

Medical Solutions

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More than 30 years of Computed Tomography at Siemens Medical Solutions

The innovative leader of clinical applications as well as user comfort and patient friendliness

32 years ago in May 1974, Siemens was the first medical technology manufacturer to bring a computed tomography (CT) system to market: back then, the Siretom made history. But since that time we have come a long way from the technology used for this system and the first slice images of the brain to today's three-dimensional display of the inside of the body with the Somatom Definition and its temporal resolution of 83 ms. The virtual flight through the human intestinal tract is no longer just a vision, nor is the targeted examination of the coronary vessels. Innovative developments by Siemens continually contribute to improvements in diagnostic capabilities, patient friendliness, and efficiency. Today, Siemens remains focused on these objectives, while continuing to develop CT technology.

Since the discovery of X-rays by Wilhelm Conrad Röntgen in 1895, radiologists and researchers attempted to display structures of the human body in two and three dimensional views. The pioneering work of British engineer Godfrey Hounsfield and American physicist A.M. Cormack resulted in the combination of computer and X-ray technology and the birth of CT in 1972. The success of Hounsfield, known as the "father of CT", is even more surprising given that he worked for the British company EMI, which up to that point produced only music records and electronic components.

In the same year, Siemens in Erlangen established its own CT development group within its Basic Research department. Two years later, the company introduced the Siretom, the first

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CT scanner. It enabled physicians to differentiate soft tissue in the brain, allowing them to detect tumors, hematomas, and infarctions by size and position without contrast agent, as well as distinguish cerebral ventricles from the brain.

At the end of 1977, Somatom 1, the first whole body CT system, established an additional milestone. The acquired slices became ever thinner over the course of development, providing an increasingly more detailed display of the area under examination. In 1985, surfaces – for example of bones – could be displayed three-dimensionally for the first time. In 1987 the slip ring technology used with the Somatom Plus Classic enabled continuous rotation of the gantry about the patient for the first time. Based on this principle, Siemens began to develop Spiral CT in the same year. In this system, the table and patient slowly moved through the gantry. And in 1989, the first spiral CT scanner came on the market. Its continuous scanning allowed acquisition of a 24 centimeter volume within 24 seconds. For the first time, e.g., the lung could be acquired in a single breathhold.

Using a mouse-controlled Windows interface, system operation became easier and more comfortable in 1991. In the following year, CT production was moved from Erlangen to a new factory in Forchheim, some 20 kilometers to the north. R&D and Marketing soon followed. 1992 also saw CT enter the area of angiography, a procedure that examines blood vessels. Due to fast rotation and processing speeds, vessels filled with contrast agent could be acquired before the contrast agent spread through the body. The initial step toward multi-slice CT came in 1998 with the Somatom Volume Zoom. For the first time, multiple slices of the body – in this case four – could be acquired within a single gantry rotation. Using a very fast rotational speed of 0.5 seconds, non-invasive display of coronary vessels became possible for the first time. This allowed for early detection and treatment of plaque and occlusions.

The Somatom Sensation 64 was introduced in 2004 during the 30th anniversary of computed tomography at Siemens Medical Solutions. It was another first. The system was able to acquire 64 slices of the body in a single gantry rotation at a speed of 0.33 seconds. In addition, it provided the highest resolution in the industry at the time, 0.4 millimeters. This expanded the diagnostic possibilities for cardiology, enabling high-resolution display of the

moving heart and all its blood vessels, as well as a virtual flight through the coronary arteries.

With its latest system, the Somatom Definition, Siemens has developed the world's first dual source computed tomography system (DSCT). The device uses two X-ray tubes and two detectors, enabling clinical acquisitions at previously unheard of speeds. Even when dealing with rapidly or irregularly beating hearts, the Somatom Definition can generate high-quality images with precise details – and with a radiation dose reduced up to 50 percent and without the need to administer beta blockers. With a gantry diameter of 78 cm and a scanning range of 200 cm, the new CT system enables diagnoses regardless of the size, stature, or health of the patient.

In addition to the actual CT systems, Siemens also develops their central elements, such as the X-ray tubes and detectors. With the Ultra Fast Ceramic (UFC) detectors that have been in use since 1996, CT systems from Siemens achieve unmatched image quality at a significantly reduced radiation dose. And the Straton X-ray tube is a patented Siemens development that remains unique within industry. Its directly cooled anode and compact design allow for gantry rotation times of 0.33 seconds. It also opened the door for constructing a DSCT with its innovative deflection of the electron beam to two foci within the tube, producing two X-ray beams and two detector measurements.

The continuous further development of CT has opened additional clinical applications: in fall 2003, Siemens was the first provider to receive FDA approval in the USA for a computer-supported procedure to identify pulmonary nodes as possible tumors. CT is also used to diagnose colon cancer: a virtual passage through the human intestinal tract can display even the smallest of polyps. If they are removed in a timely manner, the development of colon cancer can be prevented with a high degree of probability.

32 years after the inception of CT, the physicians and researchers of today have a highly-developed tool that helps them to examine processes in the body in the fastest possible way while sparing the patient. While diagnostic capabilities have been continuously improved, the radiation dose has been reduced significantly. The increasing importance of CT in the clinical routine over the years is expressed in the

Siemens' sales numbers: while only two Siretom systems were sold in all of 1974, today the CT production facilities in Forchheim and Shanghai manufacture nearly 2000 units per year of the current product spectrum which includes Somatom Emotion, Somatom Sensation, and Somatom Definition. The technical basis for increasingly more innovative imaging procedures for the diagnosis and treatment of disease has advanced significantly.

Background Information: Computed Tomography

For more than 32 years, Computed Tomography (CT) has been providing detailed images from inside the human body. However, compared to a standard X-ray image, the system generates a cross-section since the X-ray source and detector system in the gantry rotate about the patient. As a result, the physician obtains two-dimensional slice images and three-dimensional data volumes with very high spatial resolution in the shortest possible time. Today, the innovative advance to multi-slice technology – where multiple slices of the body are acquired in a single gantry rotation – visualizes moving organs in full detail in a matter of seconds.

Images accompany this press release and are located under <http://www.siemens.com/med-bilder/30JahreCT> and <http://www.siemens.com/med-bilder/Somatom-Definition>.

Siemens Medical Solutions is one of the world's largest suppliers to the healthcare industry. The company is known for bringing together innovative medical technologies, healthcare information systems, management consulting, and support services, to help customers achieve tangible, sustainable, clinical and financial outcomes. From imaging systems for diagnosis, to therapy equipment for treatment, to molecular medicine to hearing instruments and beyond, Siemens innovations contribute to the health and well-being of people across the globe, while improving operational efficiencies and optimizing workflow in hospitals, clinics, home health agencies, and doctors' offices. Recent acquisitions in the area of in-vitro diagnostics – such as Diagnostic Products Corporation – mark a significant milestone for Siemens as it becomes the first full service diagnostics company. Employing approximately 36,000 people worldwide and operating in more than 130 countries, Siemens Medical Solutions reported sales of 8.23 billion EUR, orders of 9.33 billion EUR and group profit of 1,06 billion EUR for fiscal 2006 (preliminary figures). Further information can be found under: <http://www.siemens.com/medical>