10 апреля 1967 г. ● № 100 (17782) ПРАВДА

НАУКА РАЗДВИГАЕТ ГОРИЗОНТЫ

МГД-генератор: НОВОЕ НАПРАВЛЕНИЕ ЭНЕРГЕТИКИ

В производстве электрической энергии главное место сейчас занимают тепловые электростанции, работающие за счет сжигания топлива, преимущественно угля. Их технико-экономические показатели непрерывно повышаются. Увеличиваются мощности отдельных агрегатов и станций в целом, повышаются температуры и давления водяного пара, улучшается качество оборудования. Эти задачи решают коллективы многих исследовательских институтов, лабораторий и конструкторских бюро.

Коэффициент полезного действия лучших крупных паросиловых установок составляет теперь около 40 процентов. Однако специалисты не проявляют большого оптимизма по поводу реальных возможностей дальнейшего повышения [illegible]

с созданием других важнейших элементов магнитогидродинамической энергетической установки, например, высокотемпературных воздухонагревателей, систем ввода и особенно вывода ионизирующей добавки, больших сверхпроводящих магнитных систем.

Для решения [illegible] здания [illegible]

На втором этапе исследований, намеченных на конец 1967 года, давление в камере сгорания предполагается повысить до трех атмосфер, расход воздуха [illegible] разом конструкции [illegible] ваемого фа[illegible] ционир[illegible]

MHD: a cloudy future

Engineers and budgeteers are lining up on both sides of the controversy over magnetohydrodynamics' fate

If magnetohydrodynamics has a future as a source of electric power, the latest developments in the field offer no clue as to what it will be.

In recent weeks, ambitious British plans to build a prototype MHD generator were abandoned. But at the same time, news was confirmed that Russia has started construction of a semi-commercial plant designed to produce 25,000 kilowatts of power. And Japan is considering construction of a 50,000-kilowatt unit.

In the U.S., while some leaders in the field insist that the technology has reached the point that a prototype should be built, others assert that MHD has already lost the race to nuclear power as an economical source of electricity—the kind of reasoning that led to the British decision.

To add another complication, the U.S. Atomic Energy Commission has spoken of the ideal combination of a nuclear reactor powering an MHD-conversion system, while some MHD enthusiasts suggest that the AEC isn't developing the high-temperature, gas-cooled reactors appropriate for the combination.

What makes the controversy interesting is the prospect of squeezing more electricity out of the same amount of heat. The best turbine generators convert only 40 percent of the heat into electricity; the rest is wasted. MHD could bring that efficiency up to 55 or even 60 percent.

The saving comes from eliminating the losses of driving heavy machinery. Turbine generators work by rotating a conducting wire in a magnetic field; when this happens, a current is generated in the conductor. For large amounts of electricity, many wires have to be driven, meaning a large piece of machinery has to be pushed.

The MHD system substitutes a stream of ionized gas for the wires in a turbine. In one form, the gas can be the burned fuel itself: natural gas or coal char, for instance. The stream is passed through the field of a powerful magnet; an electric current is generated in the gas and is tapped off by electrodes placed in the gas duct. The only mechanical motion is the movement of the gas molecules themselves.

When it comes out of the MHD generator, the gas is still hot enough to drive a conventional turbine generator. That means that MHD can be used as a topping for standard power plants.

The major problem in MHD has been the high temperature needed before the gas will ionize enough to generate a current. In fossil-fuel generators, the temperature has to be on the order of 5,000 degrees F.

But advances in the last year have increased the chances of an economical MHD system. One of these has been a way of preheating the air used to burn the fossil fuel by passing spent generating gas over a heat exchanger. Another has been the development of powerful superconducting magnets that put large magnetic fields in a small space. Both of these techniques have

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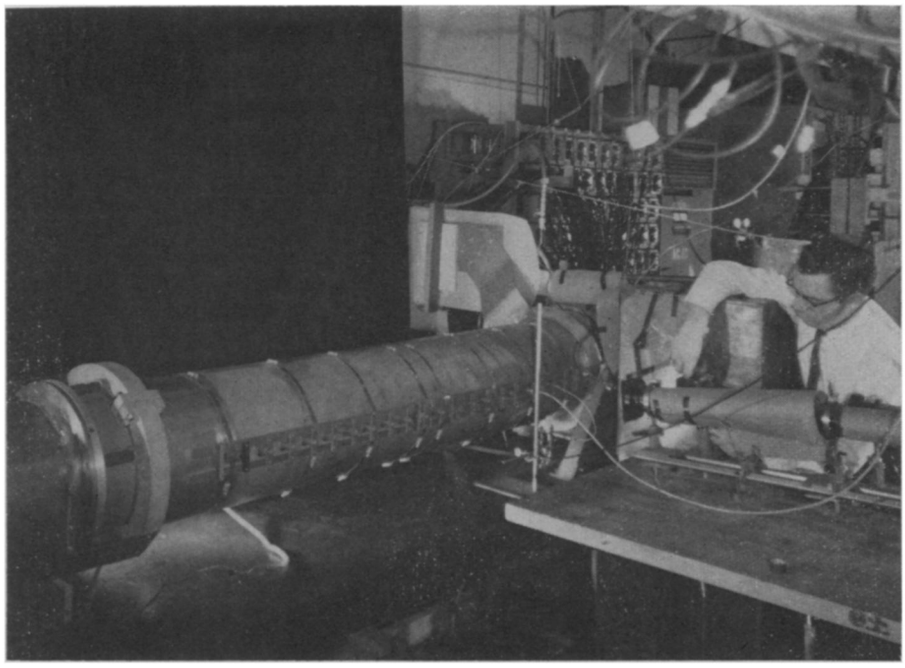
EDITORIAL

A misbegotten project

To all intents and purposes the Central Electricity Generating Board has now abandoned its work on magneto-hydrodynamics (MHD) as a prospective method of improving the efficiency of fossil-fuelled power stations although the work in hand is to be regarded as failed to com that the mo rig will be pu plainly --

From the Soviet Union, PRAVDA *reports the go-ahead on MHD power development; Britain's* NEW SCIENTIST *criticizes the MHD cutback in that country.*



Avco-Everett.

Years of work have still led to no U.S. decision on MHD; a 1961 experiment.

been developed by engineers by Avco Corp., Everett, Mass., a leader in MHD experimentation.

Another technique, developed by scientists at Westinghouse Electric, involes injecting the burning gases at various points along the length of the MHD duct, which prevents them from cooling off as they reach the end. By this means, the input temperature necessary to produce electricity can be some 300 degrees F. lower.

A nuclear-powered MHD system could run at a lower temperature, because the gas, instead of being a burned hydrocarbon, could be helium, which can become a conductor at about 3,100 degrees F. In a nuclear system, the helium would take heat directly from the reactor core, then pass through the MHD generator to produce electricity.

Even that lower temperature is out of the ball park today, however. The maximum temperature produced from Britain's gas-cooled Dragon reactor is about 2,300 degrees F. And the U.S. is pushing liquid sodium cooled—rather than gas cooled—reactors as its next generation of nuclear power generators.

So the immediate future of MHD, if it exists, lies in fossil-fueled generators, in competition with conventional nuclear plants. The Russian project will use natural gas, and is largely aimed at providing feasibility rather than high efficiency. A superior fuel would be char, a by-product of converting coal into gaseous or liquid fuel. Coal conversion is a developing technology in its own right. ◇

AAAS

The Meeting Opens in New York

The American Association for the Advancement of Science has some 110,000 members. Between Christmas and New Year's Day each year some 10 percent of them converge on some American city for an annual meeting. This winter's meeting, the 134th, was held in New York City last week, when for five days more than 10,000 scientists representing more than two dozen disciplines jammed a couple of West Side hotels to hear 85 symposia and 1,200 invited speakers on research in areas ranging from man and transportation to the hazards of fallout in Utah, from exobiology to plasma astrophysics and from the impact of ballistic missile defenses to web-building spiders.

The meeting concluded with what was billed as an informal discussion on the question, "Do life processes transcend physics and chemistry?"

The annual Christmas gathering of the AAAS is probably the largest and most diversified scientific meeting held.

Next week a Science News team will report the most significant aspects of the meeting.

PERSONALITY

The Evolutionary View Emerges

Theories of human personality, long dominated by an almost exclusive emphasis on early childhood, parent care and cultural influences, are now showing the marks of a revived interest in biology.

The new biology is not that of an old style hereditary determinism, but a new willingness to see man as a species —as an animal that evolved over the millenia carrying along many kinds of behaviors and developmental processes from his ancestors.

Though still in infancy, the evolutionary viewpoint is already showing muscle by offering alternatives to such well-rooted theories as the Oedipus complex and the primacy of early childhood.

In an upcoming book, "Perspectives in Human Evolution," edited by S. L. Washburn and scheduled for publication in March (Holt, Rinehart & Winston, N.Y.), Dr. Daniel G. Freedman of the University of Chicago spells out this evolutionary view in his chapter, "Personality Development in Infancy; a Biological Approach."

Until now, says Dr. Freedman, infancy has been a convenient dumping ground for personality theory. Supposedly, early experiences cause the personality to develop in certain ways and all later life is an effect of them.

According to Freud, for example, babies go through three stages—the oral, anal and genital—and depending upon the stage of fixation, human personality is cast into particular character types.

Psychoanalytic theory is the only systematic treatment of how relationships develop between humans, says Dr. Freedman, yet close study of children has revealed that they simply do not learn to relate—as Freud thought they did—via the erotic zones.

"Psychoanalysis is clearly in flux and, as a matter of fact, needs help to direct it into more viable ways,'" Dr. Freedman comments. An evolutionary viewpoint, he believes, can offer that help.

"An evolutionary psychologist or ethologist doesn't think strictly in terms of early life being a cause and later life an effect," explains Dr. Freedman. Early experiences cannot be the sole foundations of personality, since the child is born with personality already in existence, he says.

The child comes with the tendency of the human species to form close personal attachments in certain ways—via crying, cooing, smiling, following and seeking out the human face.

Dr. Freedman, who has spent eight years in close observation of children,