International Symposium on Microelectronic Technologies and Microsystems, Lviv, Ukraine	ITE presented a paper: "Element of silicon TCD design and technology", J. Lysko, B. Latecki et alieni
18-22 February 2003	7th International Conference "The Experience of Designing and Application of CAD Systems in Microelectronics". Slavsko, Ukraine.	TUL submitted a paper: "Modelling and simulation $\Sigma\Delta$ analog to digital converters using VHDL-AMS", M. Szermer, M. Daniel, A. Napieralski.
23-27 February 2003	Int. Conference on Modelling & Simulation of Microsystems, San Francisco, USA	TUL submitted a paper: "Design and modelling of smart sensors dedicated for water pollution monitoring", M. Szermer, M. Daniel, A. Napieralski.
23-25 April 2003	ESANN European Symposium on Artificial Neural Networks	UPC presented a paper: G. Bedoya, S. Bermejo, J. Cabestany "Comparison of neural algorithms for blind source separation in sensor array applications"
19-21 May 2003	SPIE's Int. Symposium on Microtechnologies for the New Millenium 2003	UPC presented a paper "Hybrid Neural Networks for ISFET Source Separation"
27-30 May 2003	ISESS International Symposium on Environmental Software Systems, Semmering, AT	PW presented a paper: A. Filipkowski, J. Ogrodzki, L. Opalski, A. Goralski "Software for the system of European water monitoring"
3-6 June 2003	IWANN2003 Int. Work-Conference on Artificial Neural Networks	UPC presented a paper " ISFET source separation based on linear ICA"

<i>Date</i>	<i>Type and Title/Scope</i>	<i>Number of persons attended + other information</i>
26-28 June 2003	MIXDES'2003 Conference, Lodz, Poland	3 papers were presented: from PW (On modelling temperature dependence of CHEMFETs response curves), LAAS-CNRS (Study of front-side contacted chemical field effect transistors for water analysis) and TUL (parameter extraction for electro-chemical; simulations of ion sensitive transistors)
1-4 September, 2003	European Conference on Circuit Theory and Design (ECCTD'03, Krakow, Poland	PW presented a paper "Modeling of CHEMFET sensor in SPICE" by J.Ogrodzki
22-24 September 2003	The 17th European Conference on Solid-State Transducers Eurosensors XVII, Porto, Portugal	PW – Z. Brzózka presented a paper "Reducing of total number of ion-selective electrodes in sensor array for liquid analysis"
September 2003	Int. Conf ECS'2003, Bratislava, Slovakia	TUL presented a paper "Modular structure of Sigma-Delta analogue to digital converter"
September 2003	THERMINIC, Toulouse, France	TUL presented a paper "Modelling of temperature phenomena in ion sensitive transistors"
18-19 September 2003	ECOLINK Workshop, Meze, France	LAAS-CNRS attended the conference, which gave lot of information and contacts in the field of water monitoring.
October 2003	IEEE Intern. Conference, Toronto, Canada	TUL presented a paper "Simulation of ion sensitive transistors using SPICE compatible model"
January 2004	IEEE SIcon/04, Sensors for Industry Conference	UPC presented the paper "Improving Semiconductor-based Chemical Sensor Arrays Using Advanced Algorithms for Blind Source Separation"
February 24-28, 2004	TCSET'2004, Slavsk, Ukraine	Paper form TUL: M. Szermer, A. Napieralski: "Modelling of the $\Sigma\Delta$ Analogue to Digital Converters with Application to VHDL-AMS"
March 7-11, 2004	MSM'2004, Boston, USA	Paper form TUL: M. Daniel, M. Szermer, A. Napieralski: „Modelling and practical verification of the ionophore based CHEMFET.

<i>Date</i>	<i>Type and Title/Scope</i>	<i>Number of persons attended + other information</i>
19-20 April 2004	AutMoNet'2004 Conference, Vienna, AT	4 papers were presented: 1. M. Daniel, M. Janicki, W. Wroblewski, A. Dybko, A. Napieralski: "Ion selective transistor modelling for behavioural simulations". 2. Z. Brzozka, J. Cabestany, A. Filipkowski, R.S. Jachowicz, P. Moschetta, L. Sanfilippo: "An innovative automated flow measuring probe for the measurement of chemical parameters in water based on CHEMFET sensors". 3. G. Bedoya, S. Bermejo, J. Cabestany, V. Parisi: "On-line Water monitoring using smart array of solid-state chemical sensors". 4. J. Ogrodzki, W. Wroblewski: "Computer modelling of CHEMFET sensors for data fusion in environmental water monitoring" A stand with SEWING posters and technical details was organized inside the conference, showing the LFA test unit prototype on working.
16-19 May 2004	Nis, Serbia. 24th International Conference on Microelectronics, MIEL	M. Janicki, A. Napieralski: "Estimation of Ion Mixture Composition with Chemically Modified Field Effect Transistors".
21 May 2004	PW Departmental Seminar	J. Ogrodzki, L. Opalski: "The system for ions detection in environmental water – the 5th EU Programme SEWING" (in Polish)
24-26 June 2004	MIXDES 2004, 11th International Conference, Szczecin Poland	Papers were presented : 1. L.J. Opalski, "Data fusion for CHEMFET-based Measurements", 2. M. Badowski, L.J. Opalski, "Software for CHEMFET sensor data processing and visualisation" 3. M. Janicki, M. Daniel, A. Napieralski: "Application of Inverse Problem Algorithm for Estimation of Ion Mixture Composition". 4. M. Szermer, P. Pietrzak, M. Daniel, A. Napieralski: "Laboratory Measurement Stand of Analogue to Digital Converters with Application of LABVIEW Environment". 5. I. Humenyuk, B. Torbiero, D. Lagrange, S. Assie, B. Franck, P. Marcoul, D. Medale, A. Martinez, P. Temple-Boyer: "Development of a Measurement Interface for CHEMFETs Microsensors".
27-30 June 2004	8th Conference on Optoelectronic and Electronic Sensors, Wroclaw, Poland	Paper was presented : M. Chudy, Z. Brzozka, W. Wroblewski "Ion-selective field effect transistors with membranes based on polysiloxane matrix RMS 033"

<i>Date</i>	<i>Type and Title/Scope</i>	<i>Number of persons attended + other information</i>
July 2004	Int. Joint Conference on Neural Networks (IJCNN-2004)	Paper was presented: G. Bedoya, S. Bermejo, J. Cabestany "Information-theoretic Approach to multi-channel Signal Extraction by Multiple Interference Cancellation in Electrochemical Array data."
12-16 July 2004	Hydrology: Science and Practice for the 21st century, London, UK.	SAVBA presented a paper: Lichner, Holko, Cipakova, Sir, Tesar: "New devices and techniques for hydrological observation"
18 – 21 July 2004	Third IEEE Sensor Array and Multichannel Signal Processing Workshop Sitges (Barcelona), Spain	Paper presented by S.Bermejo (UPC) "Blind source separation for solid-state chemical sensor arrays"
13-15 September 2004	Eurosensors XVIII, Roma, Italy	Paper will be presented: I. Humenyuk, B. Torbiero, S. Assie, D. Colin, X. Dollat, B. Franck, A. Martinez, P. Temple-Boyer, "Development of pNH4-ISFETs microsensors for water analysis". A stand with SEWING posters and technical details was organized inside the conference, showing the LFA test unit prototype device on working.
13-17 September 2004	2004 BEAMS (Mentor Graphics)	M. Szermer: "VHDL-AMS models of sigma-delta converters" – submitted for the contest.
29 Sept. – 1 Oct. 2004	10th Int. Conf .THERMINIC 2004, Sophia Antipolis, France	M. Janicki, M. Daniel, A. Napieralski: Temperature dependent model of ion selective transistor for multidomain simulations".
27 Sept. – 1 Oct. 2005	Int. Conf. on Hydrology of Mountain Environments, Berchtesgaden, DE	Holko, Kostka, Lichner, Pis: "Variation of NO3 in a small mountain catchment"

The following articles and other dissemination were published or presented under the SEWING label:

<i>Date/Type</i>	<i>Brief description + other information</i>
30.11.01. Short note	A note about SEWING (in Polish) in FP5 National Contact Point publication
04.02.2002, information	Information about SEWING in CORDIS data base under no 58428. Link from SEWING WEB page. Many letters of interest arrived to the co-ordinator.
21.02.2002. Short note	A note about SEWING in Hi-Tech publication under the title "Successful participation in EU Fifth Framework programme-Polish examples"
synopses booklet, 2002	The text about SEWING was prepared
Bulletin of the Polish Academy of Sciences, Technical Sciences, vol 50, No 4, 2002	L,J. Opalski: "Data Fusion for CHEMFET Arrays".
August 5, 2003	A lecture about SEWING was done (in Polish) in the Academic Scientific TV (ATVN). It can be found in ATVN archives: http://www.atvn.pl/archiwum.php and in the field "data emisji" click the box and chose "2003 sierpien 5" and than click on the title.
Elektronizacja, 10/2003, pp. 3-7.	M. Janicki, M. Daniel, A. Napieralski: Wielodomenowe modelowanie i praktyczna weryfikacja tranzystorów jonoczułych ISFET.
Neural Processing Letters, vol. 19, No1, pp. 25-35, 2004, Kluwer	S. Bermejo, J.Cabestani: "Ensemble Learning for Chemical sensor Arrays".
Accepted for publication in Microelectronics Journal. ISSN 0026-2692	M. Janicki, M. Daniel, M. Szermer, A. Napieralski: "Ion Sensitive Field Effect Transistor Modelling for Multidomain Simulation Purposes".
Accepted for publication in Water Science & Technology, ISSN 0273-1223	M. Daniel, M. Janicki, W. Wroblewski, A, Dybko, Z. Brzozka, A. Napieralski: „Ion selective transistor modelling for behavioural simulation”
Microelectronics Reliability, vol. 44 (2004), p.443-447	P. Temple Boyer, J. Launay, I. Humenyuk, T. Do Conto, A. Martinez, C. Bériet, A. Grisel: "Study of front-side connected chemical field effect transistor for water analysis"

Important way of dissemination were presentations of SEWING on seminars, workshops and meetings organised by European Commission or other FP5 or FP6 projects.

<i>Date</i>	<i>Type and Title/Scope</i>	<i>Number of persons attended + other information</i>
18-19 September 2001.	Cluster meeting on IST projects on environmental protection applications, Brussels,	About 30 persons attended. The SEWING project was presented. Contacts with several other co-ordinators were done and future co-operation proposed.
20-21 December 2002	Workshop on NoE in FP6, Yeditepe University, Istanbul, Turkey	Candidates for NoE "ESSENCE" presented their excellence in sensor networking. The results and plans of SEWING were presented by A. Filipkowski, PW.
6-7 September 2003, Rome, IT	E-Consen EEIG meeting	PW – A. Filipkowski presented the SIMPPLE proposal, which is a spin-off of SEWING experience
8-9 September, Utrecht, NL	Meeting of E-Cuisine FP5 Thematic Network	PW- A. Filipkowski presented the results of SEWING and the possibility of co-operation with E-Cuisine consortium.
November 24-26, 2003	Workshop and Forum for Italian and Polish Authorities in Agriculture, Falenty, Poland	PW and SYSTEA presented the results of SEWING, which can be used in water monitoring and early warning in agriculture sustainable development.
22 April, 2004	IST Concertation Meeting, Brussles, BE	A. Filipkowski presented progress in SEWING project and made contacts with other FP5 and FP6 project co-ordinators in the topic.
23 April 2004	IST Work Programme 2005-2006 Meeting, Brussels, BE	A. Filipkowski made a contribution about "e-environment" problem and contributed in the discussion.

Exploitation Plan: main statements for the future industrialisation of the new product

Concerning the Exploitation Plan, the following assumptions were done:

- in the prototype built in SYSTEA, the SEWING industrial partner, the selected versions of particular solutions of parts of the system were used. The choice has been made on the basis of availability of final solutions and on the simplicity and flexibility of the whole system.
- the versions are ready for eventually using them in industrial versions of SEWING, depending of the customer's demand. This idea concerns mainly the following parts:
 - the Front-Side-Contacts sensors, including the Ca sensor.
 - the voltage based interface circuit and ASIC solution of it.
 - more sophisticated solutions of Digital Signal Processing of information got from sensors.
 - more sophisticated data transmission from the sensor to the main computer.

In order the results of this research project will be exploited into a new and innovative commercial product, the industrial partner Systea has already identified the main points to be developed to go further with the research activities, on the basis of activities already done under this research project.

We hope a part of these activities could be financed by EC, national or regional Institutions to allow the quickest exploitation and application into an industrialised product to be sold in the market of environmental protection.

One of the main results of the research done show that the use of Chemfet sensors is strictly related with the use of an automatic analytical device, which is able to:

- maintain these sensors in a stable and conditioned state, in order to allow repeatable and reliable measurements,
- to automatically clean periodically the sensors, in order to enhance their life time,
- to automatically perform on-line calibrations using standard solutions.

The use of the specific laboratory devices (PW's measuring stand, Systea's LFA test unit) and demonstrators (Systea's measuring probe and final demonstrator) allowed a reliable data collection and working parameter's identification, which will be reversed into the future industrialised product.

The fact that the best measurement results were achieved using the repeated standard addition analytical procedure applied in the final prototype, which requires a very precise injection of standard solutions inside the sample itself, moves for the future industrialised product the need to have a quite complex analytical and electronic device to manage properly the sensors.

The actual design of the final prototype, which is technically described in Deliverable 18, has to be upgraded mainly to achieve:

- a more compact layout,
- a simplification of electronic subsystem,
- a simplification of hydraulic circuitry,
- a more simple handling of the modular flow cell and sensors, mainly towards the sensors qualifications and periodic substitution,
- a specific design of the external case and of the internal assembly to lower the mounting cost,

maintaining at the same time the necessary flexibility and modularity, to allow the supply of the product/s on different market needs and Customer demands from different countries.

Starting from the actual state of the art of the final prototype, the main tasks to be implemented to reach the objective to have an industrialised new product which will fit to market and price expectations are the following:

- new integrated circuitry to manage the Chemfets, using the high A/D resolution available on the Systea's hardware applied on the demonstrators,
- more compact and cheaper CPU, power supply and surrounding electronic, hopefully integrated in one single board to enhance the compactness of the industrialised device and to lower the mounting and cabling activities,
- integrated hydraulic manifold and more compact pump design,
- new design of the linear flow cell modules, to allow an easier assembling and disassembling of this measuring device to substitute the single sensors after the end of their working period,
- porting of all the software routines and updated procedures to run inside the standard firmware used for the other Systea's products,
- a new case and internal layout design to fit the new system with at least two types of applications: on-line analyzer and portable measuring device.

Standard firmware and I/O interfaces will be upgraded based on the extensive software developments and integrations done under the project.

Additional sensors could be added on the actual configuration using the same technological solutions already developed and tested under the research.

Concerning the Chemfet sensors, the following assumptions have been identified:

- ITE and CNRS partners are already organised to provide the number of wafers which could be required for the first years of the commercial life of the industrialised product: each wafer can provide a hundred of sensors, so the yearly production of 20-30 wafers (minimum quantity of wafers to be produced by a little RTD silicon factory) could support the preparation of a few thousands of sensors
- as a main result of the project, PW partner has already defined and tested all the technology and operations in order to prepare and test Chemfet sensors in a semi-industrial way (batch of hundreds of sensors each)
- PW partner cannot organize internally the activities to deposit the membrane on each ISFET and consequently to characterize each Chemfet by measurements.

As a consequence, the start-up of a new spin-off company based in PW or ITE will be the best and suitable solution to provide to Systea the tested sensors to be mounted inside the new products and to be supplied to the final Customers as consumables during the period of exploitation.

This solution will also allow the easiest handling of the know-how rights between sensor partners in Poland and the industrial partner (Systea) in charge to manufacture and sell the analytical devices in the environmental market. Application for funds (structural funds?) is possible for creation of this spin-off SME.

Concerning the algorithm and mathematical calculations applied and tested in the final prototype, designed and developed by PW partner too, a good solution is to reserve a license fee for each unit sold, enabling a continuous upgrade and further development according to market and Customers needs. New better industrialised solutions of this software should be developed before on the basis of funds obtained for further R&D activities.

Price target of the new product will be comparable with a conventional high-level multiparametric measurement probe; main applications will be the automatic measurements of drinking, surface and underground waters.

Quite large investments will be needed to move and finalise all the expected activities and the main point remains, which will fund the industrialisation phase of this new product.

The industrial partner Systea, who is mainly interested to propose on the market this new technology, will try to submit in early 2005 to the regional Administration a request of funding to grow up this industrialisation project.

At the same time, some funds have to be achieved in Poland to start-up the prospected spin-off company.

From a RTD point of view, further steps could be defined and planned during the next coming year, to reduce drastically the dimension of the analytical device, in order to have a measuring device based on μ TAS technology and to study a method to have different sensors available on the same chip.

In these further improvements the integration of other compact “chip sized” sensors, even based on different measurement technology (potentiometric, biosensors) could be prospected.

The new submission to EC for a STREP project under the 4th IST call of next March 2005 for the item 2.4.2 "Technologies and devices for micro/nano-scale integration", Focus 1 “*Heterogeneous technologies and devices for mixed-technology micro/nano systems*” is currently under the study by some of the partners.