

Quality, Innovation & Bankability



**Quality
Management
enabling MLPE
Innovations to
scale Globally while
Driving Sustainable
Profitability.**

Summary

APsystems (Altenergy Power Systems) is a global leader in microinverter technology development & manufacturing serving the photovoltaic industry. In 2014 and 2015 APsystems ranked no.2 in global market share among microinverter suppliers in units shipped and is the world's third largest vendor of Module Level Power Electronics (MLPEs) for the solar industry (source: GTM Research).

The company has experienced steady growth every year since being founded in Silicon Valley in 2009 and has been profitable since 2012. APsystems is the largest microinverter supplier to China and Australia, and is no.2 in the US and the European regions, increasing its market share dramatically through a robust distribution network worldwide.

This paper describes the crucial aspects of quality control and management taken by APsystems to achieve industry leading standards and scaling its operations globally while improving its financial performance year on year.



The Manufacturing Advantage

APsystems works in partnership with manufacturers in China, employing Lean Manufacturing with several process improvement tools and techniques to maximize operational effectiveness and productivity while eliminating waste from each step of the production process.

APsystems uses Kanban, 5S, Six Sigma principles and JIT inventory management, as well as ISO 9001 certified processes.



*Production & test chamber facility
APsystems, Jiaxing China*



Its primary contract manufacturer, TDG Technology Co. is ISO 9001, ISO/TS 16949 and ISO 14001 certified.

APsystems uses an asset light business model which allows it to leverage experienced, quality contract manufacturers without taking on burdening assets and overheads. Our manufacturing processes have been certified by international standards bureaus, assuring product quality. All products are backed by industry-leading warranties, including extended warranties available to match the design life of the products.



Assembly line facility, APsystems, Jiaxing China

Supply Chain Management

The quality of the components determines the performance and reliability of an end product to a very great extent. Only tier-1 suppliers are taken into consideration as candidates by APsystems. From the initial selection of supplier resources to final qualified enrollment, APsystems carries out a thorough investigation and analysis of the component itself as well as the qualification of the supplier.

After a strict review of product information and documents, rigorous sample testing, and in-depth supplier qualification examination, only components with best performance are approved. APsystems carries out strict Supplier Quality Management review processes, based on quarterly and annual supplier audits through both documentary and "on-the-spot" assessments.

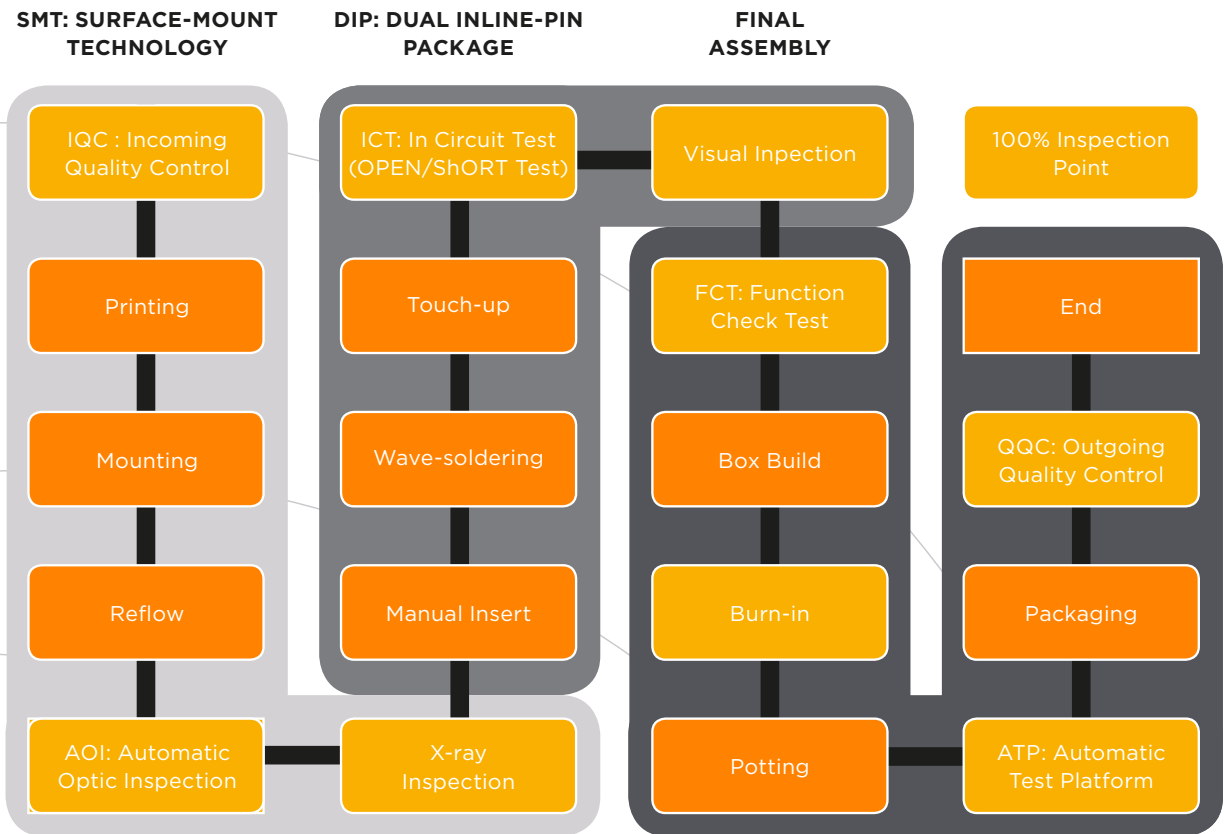
Production Process Control

On the APsystems production line, quality is given top priority through strict and systematic quality production procedures, including Automatic Optical Inspection (AOI), Functional Check Test (FCT), and burn-in testing for early-life failure identification.

Figure 1 shows APsystems' products production flow & key quality control process. The whole production process is not only restricted to a finished product coming off the line. To ensure optimum performance in any kind of climate, and reduce the possibility of failure in any conditions which may be experienced

in the field, APsystems products go through numerous and rigorous Quality & Reliability Verification Tests and simulations, including high-low temperature test, salt spray test, waterproof test, drop test and vibration test.

✓ **Figure 1:**
Production Process flow & Quality Control



Product Traceability

APsystems uses UID to control production of every unit and keeps all production and testing data. UID for each unit will be checked throughout the whole production and testing process.

“All test equipment automatically transfers all data to the database, eliminating any chance of human error”

Hai Liu, Operation Director, APsystems.



Certification & Market approval

As leading manufacturer in advanced Module Level Power Electronics, APsystems always assures its customers that its systems comply with regional and local grid regulations and certifications. Leveraging its certification department, APsystems has already been approved on numerous certifications required to access targeted markets worldwide, including CQC, CSA, CE, SAA, ETL but also VDE, G83-2, NRS 097-2-1 and EN50438 certifications.

With close to 300 MWp total installation capacity reached to date and 10% of APsystems' workforce dedicated to quality and product verification, the company does not compromise in quality to reach excellence in performance standards for its products and leading market recognition worldwide, covering more than 80 countries located in Asia, America, Australia, Europe and Africa.

Investors and Bankability

APsystems is in the exclusive business of developing, manufacturing, and distributing photovoltaic Module Level Power Electronics for residential, commercial, and utility use. APsystems was founded in Silicon Valley in 2009 by Dr. Zhimin Ling and Dr. Yuhao Luo, two senior managers from Xilinx, Inc. While these founders brought the initial concept and the required breakthrough technology, they enlisted the financial and manufacturing support they needed from two main investors: TDG* and Halead**.

These investors, who provided the initial funding, are active on the Board, and are supportive of rapid global growth. These two initial shareholders have each made a multi-million USD investment in APsystems. Two other investors, XingKe Investments and SHBC, also made early seven figure USD investments. Combining a tremendous growth with robust financial management, has led **APsystems to reach profitability since 2012.**

Notes

**TDG Holding Co., a Shanghai stock market-listed company with a \$500M market cap was founded in 1984. TDG focuses on electronic materials and components, sophisticated electronic equipment, and new energy and environmental technology and applications. TDG's energy and environmental technologies are both deep and broad in PV, LED applications, and environmental integration technology and applications. More info on TDG can be found at www.linkedin.com/company/tdg-solar.*

***Halead was established in 2001 and is now listed on the Shenzhen stock market with a \$400M market cap. Halead has exceptional strengths in coatings, fibers, and thin sheet, and brings this technology and production experience to APsystems. It also brings significant international market development experience, with sales in more than 80 countries. More info can be found at www.halead.com/en.*



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