Summary

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Press Release:

SNR Research in line with the Nobel Prize in Physics 2007

The Nobel Prize in Physics 2007 has just been awarded to Albert Fert and Peter Grünberg for their discovery of Giant Magnetoresistance (GMR). For few years, SNR ROULEMENTS has been developing a new magnetic sensor technology with Nancy University, in connection with the Thalès / CNRS laboratory where Albert Fert works: the Tunnel Magnetoresistance (TMR), which results directly from his work. It will be used in the 3rd generation of SNR sensor bearings designed for automotive, industrial and aerospace applications.

The Nobel Prize in Physics 2007 crowns what can be considered as one of the first major applications of **nanotechnologies**, especially for today's high capacity hard disks. More generally, this discovery has cleared the way for a new branch of electronics, called **spintronics**, and for new magnetic sensors generations.

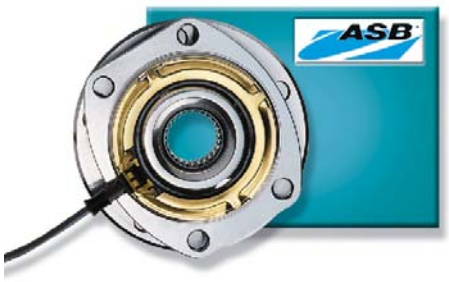
SNR ROULEMENTS has been working for more than 20 years in the field of magnetic sensors, with to its credit the worldwide success of ASB®: a 1st sensor generation that measures the wheel speed without contact. Since 1997, more than 75 million pieces using this SNR technology have been produced for the automotive industry. A second generation is currently coming to the market: it also enables position measurement, like steering wheel angle.

Since 2000, in connection with the Technological Research Team (ERT) « magnetic and acoustic microsystems and microsensors design » of Nancy University (founded with the support of SNR and Thalès / CNRS Laboratory where Albert Fert works), but also with the C4I (« Center of Competence in the Design of Integrated Circuits ») in Archamps (Haute-Savoie / France) and the German company SENSITEC, SNR has been developing its 3rd generation of magnetic sensors.
Through its **CAMEL** (for « **CA**pteur **M**agnétique à **E**ffet tunne**L** » in French) project partly funded by the French National Research Agency (ANR) under the label of the « Arve Industries » Competitiveness Cluster, SNR has been working on Tunnel Magnetoresistance (TMR) based technology. TMR, illustrating perfectly spintronics, gives rise to better performances, has lower energy consumption and paves the way for a lot of brand new applications. Thanks to this research field, the objective of SNR is to prepare the future of its Mechatronics products and to maintain its leadership in this high technology field.

Here is a great example of University - Industry collaboration. Concrete industrial applications will come out of this partnership, particularly in the automotive industry.

SNR ROULEMENTS

A great name in bearings



For nearly a century SNR has concentrated on the design, development and manufacture of bearings, for fiels where these components, usually unseen, play a fundamental and sometimes vital role
Through its sales network, SNR today is present in more than 200 countries spanning 5 continents.

Three main areas of competence

> AUTOMOTIVE : the European reference.

Creator of d'ASB (Active Sensor Bearing), an instrumented bearing that is worldwide standard. SNR supplies, since 2003, 8 of the 10 most sold vehicles in Europe.

> AEROSPACE : partner of the first Airbus A380 flight, the largest aircraft in the world

SNR is serving the major aeronautical and space programs : the cfm56 jet engine, which is the most selectid engine for Airbus and Boeing aircraft, the European launcher Ariane 5and continues to be the Euroean leader for supply of helicopter transmission.

> INDUSTRY : partner of the TGV since its debut.

Both for OEM and aftermarket, SNR is serving major industries such as textile, robotics, steel, food, paper mills, railway

In April 2007, the Japanese company NTN took part of the SNR capital and will progressively acquire the majority of holdings of SNR capital.

The capabilities of SNR combined with the strength of NTN will permit the development of both brands and companies on a global basis:

- Europe, South America and Africa based on the strong SNR position
- in Asia, North America and Australia based on the powerful NTN presence.

SNR : IDENTITY CARD

Production capacity: 10 sites (5 in France, Germany, Italy, USA, Brasil, Romania)
Sales network: SNR present in more than 200 countries
Europe : France, and « Direct Europe », Germany, Italy, Spain, UK
Africa : Morocco, South Africa
América : USA, Argentina
Asia : Japan
2 global logistics centers *:* Annecy, Lyon (France)
More than 14 quality certifications : firt beaing manufacturer certified ISO 9001, QS 9000 since 1997, ISO 14001, ISO TS 16949, "A Class" Automotive since 1994…

2006 KEY FIGURES :

Workforcef : 4000 personnes
Salesr : 578,9 M €
Manufacturing output : 319 000 bearings/day
R&D Investments : 4,3% of sales turnover
Investments : 4,3% of sales turnover

CAMEL Project

« CApteur Magnétique à Effet tunneL »

SNR already provides speed and position measurements
With the “Active Sensor Bearing” (ASB) technology, SNR introduced a standard for **contactless wheel speed measurement**.
This technology consists in measuring the magnetic field generated by a multipolar magnet included in the wheel bearing seal with the help of a Hall effect or magnetoresistive (AMR) sensor.

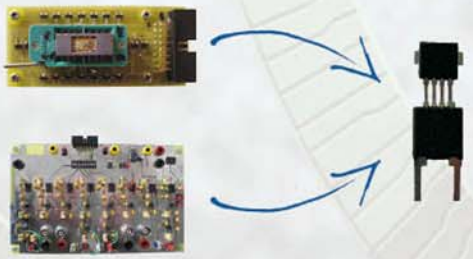
1st generation: more than 75 million pieces of the **ASB speed sensor** have been produced since 1997 for the automotive industry

2nd generation: the steering angle sensor will come on the market in 2008.

SNR has developed since a magnet / sensor pair which enables also the **absolute angular position measurement** with high resolution
The magnet has a 2nd track including magnetic singularities. The sensor, developed by SNR, consists in Hall elements integrated on silicon and arranged in arrays, on the same chip as their conditioning circuit. A new generation of applications (steering angle measurement, brushless motor control) is coming on the market.

TMR : SNR is developing the 3rd generation of magnetic sensors
This is the **CAMEL project** using the **Tunnel Magnetoresistance (TMR) technology**.
A TMR is an electrical resistance which is sensitive to the magnetic field. It is composed of two conductive magnetic layers separated by an insulating barrier (the tunnel barrier) whose thickness is only a few nanometers (thousandth of microns). The fully innovative physical principles used are in the field of **quantum physics and nanotechnologies**.

from prototype to product



Advantages of TMR:
- higher sensitivity,
- lower electrical consumption,
- better signal to noise ratio,
- larger temperature range.

Objective:
Maintain SNR leadership in the high technology magnetic sensor field for the 2010-2012 timeframe.

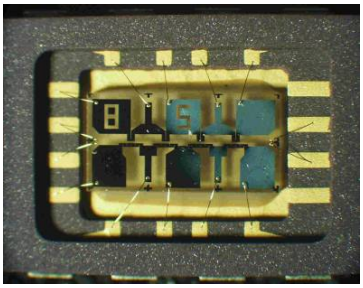
The CAMEL project is developed in collaboration with: Nancy University, C4i and the SENSITEC Company.

3rd generation of magnetic sensor: a successful University – Industry partnership

The 3rd generation of magnetic sensor, arising from the Nobel 2007 discoveries, is the result of the efficient collaboration between fundamental Research et applied Innovation, in other words the result of the successful partnership between Nancy University, CNRS, SNR and THALES.

This story started in 2000. Nancy University then founded a Technological Research Team (ERT) under the responsibility of Patrick Alnot. It was dedicated to the study of metallic nanostructures, connected with the Physics of Materials Laboratory (LPM) of the University, especially Alain Schuhl and Michel Hehn.
It has two objectives: exploring new fields of fundamental study while contributing to the realization of new concrete applications.

From its foundation, the ERT « magnetic and acoustic microsystems and microsensors design » has been supported by the THALES/CNRS Laboratory (managed until March 2007 by Alain Friederich), where Albert Fert (Nobel 2007) works, and SNR ROULEMENTS. SNR had already been a precursor in Mechatronics field, with its work on sensors, signal processing, and their applications in the automotive industry (Active Sensor Bearing: measurement of rotation speed integrated in a bearing). To maintain its technological leadership against its competitors, an active collaboration with Nancy's ERT has been decided to proceed with its innovation efforts.



As a result of a real partnership between these actors, the Research work could be led in an efficient way, particularly in the frame of Grégory Malikowski's « Industrial Convention for Training through Research » (**CIFRE**) PhD.
It gave birth to the discovery of new technology, patented by SNR: a Tunnel effect magnetic sensor, in other words the 3rd generation of magnetic sensors. It is presently being developed in the frame of the CAMEL project (see above information) that will be directly applied in the coming years in the automotive industry.