



IS&T

# REPORTER

"THE WINDOW ON IMAGING"

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## HIGHLIGHTED PAPERS: NIP28/Digital Fabrication 2012

Winner of the Best Interactive Paper Award

### Central Challenges When Up Scaling the Manufacturing of Thin-film Battery Applications

Michael Espig,<sup>1</sup> Frank Siegel,<sup>1</sup> Jens Hammerschmidt,<sup>1</sup> Andreas Willert,<sup>2</sup> and Reinhard R. Baumann<sup>1,2</sup>;

<sup>1</sup>Chemnitz University of Technology and <sup>2</sup>Fraunhofer Institute for Electronic Nano Systems ENAS (Germany)



Best Interactive Paper Award winner Jens Hammerschmidt (left) with co-author Reinhard Baumann

**Abstract:** In recent years the field of large-area, organic and printed electronics has demonstrated various applications of functional devices. For most of the applications, a reliable supply with electric energy tailored with respect to functional devices and applications is a mandatory, making thin-film battery a challenging area of research. Among a variety of manufacturing concepts printing technologies and their established workflow provide interesting opportunities to fully integrate the battery in a product by customizing its size and shape regarding the device to be driven by that battery. Hence, these printed electronics applications will contribute a new momentum in the packaging market.

Out of the well-known battery concepts for thin-film batteries, the well understood zinc manganese dioxide battery system is very promising due to its simplicity and its environmental sustainability. Therefore it has been chosen to study appropriate fabrication opportunities based on printing technologies. In this paper, we report on the development of a process workflow and, the setup of a pilot manufacturing line, taking into account the require-

ments to adapt the energy content, the size and the shape to the powered product. The overall manufacturing procedure is divided into single process steps, following the traditional printing workflow which is used in the printing and media industries consisting of Prepress, Press and Post Press.

The paper maps the advantages of an automated production process and covers the introduction of process documentation, aspects of quality control, cost minimization and the efficiency improvement. A basic concept for an adapted digital workflow comprising the definition of relevant metadata and job ticket content, which is required for further industrial fabrication of thin film batteries, will be presented.

### Color Reproduction Consistency and Capability of Tree-free Copy Paper

Yu-Ju Wu, Appalachian State University (USA)

**Abstract:** The life cycle of print starts with paper choices—specifying environmentally preferable paper products can reduce the effect that printing

To view the full papers of these abstracts for no fee go to [www.imaging.org/ist/publications/reporter/index.cfm](http://www.imaging.org/ist/publications/reporter/index.cfm)

\* These papers were presented at NIP28/Digital Fabrication 2012, held Sept. 9-13, 2012, in Quebec City, Canada.

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has on the planet. Over the past two centuries, wood is the primary raw material in paper manufacturing. However, wood-based paper carries a significant “ecological shadow” of energy consumption, bleaching chemicals, and water used in its production. In its 2010 report, United Nations Environment Program (UNEP) identified pulp and paper industry as one of the largest direct contributors to human toxicity. The substances from paper and paperboard mills that contribute most to human toxicity impact are mercury (II) ion, beryllium, and hydrogen fluoride. Motivated by legislation, consumer pressure, and the desire to become more efficient, the pulp and paper industry in the United States has invested in new technologies and processes that reduce its environmental impact. Tree-free fiber used in production is one way to minimize or eliminate the environmental impacts. This paper studied sustainable development and use of tree-free copy paper for the laser printer. The color reproduction capability and process capability of tree-free paper were evaluated in terms of optical density, print contrast, and color gamut.

## Digital Fabrication of 3D Bio Devices Utilizing PELID (Patterning with Electrostatically-Injected Droplet) Method

*Shinjiro Umezumi<sup>1,2</sup>, Tatsuru Hatta<sup>1,2</sup>, and Hitoshi Ohmori<sup>2</sup>;  
1Tokai University and 2Riken (Japan)*

**Abstract:** In this paper, we fabricated soft 3D bio devices utilizing PELID (Patterning with Electrostatically-Injected Droplet) method. It is preferable to perform laboratory experiments with 3D structures in bioengineering. We have investigated mechanism and fundamental characteristics of the PELID method and now been applying for new printing technology of high image quality and 3D printing technology. The method has two merits, higher resolution than commercial printer and ability to eject with highly viscous liquid. We can eject viscous paste that viscosity is 30000 mPas. At DF 2010, I already presented that cells and scaffolds were printed to fabricate 3D cell structures because scaffolds assisted the weight of cells. Now, we should fabricate 3D structure that has cave because real 3D structure has blood vessel like cave. It is difficult to fabricate 3D structure that has cave. Gelatin is used as sacrificial layer. When the printed 3D structure is put into hot water, gelatin is removed. With this technique, we can print 3D structure that has cave. The tube filled with the liquid that contained gelatin and the tube filled with the liquid that contained calcium alginate was hanged down perpendicular to a dish. Voltage was applied between the syringes and the dish by power supplies (voltage range: -5kV ~ +5kV, Matsusada Precision Inc, Tokyo, HVR-10P). The air gap was adjusted by a z-stage and the plate electrode was moved in x and y directions with two linear motors. PC controlled voltage application and motion of linear stages. We fabricated 3D bio devices.

## UV Inkjet Inks with Improved Stray Light Resistance

*Steve Hall, Kirsty McVean, and Hugh Allen, SunJet (UK)*

**Abstract:** Energy curable inkjet inks are susceptible to build up of cured material at the nozzle where ink is ejected, which leads to jet deviation and ultimately lost jets. This causes a reduction in image quality and the need to replace the printhead. Traditional stabilizers do not reduce the susceptibility of energy curable inkjet inks to stray light or if they do, cure is compromised. It has been discovered that nitroxyl stabilizers will significantly reduce the build up of cured ink caused by exposure to low levels of UV light from stray light sources without compromising cure speed. In this paper a new test method for assessing the stray light resistance of energy curable inkjet inks is detailed. The major types of stabilizers are described and their effect on stray light resistance and cure for UV curable inkjet inks is determined.

## Inkjet Geometric Design & Compensation Rules Generation and Characterization

*Eloi Ramon, Carme Martínez-Domingo, Ana Alcalde-Aragónés, and Jordi Carrabina, Universitat Autònoma de Barcelona (Spain)*

**Abstract:** Geometric design and compensation rules aim to guarantee that layout representations match final printed patterns within a valid tolerance for a desired process yield. The more conservative the rules are, the better is the yield. So, for a given process and after an experimental extraction of the required process parameters, it is possible to derive minimum design rules that characterize the technology process to a point where design engineers can address physical design to develop devices and systems without a deep knowledge of process and materials. A methodology to extract and characterize inkjet geometric design and compensation rules is proposed in this work as a first step to separate design from fabrication in a similar way as in silicon technology.

## Cloud Computing for Graphic Arts Printing

*Lee C. Moore and Barry G. Gombert, Xerox Corporation (USA)*

**Abstract:** Cloud Computing offers new opportunities to enhance digital print and variable data workflows. The combination of Software-as-a-Service (SaaS) with a scalable Infrastructure-as-a-Service (IaaS) has the potential to offer great benefits to the graphics arts value chain. Cloud computing can increase accessibility to new markets, provide higher levels of automation, and help to reduce operational costs. In this paper we will describe ways in which digital printing workflows can harness the power of the cloud. ▲

# Networking and Stimulating Ideas Highlight NIP28/Digital Fabrication 2012

by NIP28 General Chair Scott Silence, Xerox Corporation

**N**IP28, held in Quebec City in early September and collocated with Digital Fabrication 2012, was a vibrant conference, full of interesting keynotes, contributed talks, posters, short courses, interactive sessions and other special events, including the important Exhibition. It reinforced once again the reputation that NIP has built over the years as the premier global technical conference on digital printing technologies. People from 21 countries on four continents attended—from industry, academia, and government labs and organizations—to give and hear presentations, participate in panels and roundtables, and perhaps most importantly, to network with their colleagues during five packed days of scheduled events.

There were two key themes that surfaced throughout the conference and its myriad events. The first was the coexistence of print and electronic media in our lives. Monday morning began with a

NIP28/DIGITAL FABRICATION 2012	
Attendees*:	413
Oral Papers:	126
Interactive Papers:	23
Short Courses:	16
Exhibitors:	33
Dates:	September 9-13, 2012
Location:	Quebec City, Canada
*includes Short Course only and guests	

keynote on this topic and closed with a roundtable on it. The keynote had a non-traditional format (always good to shake things up a bit), in which four industry experts—Hirohito Shibata (Fuji Xerox), Eric Hanson (Hewlett-Packard Laboratories), Wolfgang Schmidt (Schoeller Technocell GmbH & Co. KG), and George Gibson (Xerox Corporation)—shared their disparate views on the subject. The speakers invited the audience to think about the topic, interact with their colleagues at the conference over the week both formally and informally, and then came back to the roundtable near the close of the conference

on Thursday with questions, comments, and observations. It made for a lively, insightful, and informative roundtable.

The second theme was high-speed digital printing, in particular high-speed inkjet, which has really emerged as a dominant technology in the space. Wednesday saw two keynotes on this topic from two major players in the field. Opening the morning session was Hidetoshi Shinada (FUJIFILM Dimatix), who presented a keynote on Single Pass Inkjet Digital Printing Technology for the Commercial Printing Market. The afternoon session featured Gilad Tzori (Landa Digital Printing), who presented “The Nanographic



Quebec City (above) played host to this year’s meeting. Paul Dury with keynote speaker Gilad Tzori (middle top). Volkhard Maess, Detlef Schulze-Hagenest, and Martin Schleusener kick off the week with the Sunday night Welcome Reception (right).



Kazuyuki Tada and Shinjiro Umezu enjoy the Demonstration Session, which highlighted unique printing applications (top). Takumi Suzuki, Mineo Kaneko, Yutaka Kurabayashi, Masahiko Fujii, and Koji Hirakura share some fun at the Conference Reception (bottom).

Photos: Axel Fisher and Diana Gonzalez

Printing™ Process.” While both are inkjet technologies, the approaches discussed by these two experts are very different, and questions, discussion, and controversy abounded at these sessions. Discussion of high speed inkjet was not confined to the keynotes. There were also very strong sessions for contributed and focal papers in the Inkjet Printing Materials and Inkjet Printing Processes sessions on Monday and Wednesday, the Commercial and Industrial Printing session on Monday, and in the Printing Systems Engineering and Optimization session on Tuesday—all of which had a decidedly inkjet focus.

Other printing technologies were also a significant part of the conference. Electrophotographic technology was featured in sessions on Toner-based Printing Processes, Toner-based Printing Materials, and Fusing, Curing Drying, which ran continuously from Tuesday morning until the final keynote on Thursday. Cutting-edge advances in materials, hardware and processes were presented and discussed. These advances will undoubtedly enable future generations of digital printing technology; many probably already have.

The application focused sessions in the conference were particularly thought-provoking this year. Digital print fulfillment and cloud printing, featured in the Advanced and Novel Printing Session, generated a lot of excitement and interest, as did papers in the sessions on Electronic Paper and Paper-like Displays, Mathematical Modeling, and Actionable, Security and Forensic Printing. All are rapidly growing application areas for digital printing, and I’m sure we’ll continue to see more and more work in these areas presented at future NIP/Digital Fabrication conference. The Environmental Sus-

tainability session anchored the end of the conference and the topics covered, from deinkability to sustainability though vari-

way to jump into the rich technical sessions and really get the most out of them.

### The Importance of Networking

The special events this year at NIP28/Digital Fabrication 2012 really focused on networking. We can all sit in our offices and read papers; one real value of going to a conference like NIP28/ Digital Fabrication 2012 is the networking opportunities it affords. On Monday there were networking sessions based on specific technology focus areas, and on Wednesday a set of application roundtables were held. The topics in both were broad and the discussion was free ranging. I personally enjoyed the application session on Document Ecosystems, led by George Gibson (Xerox Corporation), which turned out to be quite a philosophical discussion,

not the kind of discussion you have every day. The topic session on University/ Industry interactions provided impetus for a stronger university participation in the future NIP conferences, including the creation of a University Liaison Chair.

The conference exhibit featured 33 companies who shared their new products and offered opportunities to partner. The space was shared with the interactive posters, print sample gallery, and demonstration session where each author had the opportunity to explain their research in more depth to the conference attendees. Having these two activities share the same space helped in fostering networking too.

The conference reception venue, Quebec City, was remarkable and charming, a bit of France in North America. The conference reception in the Muse de la Civilization, inside the old walled city, was an experience I won’t soon forget.

We hope to see you next year in Seattle, where I’m confident we will continue to improve the offerings of these two important conferences—as well as enjoy another wonderful conference venue. ▲



Photos: Axel Fisher and Diana Gonzalez.

Scenes from the Exhibit Hall.

able data printing serve to remind us of how critical environmental sustainability is to the digital printing industry.

### Interactive Papers, Demonstrations, and Short Courses

The connection between the presentations and the Interactive and Demonstration on Tuesday afternoon was tight this year. In particular, the demonstration session served to introduce much of the 3D printing work, including samples of ceramic and glass printing, that was presented the next day during the 3D Printing session. Many of the security and forensic printing talks were also foreshadowed during the Demonstration session.

All of the technical sessions, on inkjet, electrophotography, and printing application areas were significantly augmented by a full slate of short courses, most occurring on Sunday and Monday, allowing those who are new to a technology (and some of us who are old hands in some technologies) to get a solid base of understanding in a new field from industry experts. Taking a short course is a great



Some of the many faces and places that made NIP28/Digital Fabrication 2012 such a special event.

## Lab-to-Fab Panel Highlight of Digital Fabrication 2012

by Digital Fabrication Publications Chair Werner Zapka, XaarJet AB

Thirty-five presentations comprised the Digital Fabrication 2012 conference, which featured good attendance and the discussions at each session. A large majority of the presentations dealt with inkjet technology, with printing processes and printed devices, as well as associated processes, such as the design of print pattern in metrology and instrumentation.

The contributed papers were distributed in two main topics, namely ‘devices’ and ‘pre- and post processing’. Several papers described the use of inkjet printing in manufacturing of solar cells, and some individual papers dealt with inkjet printing of OLEDs, sensors, antennas, and lab-on-chip.

Several contributed papers were selected as focal papers offering half hour, in-depth presentations. In an invited ‘extended focal’ paper, Shlomo Magdassi (Hebrew University of Jerusalem) gave an overview on inkjet printing of electrical devices, covering the formulation of metallic inks, specific print processes, and post-processes.

A highlight was the ‘lab-to fab’ panel discussion, where the six panel members from industry and academia described their experiences with issues in the transfer of applications from the R&D phase to the manufacturing floor. Apart from technical issues, the availability of process equipment capable of fast and high vol-

ume processing was required, while at the same time the high cost of such industry compliant equipment was seen as a hurdle for lab-to-fab transfer. The availability of capable integrators to support system development was seen as another requirement for successful lab-to-fab transfer. Checking for potential conflicting IP early was recommended. The discussion between the panel members and the audience was very lively and unfortunately had to be cut short after one hour so as not to miss the final keynote presentation “Digital Fabrication: Enabling Ambient Intelligence, Ubiquitous Computing and the Internet of Things,” given by James Stasiak (Hewlett-Packard Company). ▲

## STANDARDS UPDATE:

David Q. McDowell, Editor

This issue of Standards Update is primarily devoted to ISO 42 (Photography) and the ANSI/IS&T IT Standards committees. As you will remember the January/February 2011 Issue of *Standards Update* discussed the steps being taken by IS&T to become the support organization for the ISO TC42 Secretariat, the USTAG to TC42 and the ANSI IT photographic committees.

### NEW TC42 Working Group Formed

At the 2011 Plenary meeting of TC42 that was held in Rochester NY in August 2011, a Joint Working Group (JWG) 26 was formed with the title “Imaging system capability qualification for archival recording and approval.” The short name for the JWG is Digitizing Cultural Heritage Materials. It has as its participants, in addition to members of TC42, representatives of IEC/TC110, ISO/TC46/SC11 and ISO/TC171.

The convener is Franziska Frey, head of preservation and digital imaging services at Harvard Library, Harvard University. The scope of JWG26 is to unify metrics, related methods, and tools used to specify and measure image quality capability of systems for the recording and evaluation of cultural heritage materials for archival purposes.

### JWG26 Work Program

The work program of JWG26 is to standardize tools and techniques for maintaining consistency when digitizing cultural heritage materials. This will ensure the accurate capture, encoding, and long-term preservation of digital representations of these cultural heritage materials.

Currently, there are several guidelines in this field, such as Metamorfoze (Dutch National Programme for Preservation of Paper Heritage) and the FADGI guidelines (Federal Agencies Digitization Guidelines Initiative) (best practices for digitization of cultural materials by US federal institutions), as well as tools which utilize various test targets and software. While these guidelines and tools are help-

ful, users may be confused about the appropriate techniques and tolerance levels for their particular application. Users and manufacturers will benefit by international standards in this area.

### Preliminary Projects

JWG26 has begun working on the following projects:

- (1) A glossary, to ensure there is a common understanding of terms.
- (2) A general description of digital imaging for cultural heritage organizations, targeted at non-technical audiences.
- (3) A list of existing standards for test methods and test charts.
- (4) Recommendations for different use cases.
- (5) A gap analysis to guide new work and ensure issues are addressed comprehensively.

### Relevant Existing Standards

One example of a relevant standard previously developed by ISO/TC42 is ISO 16067-1:2003 *Photography — Spatial resolution measurements of electronic scanners for photographic images — Part 1: Scanners for reflective media*. It specifies methods for measuring and reporting the spatial resolution of electronic scanners for continuous tone photographic prints.

### IS&T References to Related Work

IS&T holds a yearly Archiving conference where papers are presented related to archiving cultural heritage materials. Many papers are available, such as:

- RIT American Museums Survey on Digital Imaging for Direct Capture of Artwork, Mitchell R. Rosen and Franziska S. Frey, Rochester Institute of Technology (USA).
- Managing A Quality Digitization Practice in Cultural Heritage Institutions: Statistical Quality

Control Tools and Techniques, Ronald J. Murray, Library of Congress (USA).

- Barriers to Adopting PREMIS in Cultural Heritage Institutions: An Exploratory Study, Daniel Gelaw Alemneh, University of North Texas (USA).
- Advances in Digital Imaging for Fine Art and Cultural Heritage, D. John Redman, Hewlett-Packard Company, and Mark Mudge, Cultural Heritage Imaging (USA).
- High-Accuracy Digital Imaging of Cultural Heritage without Visual Editing, Roy S. Berns, Lawrence A. Taplin, Mahdi Nezamabadi, Yonghui Zhao, and Yoshio Okumura, RIT (USA).
- National Digital Repository for Digital Still Images in the Netherlands, Astrid Verheusen and Caroline van Wijk, National Library of the Netherlands (the Netherlands).

### Meetings

ISO TC42 / JWG26 has held three meetings in 2012: January 20, in Washington, DC; June 11, in Copenhagen, Denmark; and November 9, in Washington, DC. A meeting will be held during the 23rd ISO/TC42 Plenary meeting in June 2013.

### To get Involved

To participate in JWG26, experts must be nominated by a participating member (P-member) country. The P-members of ISO/TC42 are Belgium (NBN), China (SAC), Denmark (DS), Germany (DIN), Japan (JISC) Republic of Korea (KATS), Russian Federation (GOST R), Sweden (SIS), Switzerland (SNV), the United Kingdom (BSI), and the United States (ANSI). P-members often assign multiple experts to participate in ISO/TC42 work, but each P-member has one vote on ISO standards ballots. Each P-member sets requirements for participation, and main-

tains its list of representatives. These experts can attend JWG26 meetings and access the official N-numbered documents which are posted on the ISO Server.

Members of the IT10 standards committee can participate as US experts in JWG26. Participation in IT10 is open to experts representing organizations, companies, and government agencies, as well as to individuals affected by the work undertaken by IT10.

Persons interested in participating in this work on behalf of the United States should contact standards@imaging.org.

### Recently Published TC42 Standards

TC42 has been busy over the last year catching up on standards. Many were delayed or backlogged by the transfer of administration to IS&T.

Some of the more significant standards published in the last year include:

- ISO 3665:2011 (Ed. 3) *Photography — Intra-oral dental radiographic film and film packets — Manufacturer specifications*
- ISO 18920:2011 (Ed. 2) *Imaging materials — Reflection prints — Storage practices*
- ISO 18930:2011 (Ed. 1) *Imaging materials — Pictorial colour reflection prints — Methods for evaluating image stability under outdoor conditions*
- ISO 18934:2011 (Ed. 2) *Imaging materials — Multiple media archives — Storage environment*
- ISO 18941:2011 (Ed. 1) *Imaging materials — Colour reflection prints — Test method for ozone gas fading stability*
- ISO 18946:2011 (Ed. 1) *Imaging materials — Reflection colour photographic prints — Method for testing humidity fastness*
- ISO 12231:2012 (Ed. 3) *Photography — Electronic still picture imaging — Vocabulary*
- ISO 18929:2012 (Ed. 2) *Imaging materials — Wet-processed silver-gelatin type black-and-white photographic reflection prints — Specifications for dark storage*
- ISO 18936:2012 (Ed. 1) *Imaging*

- materials — Processed colour photographs — Methods for measuring thermal stability (2012-04-13) IT 9*
- ISO 18944:2012 (Ed. 1) *Imaging materials — Reflection colour photographic prints — Test print construction and measurement (2012-04-13) IT 9*
- ISO 20462-3:2012 (Ed. 2) *Photography — Psychophysical experimental methods for estimating image quality — Part 3: Quality ruler method*
- ISO 18933:2012 (Ed. 2) *Imaging materials — Magnetic tape — Care and handling practices for extended usage*
- ISO 18913:2012 (Ed. 2) *Imaging materials — Permanence – Vocabulary*
- ISO 18926:2012 (Ed. 2) *Imaging materials — Information stored on magneto-optical (MO) discs — Method for estimating the life expectancy based on the effects of temperature and relative humidity*
- ISO 12234-1:2012 (Ed. 3) *Electronic still-picture imaging — Removable memory — Part 1: Basic removable-memory model*
- ISO/TS 22028-3:2012 (Ed. 2) *Photography and graphic technology — Extended colour encodings for digital image storage, manipulation and interchange — Part 3: Reference input medium metric RGB colour image encoding (RIMM RGB)*

### Next TC42 Plenary Meeting

The 2013 ISO/TC42 Plenary meeting will be hosted by the Danish Standards Foundation (DS) at the National Museum of Denmark in Copenhagen, June 3-7, 2013.

### Recent ISO Press releases

Some recent ISO press releases that may be of interest to the imaging community are:

#### *From standards for fireworks to sustainable development – ISO tackles new areas*

With already a wide-ranging portfolio of over 19,100 International Standards covering almost everything from screw sizes to social responsibility, ISO's scope con-

## IS&T REPORTER

Executive Editor: Peter Burns  
Managing Editor: Donna Smith  
Standards Editor: David McDowell

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Imaging.org focuses on all aspects of imaging, with particular emphasis on digital printing, electronic imaging, image perception, photo fulfillment, color imaging, image preservation, digital fabrication, and the physics and chemistry of imaging processes. For more information, visit [imaging.org](http://imaging.org). IS&T publishes the *Journal of Imaging Science & Technology* and (with SPIE) *Journal of Electronic Imaging*.

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tinues to diversify with the recent addition of seven new work areas for standards development. These are:

- Coalbed methane
- Fireworks
- Carbon capture and storage
- Biomimetics
- Facilities management
- Sustainable development in communities
- Railway applications.

More information is available at:

[www.iso.org/iso/home/news\\_index/news\\_archive/news.htm?refid=Ref1612](http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1612)

#### *New ISO video introduces "simpler, faster and better" Website on International Standards*

ISO has just launched a video on YouTube giving a quick introduction to the new ISO Website that aims to give "simpler, faster and better" access to information on ISO International Standards.

The new Website, which went live in June, has been fully revised with customer focus and readability in mind. The concise

introductory video helps busy people quickly learn how to get the best out of the site and discover how ISO standards provide benefits for business, government and society.

More information is available at: [www.iso.org/iso/home/news\\_index/news\\_archive/news.htm?refid=Ref1645](http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1645)

To access the video, go to: [http://youtu.be/Clq2vK\\_MCWI](http://youtu.be/Clq2vK_MCWI)

To access the new Website, go to: [www.iso.org](http://www.iso.org).

### ISO 9001 for Small Businesses now available as ePub

ISO has just launched an ePub edition of one of its most successful publications, ISO 9001 for Small Businesses. The original paper publication, in plain language and through numerous concrete examples from a wide range of sectors, helps small and medium-sized enterprises understand and implement ISO's globally known standard for quality management systems, ISO 9001.

The ePub edition provides new bene-

fits, including mobility (can be read on most tablets; reflow (adapts well to variously sized displays and devices); user friendliness; and ease of reading, even on small screens. More information is available at: [www.iso.org/iso/home/news\\_index/news\\_archive/news.htm?refid=Ref1669](http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1669)

*For suggestions for (or input to) future updates, or standards questions in general, please contact the editor at [dmcdownell@npes.org](mailto:dmcdownell@npes.org).*

## AWARDS PRESENTED AT NIP28/DIGITAL FABRICATION 2012



A number of awards were presented at the NIP28/Digital Fabrication 2012 Conference in September.

**Top row:** A Service Award to Shinri Sakai and Senior Membership to Makoto Omodani (left) and Service Award to George Gibson (right).



**Middle Row:** Service Award to George Marshall, Fellowship to Ross Mills, and the Carlson Award to Richard Veregin (left) and Senior Membership to Wolfgang Schmidt (right).



**Bottom Row:** The HP Image Permanence Award and a Service Award to Alan Hodgson (left) and Senior Membership to Joe Labarca (right).

**Not pictured:** Others receiving awards at the meeting, but not pictured, were Xavier Bruch (Service Award) and James Stasiak (Gutenberg Award).