



**RAPID PRODUCT DEVELOPMENT  
ASSOCIATION OF SOUTH AFRICA**

**2011 CHAIRMAN'S REPORT**

**November 2<sup>nd</sup>, 2011**

**RAPDASA  
Annual General Meeting**

**Riverside Hotel and Conference Centre  
Vanderbijlpark**

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## **1. Introduction**

The Rapid Product Development Association of South Africa (RAPDASA) was formally founded at the First Annual General Meeting of the Association on 8 November 2000, at the CSIR Conference Centre in Pretoria. Since its inception, RAPDASA has been a cornerstone in the development of the Additive Manufacturing industry in South Africa. Through the years, the association grew in numbers and impact and 2011 was no exception.

Tireless efforts by RAPDASA members and the management committee ensured a number of milestones during the year. These include a number of presentations, workshops and seminars held during the year, the launch of the new RAPDASA website, ASTM membership, as well as one of the biggest (if not the biggest) RAPDASA conferences ever.

The Additive Manufacturing industry itself also took leaps and bounds in 2011 with the support of government and funding agencies, ensuring that the industry experienced investments unheard of in previous years.

This report highlights some of the successes of 2011, not only those of RAPDASA, but also of the industry it serves.

## **2. Management Committee**

The management committee for 2011 was elected by the Annual General Meeting on 5 November 2010, held in Vanderbijlpark. The secretary and treasurer for 2011 was elected at the first committee meeting held on 18 January 2011 at the CSIR. The management committee for 2011 was as follows

Chairperson: Mr Marius Vermeulen  
Secretary: Mr Piet Bezuidenhout  
Treasurer: Mr Eugene Erfort  
Members: Mr Gerrie Booysen  
Dr Deon de Beer  
Dr Willie du Preez  
Mr Jan Jooste  
Mrs Ravini Moodley

Management Committee meetings were held on 18 January 2011, 15 March 2011, 24 May 2011, 26 July 2011 and 20 October 2011.

## **3. RAPDASA Members**

All RAPDASA Conference participants receive a full year membership to the association.

#### **4. Workshops, seminars and outreach**

One of the focus areas for RAPDASA during 2011 was to ensure outreach and growth of the organization. This was implemented through a number of presentations, workshops and seminars held in specific industry sectors, promoting RAPDASA and the AM industry in South Africa.

Feedback from these outreach programmes were very positive and the increase in conference attendance can, to some extent, be contributed to these efforts. I would like to express my gratitude to all institutions and organizations hosting these events. Special thanks also go to all individuals offering time and resources to make these outreach programmes successful.

The events for 2011 are listed here:

##### ***Institute for Inventors and Innovators (III)***

The Institute for Inventors and Innovators (III) hosted a presentation themed "Rapid Prototyping Technology in South Africa". It was held at Wits University on 13th of April, 2011. Dr. Willie du Preez, from the CSIR Materials Science and Manufacturing, presented on behalf of RAPDASA. The event was very well attended.

##### ***Aeronautical Society of South Africa***

RAPDASA presented at the Aeronautical Society of South Africa. Prof. Deon de Beer, from the Department of Technology Transfer and Innovation at VUT, presented his perspective on "The Establishment of a Rapid Prototyping/ Additive Manufacturing Capability in SA." A case study was also presented by Richard Schulz, director of Adept Airmotive. His topic, "Application of Rapid Prototyping in the development of the ADEPT Airmotive Engine" was also very well received.

##### ***Afrimold 2011***

Jan Jooste, from the Vaal University of Technology, presented a paper on the 29<sup>th</sup> of September on behalf of RAPDASA at Afrimold 2011. The presentation was aimed at giving an introduction to the Rapid Product Development Association of South Africa. Afrimold was held in the Sandton Convention Centre from the 27-29 September. It was a very successful event and the large number of Additive Manufacturing exhibitors was very encouraging.

##### ***Seminar on Direct Metal Laser Sintering (DMLS) of Titanium***

The Centre for Rapid Prototyping and Manufacturing (CRPM) hosted the first DMLS Titanium Seminar in SA. The focus was on Additive Manufacturing Technologies and was held in Bloemfontein on Wednesday, 21st September 2011, at the Central University of Technology, Free State. Currently the CRPM have the only Direct Laser Sintering machine in Africa producing Titanium components. This machine is one of nine rapid prototyping machines available at the CRPM. The CRPM acquired this machine in 2007

from EOS GmbH in Germany. It is able to produce medical implants in bio-compatible titanium. It can also manufacture aerospace parts which can be used during development for testing as final products.

Collaborative studies have been carried out with local and international partners with more studies planned in the near future. This Seminar was of high value, as all the parties involved in Titanium research met and presented papers on progress made with Direct Laser Sintering of Titanium. The future developments for this very new industry was also discussed and mapped out. Sixty people attended the seminar with representation from academia, industry and government. A number of requests were made that the seminar will become an annual event.

### ***MIMICS pre-conference workshop***

Materialise NV from Leuven, Belgium, agreed to sponsor a Materialise MIMICS Innovation Suite workshop, as part of the RAPDASA 2011 conference. This is a significant contribution, as previously this was only presented in Europe and USA. The workshop is scheduled for 31 October and 1 November, at the Riverside Hotel and Conference Centre, Vanderbijlpark.

### ***AM Optomec LENS Workshop***

The CSIR, National Laser Centre (NLC) will be hosting a Laser Engineered Net Shaping (LENS) workshop on the 2<sup>nd</sup> of November, during the RAPDASA 2011 conference. The objective of this mini-workshop is to establish a collaborative research programme for utilisation of the LENS system acquired by the NLC.

### ***Tissue Engineering and Biomaterials Workshop***

Dr. Ketul C. Popat and Dr. David A. Prawe from the School of Biomedical Engineering at the Department of Mechanical Engineering, Colorado State University, will be presenting a “Tissue Engineering and Biomaterials Workshop” during RAPDASA 2011. The workshop is scheduled for the 3<sup>rd</sup> of November at the Riverside Hotel and Conference Centre, Vanderbijlpark.

### ***Design for DDM Workshop***

Philip van der Walt, with co workers David Mauchline and Leslie Becker from the VUT, organised a “Design for Direct Digital Manufacturing” (DDM) workshop, to be presented on 4 November, at the Riverside Hotel and Conference Centre, Vanderbijlpark. Guest presenters will be Dr M Jansen van Vuuren (Nomili, SA); Prof O Diegel, AUT, NZ; Ms C Kuhn, CUT, SA and Mr Evert van Engelhoven, SA. The workshop will be moderated by Dr Ian Campbell, from Loughborough University, UK, together with Dr Lionel Dean, from Future Factories and DeMontfort University, UK.

### **Other**

Other publications and presentations marketing RAPDASA during 2011 include:

- RAPDASA presentation at *VDI – The association of German Engineers*, by Mr. Jan Jooste from the Vaal University of Technology on the 7<sup>th</sup> of June 2011
- Article titled “Additive Manufacturing is coming of age in SA” was published in the October/November Issue of *SA Plastics* magazine by Prof. Deon de Beer from the Vaal University of Technology.
- Prof Deon de Beer presented keynotes/invited papers at conferences in NZ, Australia and Portugal, where awareness was also created about the RAPDASA conference.
- Publication by Campbell, R.I., De Beer, D.J. and Pei, E. on *Additive manufacturing in South Africa: Building on the foundations*. Published in the *Rapid Prototyping Journal*, 17 (2), pp. 156-162.
- Publication De Beer, D.J. on *Establishment of rapid prototyping/additive manufacturing in South Africa* in the *SIAMM - Journal of The South African Institute of Mining and Metallurgy*, 111 (3), pp. 211-215.

## 5. Annual conference

The 2011 RAPDASA conference was hosted by the Vaal University of Technology from 2-4 November. The conference, organised by Prof. Deon de Beer, was held at the Riverside Hotel and Conference Centre, Vanderbijlpark.

The 2011 conference proved to be one of the largest (if not the largest) RAPDASA conferences up to date with 10 keynote presentations, 7 invited presentations and 45 other presentations running in three parallel sessions. The conference attracted no less than 166 attendees.

28 international speakers and visitors also attended RAPDASA. Visitors represented 13 countries and 6 continents, making RAPDASA 2011, once again, a truly international conference.

This year the conference also boasted with a very impressive exhibition hall and the following exhibitors were present:

- 3D Solids (Stratasys)
- Demoplastech (Objet)
- CAD House (Bits from Bytes)
- CSIR, National Laser Centre
- CUT, CRPM
- CUT, PDTS
- Idea2Product Lab
- Kopanang Converters
- Materialise
- Rapid3D
- Voxeljet
- VUT, MPTS

The conference proceedings ensured maximum exposure to exhibitors at this year's event as many functions were held in the exhibition hall. The 4<sup>th</sup> of November was earmarked as an "open exhibition" where the exhibition area was open for public attendance.

RAPDASA is pleased to announce that the South African Institute for Industrial Engineers agreed to publish a select group of papers from the conference in the SAIIE Journal – an ISI accredited journal. The Engineering Council of South Africa (ECSA) also confirmed that RAPDASA is accredited and that CPD points will be awarded to attendees. Emerald Publishers (through the Rapid Prototyping Journal) will also make a best paper award. The winning paper will be invited to submit for publication in the RPJ.

Apart from the main conference, a pre-conference MIMICS workshop was held on 31 October and 1 November. Three other conferences were also held during RAPDASA 2011:

- AM Optomec LENS workshop
- Tissue engineering and biomaterials workshop
- Design for DDM workshop

On behalf of RAPDASA I would like to express my appreciation to the generous sponsors for this year's event. First and foremost, to our platinum sponsor, I would like to thank the Vaal University of Technology which has made a tremendous contribution, not only in monetary value, but also in kind.

I would also like to express my gratitude to SASOL who, as always, sponsored generously and is our Gold sponsor for the year.

Special thanks go to all other sponsors for their confidence in the association and ensuring the success of the conference through their contributions:

- Aerosud Innovation & Training Centre
- Central University of Technology
- EDM-Shop
- EOS
- Materialise
- Stratasys
- Wohlers Associates

Lastly, a very special thanks to Prof. Deon de Beer, supported by a very competent Conference Secretariat consisting of Jenny van Rensburg, Rynette Coetzer and Zelda Kotze, for once again organising an excellent event. It should be mentioned that Deon and his team was also responsible for the 2010 conference and their dedication and tireless persistence is reflected in the quality of the events.

## 6. RAPDASA on the web

### *Website*

RAPDASA proudly announced the launch of the new website on the 8<sup>th</sup> of September 2011. The new website was designed with features aimed at supporting researchers, customers, service providers and industry alike. The website was established to provide a common knowledge base of the Rapid Prototyping / Additive Manufacturing industry in South Africa. There is also a strong focus on educating customers in the field of RP/AM and linking them to the designers, service providers and machine resellers in SA.

The website can be found at [www.rapdasa.org](http://www.rapdasa.org)

Some of the features on the website include:

- **Online registration** – For the first time, RAPDASA offers online registration for the annual conference. With some exceptions, the online registration service worked very well for this year's conference and proved an invaluable tool.
- **List of service providers** – This is a free feature where service providers in the RP/AM industry can list their company information and indicate what services they provide to the industry.

Service provider categories include:

- Design
- Machine resellers
- Tool making
- Testing and analysis
- Manufacturing
- Software and related technologies

The service is already being used by a number of service providers and users alike and everyone is invited to use the feature. Ideally, this would provide a listing of all service providers in SA.

- **Background on Additive Manufacturing** - The website offers a vast amount of information regarding Additive Manufacturing, the technology involved, the state-of-the-industry in South Africa etc.
- **Interesting links and articles** – One of the focus areas of RAPDASA is to aid and educate the AM industry in South Africa. The website provides lots of information in the form of links, articles and presentations. All RAPDASA members are invited to use this information, but also to contribute by adding information to the database.
- **A “calendar of events” on AM related topics** – The calendar shows information on all future events and allows for downloading of presentations for past events. Please contact the RAPDASA committee should you wish to add events to the calendar.

During the 8 weeks since the website was launched, close to 800 visits were recorded of which approximately 50% are unique visitors. It is also noticeable that only 70% of these visits are from locations within South Africa. The website was also used for at least 166 conference registrations.

A full statistical report for the website can be seen in Appendix A.

Special thanks go to the Support Programme for Industrial Innovation (SPII) for sponsoring the RAPDASA website.

### **Social Media**

During 2011, RAPDASA also started the use of social media pages and can be found on Facebook and Linked-In

<http://www.facebook.com/pages/Rapdasa-Rapid-Product-Development-Association-of-South-Africa/242849005740757>

[http://www.linkedin.com/groups/RAPDASA-Rapid-Product-Development-Association-3982231?gid=3982231&trk=hb\\_side\\_q](http://www.linkedin.com/groups/RAPDASA-Rapid-Product-Development-Association-3982231?gid=3982231&trk=hb_side_q)

## **7. GARPA**

“The Global Alliance of Rapid Prototyping Associations (GARPA), and its annual meeting, the Global Summit, were formed to encourage the sharing of information on rapid prototyping and related subjects across international borders. As a part of this sharing, GARPA members from around the world participate in activities that include technical presentations at industry conferences, the publication of application case studies, business meetings, social events, and the formal and informal exchange of information. “

RAPDASA has been a member of GARPA since 2001. Membership entails that RAPDASA is allowed to nominate 5 members to become GARPA fellows. Dr. Willie du Preez was the first member of the association nominated to become a GARPA

fellow and at the 2010 AGM, his acceptance as fellow was announced. At the 2010 AGM, Prof. Dimitri Dimitrov and Prof. Deon de Beer was also nominated for GARPA fellowship.

## **8. ASTM**

“ASTM International, formerly known as the American Society for Testing and Materials (ASTM), is a globally recognized leader in the development and delivery of international voluntary consensus standards. ASTM Committee F42 on Additive Manufacturing Technologies was formed in 2009. F42 meets twice a year, usually in January and July, with about 70 members attending two days of technical meetings. All standards developed by F42 are published in the Annual Book of ASTM Standards, Volume 10.04. “

During 2011, RAPDASA registered as an organisational member of ASTM. Membership entitles RAPDASA to participate in and vote on all F42 subcommittees. RAPDASA aims to have at least one participant at all F42 committee meetings. The membership entails all RAPDASA members to have access to information resulting from the F42 committee. All interested parties are invited to contact the RAPDASA management committee regarding this matter.

## **9. Financials**

RAPDASA, once again, has a healthy financial status. This can mainly be contributed to the very successful conferences for 2010 and 2011 hosted by the Vaal University of Technology and, more specifically, Professor Deon de Beer. On behalf of RAPDASA, I would like to thank you for your contribution in ensuring the financial status of the association. I also want to express my appreciation to our Treasurer, Eugene Erfort, for his work in this regard.

## 10. Highlights of the South African AM industry for 2011

### ***SA invests in high-end AM research and equipment***

One of the highly notable achievements in the South African Additive Manufacturing industry for 2011 is the number of large investments made in research and capital equipment in the so called “high-end” Additive Manufacturing systems.

It is believed that this year, a milestone was marked in the Additive Manufacturing industry in South Africa. It seems that the research performed over the years by Technology stations, Universities and Research councils is suddenly culminating into a noticeable industry in South Africa. This is reflected in the high level of involvement of funding agencies and industry alike.

An estimated total of R80m has been awarded in terms of funding for the acquisition of Additive Manufacturing systems, as well as the development of new AM platforms and related technologies. It should also be noted that 97% of these investments are aimed at the production of metal components, mostly for manufacturing applications, rather than for prototyping.

Funding has been awarded by a number of sources including the following:

- Department of Science and Technology (DST)
- Technology Innovation Agency (TIA)
- National Research Foundation (NRF)
- Photonics Initiative of South Africa (PISA)
- Technology and Human Resources for Industry Programme (THRIP)
- National Foundry Technology Network (NFTN)

The following projects deserve special notice:

- CUT acquires new Direct Metal Laser Sintering Technology.
- Stellenbosch University acquires a “M2 LaserCUSING” machine, from Concept Laser, with TIA funding
- VUT acquired a Formiga P 100 and funded an Idea 2 Product Lab™
- National Laser Centre (CSIR) acquires Laser Engineered Net Shaping (LENS) system via NRF funding
- AeroSwift – DST funded project for the development of a large Titanium Additive Manufacturing pilot plant
- PISA funds laser technology research for sphericalisation of locally produced Ti powders

See Appendix B for the full report.

### ***Idea2Product Lab***

South Africa in general, but more specifically poverty-stricken areas such as the Southern Gauteng, are challenged with low levels of skills development, underpinned by insufficient job opportunities, and the growing perception of a dying industrial zone. Also, South African education often suffers from international initiatives that may inhibit own development.

As part of an innovation and job creation strategy-driven solution, the VUT introduced a unique concept, the **Idea2<sup>Product</sup> Lab™**, in 2011. This concept, as a strategic intervention, allows entrepreneurs from the region to be provided with appropriate skills development and infrastructure to develop new products that can be tested and modified in the market place, according to customer needs.

The **Idea2<sup>Product</sup> Lab™**, which is located at the VUT campus, contains 20 low cost Additive Manufacturing platforms and is based on the traditional FabLab concept which ensures that the lab is used as an open facility.

Over and above serving as an outreach initiative, the VUT is also using the **Idea2<sup>Product</sup> Lab™** to serve as a multidisciplinary design and advanced manufacturing / production education and research platform. In combining these, it also enables the Technology Transfer and Innovation Directorate to stimulate innovation and technology transfer – both within and external to the institution. Current research and development translates into new tools for entrepreneurs and SMMEs, and results in increased transfer and adoption of technology. As an educational and research platform, it creates an environment that stimulates manufacturing innovation, and orient students to become inventors of technology, opposed to only applicators of existing (imported) technology platforms.

### **Service Providers:**

The following technologies are currently being represented by resellers / agents:

- Stratasys (3D Solids)
- 3D Systems (CAD House)
- Z Corp (Rapid 3D)
- Solidscape (Rapid 3D)
- Objet (Demoplastec)
- MCor (Perform Set Technologies)

System sales for the above-mentioned technologies are in the order of 200, which furthermore represent entry level to high end machine sales (excluding the systems described under initiatives by the CUT, NLC, Aersoud, Stellenbosch University and VUT.

Total sales value of the units described above represent approximately R20 million. News regarding system improvements will be covered (together with a detailed analysis) in Appendix C, to be added to the report, and which will be made available on the RAPDASA website.

Above-mentioned are being supplemented by direct sales from companies such as EOS, Hoffman, OPTOMECH, LENS, representing a further R80 million.

As can be deduced, various sources of financial support (private and government) are being invested in SA's AM industry, turning it into a very healthy support cluster, and which gives RAPDASA a more important role to

play in supporting the co-ordination/networking, education, outreach and marketing.

## 11. Future

The Additive Manufacturing (AM) industry is coming of age in South Africa and RAPDASA 2011 is celebrating 21 years of activities. It is with this celebration that the industry is seemingly taking the next step. The initial baby steps have, through the years, developed into a stride and who knows where the AM industry in South Africa will lead in future?

The RAPDASA management committee for 2011 developed a number of short term projects for the future and I challenge the next management committee to see these to completion. During 2011, it was suggested that an annual RAPDASA competition is launched. The competition is to be based on the “Siemens Cyber Junkyard” principle and the idea of the competition is to get students involved in the technology on undergraduate level. RAPDASA started discussions with Bits From Bytes from the UK, to sponsor a national “BFB” AM competition, but unfortunately it was not possible to conclude the final negotiations in time for this year’s RAPDASA. At current, Deon de Beer and Bernard Vogt from CAD HOUSE (local 3D Systems agent) are taking the discussions forward, and the plan is to launch the competition in 2012, with the final adjudication as part of RAPDASA 2012.

RAPDASA also invested heavily into the new website and a number of proposals still require finalisation and implementation. This includes creating a member space where information that is not in public domain, such as RAPDASA publications and information from ASTM, can be shared to members. Other proposals relates to the list of service providers that is currently available, but a number of proposals exist to ensure that the listing is extensive and allows users of the technology to access the right service providers.

With all the advances in the AM industry, the technology is however still relatively unknown to the general public, academia, industry et. al. This poses one of the greatest challenges that the industry faces and I believe it is the role of RAPDASA to ensure that the situation changes. Internationally, programs such as “Bright Minds” etc. are targeting school children and I believe that that is the future of the industry. South Africa needs a change of mindset and that should be the ultimate long term focus for the association and the industry in South Africa.

## 12. Conclusion

At the 2010 AGM, I expressed my goals for 2011 for the association and these were to increase communication, within the association and externally, and to GROW! I am proud to say that the management committee for 2011 tackled these goals with vigour and that the results exceeded all my expectations.

However, the growth and advances that we have seen as an association is wholly overshadowed by the advances made in the Rapid Product Development industry in South Africa during the year. For this I have to congratulate you, as that is the real success for 2011!

In summary, RAPDASA has held a large number of workshop, seminars and presentations during the year to ensure networking, education and awareness. A new website was launched to ensure a portal for the association through which the network can be built and information can be shared. RAPDASA became member of ASTM F42, giving a voice to the association in the development of standards for the industry and ensuring access to new and relevant information to all members. A very successful international conference was held with more than 150 attendees.

The Rapid Product Development industry in SA saw a revolution unmatched in previous years. Some of the highlights include an estimated R80m approved in terms of funding for “high-end” AM systems and development, a large increase in the number of systems available in the country and the birth of a new education and development lab – the Idea2Product Lab. Research focus took a turn and SA is starting to take on the role of technology developers, rather than being only users of existing technology. Service providers also experienced a surge in sales and new service providers and technologies surfaced.

Looking back at these achievements I believe that 2011 has been a very successful year and I am privileged to have been in the position of chairman of RAPDASA.

These achievements are however not just bestowed and I would like thank the scientists and researchers for the ground-breaking work that they have been doing over the last ten years (and are still doing) to position South Africa as a global competitor.

I would like to thank:

- Ø the organizations and institutions that are creating the platforms for this research and, through extensive Human Capital Development, are ensuring the future health of the industry and the country;
- Ø funding agencies for realising the potential of the technology and for enabling the research being done in South Africa;
- Ø government departments (i.e. DST) for understanding the need for research and development and for creating the policies that allows for this;
- Ø industry for stepping up and taking the challenge as future research is dependent on the commercialization of today’s technology and your involvement gives the confidence to continue.

To the management committee, thank you for your hard work and dedication. Congratulations on a job well done.

Finally, a special thanks once again for Deon de Beer and the Vaal University of Technology for hosting a memorable conference. Also, thanks to Jenny van Rensburg, Rynette Coetzer and Zelda Kotze for your efforts in this regard.

I hope and believe that 2012 will be an even greater year for the industry and I wish you all good luck on your endeavours in ensuring this.

Yours sincerely



Marius Vermeulen  
(Chairman)

**Appendix A - Statistical report of the RAPDASA website:**

www.rapdasa.org **Visitors Overview** Oct 1, 2011 - Oct 31, 2011  
Comparing to: Site



**398 people visited this site**

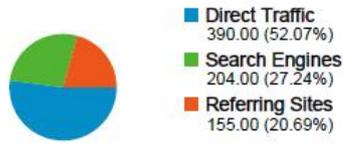
- 749 Visits**
- 398 Absolute Unique Visitors**
- 3,601 Pageviews**
- 4.81 Average Pageviews**
- 00:06:22 Time on Site**
- 27.64% Bounce Rate**
- 46.46% New Visits**

www.rapdasa.org **Traffic Sources Overview** Oct 1, 2011 - Oct 31, 2011  
Comparing to: Site



**All traffic sources sent a total of 749 visits**

- 52.07% Direct Traffic**
- 20.69% Referring Sites**
- 27.24% Search Engines**





**749 visits came from 27 countries/territories**

Site Usage						
Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate		
<b>749</b>	<b>4.81</b>	<b>00:06:22</b>	<b>46.46%</b>	<b>27.64%</b>		
% of Site Total: 100.00%	Site Avg: 4.81 (0.00%)	Site Avg: 00:06:22 (0.00%)	Site Avg: 46.46% (0.00%)	Site Avg: 27.64% (0.00%)		
Country/Territory	Visits	Pages/Visit	Avg Time on Site	% New Visits	Bounce Rate	
South Africa	554	5.03	00:06:56	42.96%	26.90%	
United Kingdom	37	4.41	00:04:11	62.16%	27.03%	
United States	30	3.33	00:03:24	73.33%	30.00%	
India	18	4.00	00:05:16	77.78%	50.00%	
Germany	18	4.78	00:04:47	61.11%	16.67%	
Brazil	16	5.62	00:08:02	50.00%	25.00%	
Iran	13	2.38	00:01:44	7.69%	38.46%	
New Zealand	11	3.91	00:02:41	27.27%	18.18%	
Belgium	10	4.80	00:07:03	30.00%	30.00%	

Norway	8	9.50	00:19:49	25.00%	0.00%
Sweden	5	2.00	00:00:18	80.00%	40.00%
Singapore	4	2.00	00:00:58	25.00%	50.00%
Portugal	3	8.33	00:11:35	66.67%	33.33%
Australia	3	5.00	00:04:47	33.33%	0.00%
Vietnam	2	1.50	00:00:18	50.00%	50.00%
Netherlands	2	2.00	00:00:21	50.00%	50.00%
Russia	2	1.00	00:00:00	100.00%	100.00%
Israel	2	5.00	00:03:42	100.00%	50.00%
Poland	2	2.00	00:05:40	50.00%	0.00%
Finland	2	3.50	00:01:06	100.00%	0.00%
Denmark	1	3.00	00:02:13	100.00%	0.00%
(not set)	1	4.00	00:08:05	100.00%	0.00%
Canada	1	3.00	00:00:33	0.00%	0.00%
Venezuela	1	2.00	00:00:21	100.00%	0.00%
China	1	1.00	00:00:00	100.00%	100.00%
Spain	1	1.00	00:00:00	100.00%	100.00%
France	1	1.00	00:00:00	100.00%	100.00%

## Appendix B - SA invests in high-end AM equipment and research

One of the highly notable achievements in the South African Additive Manufacturing industry for 2011 is the number of large investments made in research and capital equipment in the so called “high-end” Additive Manufacturing systems.

It is believed that this year, a milestone was marked in the Additive Manufacturing industry in South Africa. It seems that the research performed over the years by Technology stations, Universities and Research councils is suddenly culminating into a noticeable industry in South Africa which is reflected in the high level of involvement of funding agencies and industry alike.

An estimated total of R80m has been awarded in terms of funding for the acquisition of Additive Manufacturing systems, as well as the development of new AM platforms and related technologies. It should also be noted that 97% of these investments is aimed at the production of metal components, mostly for manufacturing applications rather than for prototyping.

Funding has been awarded from a number of sources including the following:

- Department of Science and Technology (DST)
- Technology Innovation Agency (TIA)
- National Research Foundation (NRF)
- Photonics Initiative of South Africa (PISA)
- Technology and Human Resources for Industry Programme (THRIP)
- National Foundry Technology network (NFTN)

The following projects deserve special notice:

- CUT acquires new Direct Metal Laser Sintering Technology.
- Stellenbosch University acquires a “M2 LaserCUSING” machine, from Concept Laser, with TIA funding
- VUT acquired a Formiga P 100 and funded an Idea 2 Product Lab™
- National Laser Centre (CSIR) acquires Laser Engineered Net Shaping (LENS) system via NRF funding
- AeroSwift – DST funded project for the development of a large Titanium Additive Manufacturing pilot plant
- PISA funds laser technology research for sphericalisation of locally produced Ti powders

### ***CUT acquires new Direct Metal Laser Sintering Technology***

The Central University of Technology, Free State (CUT) and the Centre for Rapid Prototyping and Manufacturing (CRPM) are in the process of acquiring the newest Direct Metal Laser Sintering (DMLS) technology. As these technologies are maturing to the production of functional end-use parts, it was decided to make this huge investment in upgrading the existing DMLS machines available at the CRPM. This will enable the CRPM to produce functional parts and tooling inserts (in Titanium and Maraging Steels) for the aerospace, medical and tooling industries.



## **Stellenbosch University acquires M2 LaserCUSING machine**

Research: in March Mr AA Moammer defended very successfully his PhD dissertation on “*Thermal management of moulds and dies - a contribution to improved design and manufacture of tooling for injection moulding*”. The base for that is the consistent application of AM.

As a result of a case study for this research – a project with USABCO, a Cape Town based company – SUN received applications for 5 further industrial projects and most importantly – the funding from TIA from the IAT programme for the acquisition of a Concept Laser *M2 Laser Cusing* system.

It is an investment of ± R 5m. The focus is on the tooling industry – as mentioned above better thermal management through uniform cooling. A result of this is productivity increase and a better product quality. However also projects for the aerospace industry – building of net-shape or near-net shape components followed by machining, and medical applications are envisaged funded to a large extend by DST.



The Laser Cusing machine was delivered last Tuesday and will be commissioned end of November 2011.

A large research and industry related programme is set in form of a THRIP project, which is due to commence in January next year. As mentioned above the focus is put on tooling applications mainly for injection moulding and die casting, where tooling steel is used as a material. For aerospace and medical application titanium powder has been made available.

A large collaboration platform on national and international level is set too.



## **VUT acquired a Formiga P 100 and funded an Idea 2 Product Lab™**

The VUT successfully established a multi-disciplinary design centre, with significant design capacity and expertise, and amongst others, already managed to successfully train a number of DST interns to specialise in design. The Design Centre creates the input side for a high number of SPII-funded product development projects, and serves industry projects in general. The successful integration of design and AM (Direct digital Manufacturing) also allowed for participation in a multi-million multinational project.

An investment of ca. R2.4 million added significantly to the VUT's high end AM side, where the focus will predominantly be on polymer-based materials and matrices, in support of product development through a sectoral approach.

Furthermore, the VUT successfully established an Idea 2 Product laboratory (trademarked) as local development to replace the MIT Fablab initiative, which somehow seemed to stop in SA. An initial investment of approximately R1.5 million mobilised the project. The VUT's Technology transfer and Innovation (TTI) directorate also proved the scalability (up or down), by launching a downscaled (1/10<sup>th</sup>) facility at its satellite campus in Upington, to stimulate local innovation in a rural environment. According to Terry Wohlers, this is the first initiative of this kind, internationally.



## **National Laser Centre (CSIR) acquires LENS system**

The Laser Materials Processing (LMP) Unit within the NLC are expecting their Laser Engineered Net Shaping (LENS) System early in 2012 that was awarded through the NRF (R35m). LENS uses a high-power laser (500W to 4kW) to fuse powdered metals into fully dense 3-dimensional structures.

The LENS system uses the geometric information contained in a Computer-Aided Design (CAD) solid model to automatically drive the LENS process as it builds up a component layer by layer. Additional software and closed-loop process controls ensure the geometric and mechanical integrity of the completed part. The LENS process is housed in a hermetically-sealed chamber which is purged with argon so that the oxygen and moisture levels stay below 10 parts per million. This keeps the part clean, preventing oxidation. The metal powder feedstock is delivered to the *material deposition* head by a powder-feed system, which is able to precisely regulate mass flow.



The goal for LMP is to interact with Academia and Industry to carefully define the research efforts with the LENS system since it is the first of its kind in South Africa. The mission is to ensure that this LENS system will help in furthering South Africa's efforts in establishing an Additive Manufacturing economy that is 2nd to none. When the system arrives to the NLC they will host a series of workshops and open days for industry to come in. They will also offer the possibility of helping companies refurbish a component with the LENS system just to highlight its capabilities (i.e. bore cladding, 3-D cladding).

The LENS system can build parts (i.e. turbine blades) with the aim of tailoring its properties or simply repair an area that has been damaged through corrosion or wear. The advantage of LENS over traditional methods is the low heat input that eliminates distortion and the ability to create functionally graded materials (can control the metallurgical properties). This tool has the potential to give a great boost to the manufacturing industry by making South Africa less dependent on foreign suppliers.



## ***AeroSwift – Development of a large Titanium AM pilot plant***

A consortium consisting of the CSIR National Laser Centre and Aerosud ITC has been awarded a grant from the Department of Science and Technology (DST) for the development of a high speed large area Selective Laser Melting Additive Manufacturing technology demonstrator / pilot plant. The project, aptly named “AeroSwift”, is based on a concept for the technology which originated with Aerosud. During early 2010, the CSIR National Laser Centre and Aerosud build an experimental test bed to test and evaluate the concept. Based on the success of these tests, a grant to the value of R 24 million was secured from the DST to develop a full scale technology demonstrator / pilot plant.

Present commercial AM systems based on selective laser melting all suffer from the same limitations, being limited forming speed, limited part size, and in many cases inconsistent build quality. The technology the consortium plan to investigate and further develop is intended to shift the boundaries of this manufacturing technology, by scaling up build speed and size of components by at least one order of magnitude. The primary focus of the technology development is to build metal parts for the Aerospace industry, more specifically Ti alloy components.



The concept is based on using an advanced scanning process to scan a high beam quality / high power laser beam across a bed of Ti powder. A powerful 5 kW single mode fibre laser from IPG lasers was acquired for the project, and is expected in the country soon. The project poses several technology challenges which will require the development of new techniques and processes that will be required to realise the final technology demonstrator. Some of these include switching of high power laser beams, beam propagation technologies to preserve the quality of the high power laser beam, material handling technologies, and processing strategies that will ensure the build of high integrity components.

The project completion date is anticipated for end 2012.

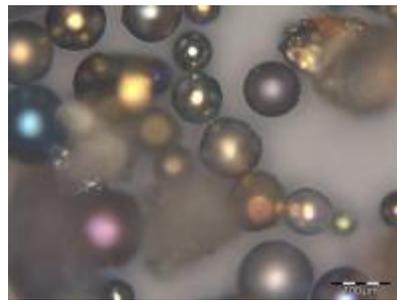
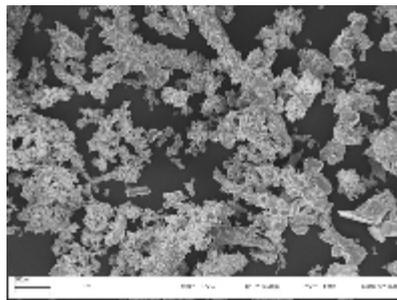


## ***Laser technology research for sphericalisation of local Ti powders***

One of the cost drivers in Additive Manufacturing is the powder used during the process. Powders produced by international suppliers using atomisation technologies are generally preferred due to the high quality and excellent flow characteristics of these powders. These powders are expensive, and have a negative impact on the techno economic feasibility of any technology that aims at producing large and bulky components from Ti powders using an additive manufacturing technology.

South Africa has started a program to produce locally manufactured Ti powders. This work, conducted by the CSIR Materials Science and Manufacturing group as part of the Ti Centre of Competence is funded by the Department of Science and Technology (DST). The process at present produces powder particles with geometries that do not allow easy flow properties which are required for the preparation of a uniform powder bed required for the Selective Laser Melting additive manufacturing process.

The CSIR National Laser Centre, in collaboration with Aerosud ITC, investigated the re-melting of locally produced Ti Powders, in order to produce spherical particulates with better flow properties. A proof of concept study was completed, and initial findings shows promising results. The present research project is funded through the Photonics Initiative of South Africa, and a grant of R 2 million was made available to the CSIR National Laser Centre to continue this research.



The attractiveness of the process is that if successful, the locally produced powders using the laser-based post processing to shape the powder particulates will be less expensive than imported powders. Anticipated savings of up to 90% is envisaged compared to high quality imported powders from the abroad.

