

Equipment and Products

INDUSTRIAL MAGNETS FOR SUPERCOLLIDER

The first industrially assembled dipole superconducting magnets for the Superconducting Supercollider (SSC), to be built in Ellis County, Texas, have been successfully tested. General Dynamics assembled seven magnets at Fermilab and Westinghouse assembled five magnets at Brookhaven. All magnets tested to date operated at currents of at least 7000 amperes with little or no training, well above the design current of 6500 A.

After prototype tests and evaluation, General Dynamics and Westinghouse will begin magnet fabrication at their Hammond, Louisiana, and Round Rock, Texas, plants. General Dynamics will start by building 15 prototype magnets for test and evaluation in 1993. Each firm will then produce 35 preproduction magnets and then, at an increased rate, 251 magnets for actual installation.

Ultimately, 8600 magnets will be needed to equip the two 87 km SSC rings.

NEW HIGH-TEMPERATURE SUPERCONDUCTOR

A new family of ceramic superconductors based on cadmium–lead cuprates has been developed by researchers at the Hirst Research Centre of GEC–Marconi in London. Although critical properties are likely to be similar to the thallium–based materials, new superconductors are free from the toxicity and volatility problems associated with thallium and its oxides. The resilience of current to a magnetic field is higher than for the bismuth materials currently investigated in Japan and elsewhere. New superconductors have so far shown transition temperatures up to 92 K.

COAL TRANSPORT USING MAGNETIC LEVITATION

The US Bureau of Mines is developing alternative haulage systems that will meet the needs of future high–production longwalls. By using Nd–Fe–B and ferrite

permanent magnets, a system concept has been formulated and designed. Two systems that transport coal in magnetically levitated containers were modelled. One system operates in the attractive mode, the other in the repulsive mode. Both of the proposed systems use a combination of permanent magnet levitation and low-pressure pneumatic propulsion. operation in a totally enclosed pipe also minimises dust and gas problems typical of conveyor haulage of coal. Current efforts are focusing on completion of bench-scale models that will be used to assess systems operating parameters and economics.

DENTURES ATTACHED BY RARE EARTH MAGNETS

Attachments to hold dentures in position using Sm-Co permanent magnets have been developed by Hitachi Metals Ltd. The attachment consists of two types that combine to hold dentures in a firm position by magnetic force. One is an assembly of Sm-Co magnets covered with stainless steel that is laid in the back of the denture. Another is a pivot-like keeper of Au-Ag-Pd alloy covered with stainless steel that is laid in the roots of the teeth.

The two create a magnetic attraction of 350 grams in vertical direction and 90 grams horizontally. This lightens the burden on the gum as well as roots and holds the denture firmly while chewing. Market of US\$8.5 million can be expected in three years.

FOCUS ON MAGNETICALLY LEVITATED TRAINS

The U.S.A. is urged to develop its own magnetically levitated train. It is estimated that the overseas market potential is of the order of US\$12 billion per year in 20 years. Recent studies indicate that the guideway costs of between \$12 million and \$15 million per mile are required if maglev is to be economically viable.

Maglev Transit Inc. is developing a maglev system from Orlando Airport to a tourist complex, 13.3 miles away. Travel time will be 5.5 minutes. Financial problems have sidetracked California's plans to build a line from Anaheim to Las Vegas. Pittsburgh is intending to develop a prototype maglev between the airport and downtown.

NEW ND-Fe-B PERMANENT MAGNET FROM CRUCIBLE

Crucible Magnetics have launched a new grade of Nd-Fe-B permanent magnet suitable for roll magnetic separators. The new grade marketed under the label Crumax 352 has the following magnetic properties: $B_r = 12.1$ kG, $H_c = 11.3$ kOe, $H_{ci} = 17$ kOe, $BH_{max} = 35$ MGOe. An important advantage of this grade is, reportedly, its working temperature of up to 180° C, an essential requirement for many magnetic separation applications where the magnetic rolls are exposed to temperatures exceeding 100° C.

10 TESLA MAGNET AT BERKELEY

A 50 mm bore dipole magnet built at the Lawrence Berkeley Laboratory, USA, has reached a central field of 10.06 T at 1.75 K. The Superconducting Supercollider dipoles, operating at 4 K liquid helium temperature, provide 6.6 T. Last year, a twin-aperture dipole of the type envisaged for CERN's LHC collider reached a field of 10.2 T.

NEW SEPARATOR OF NONFERROUS METALS

A new system for recovering nonferrous metals from shredder fluff has been installed at D.J. Joseph Co., Tampa, Florida, USA. The EddySort non-ferrous metal recovery system, manufactured by Wendt Corp. recovers nonferrous metals from the residue left by shredders when they recover ferrous metals from junked cars. The Eddysort system is designed to break the fluff down into a consistent flow of uniform particle depth which is subsequently exposed to an eddy current magnetic system. Throughput of the separator is in excess of 11 tons per hour.

SUPERCONDUCTING MOTORS, ENERGY STORAGE DEVICES AND CABLES TO BECOME AVAILABLE

American Superconductor Corp. (ASC) announced that prototypes of superconducting motors able to deliver up to 1 Hp will be available as early as

1993. In order to make long lengths of the wire, traditional ceramic powder forming techniques have now been abandoned in favour of metallurgical routes based on wire drawing and forming. Superconducting motors are attractive to both the manufacturer and the end-user as new compact designs, as little as a 1/3 the size of traditional copper-wound motors, become available. It is believed that superconducting motors will be fully commercial before the end of the decade.

In five years time, new magnetic energy storage devices based on superconducting parts should be ready for commercial use. These devices offer an efficient method for coping with the voltage surges and power spikes on utility grids, a common cause of temporary shut-down of manufacturing plants.

Under a contract awarded by the Electric Power Research Institute (EPRI), Pirelli will develop high-temperature ceramic superconductor cables with ASC. To date, multi-strand conductors of 1 m in length have been built. These can carry hundreds of amperes at liquid nitrogen temperature and it is expected that a 300 m long test cable will be up and running in the next 5 years.

NEW LABORATORY SEPARATOR FOR NON-FERROUS METALS

Steinert Elektromagnetbau of Köln, Germany, have developed a new laboratory separator for non-ferrous metals. The unit is designed to treat material in size range from 3 to 50 mm by feeding it on a conveyor belt, the speed of which can be steplessly controlled in the range 0.5 – 2 m/s by adjusting the speed of the rotation of the motor drum. The magnetic system, in the second drum, revolves at a higher rate, so generating high frequencies.