The IEC and its future

Die ersten drei Teilgebiete wurden als die zuerst zu behandelnden bezeichnet. In diesem Zusammenhang wurde die Detailbearbeitung von zwei Dokumentsentwürfen bezüglich Begrenzung der von Haushaltgeräten hervorgerufenen Oberwellenspannungen und Flickererscheinungen begonnen aber aus den oben erwähnten Gründen an Arbeitsgruppen überwiesen. Es wurden in diesem Zusammenhang fünf Arbeitsgruppen gegründet: Terminologie, Netzimpedanzen, Oberwellen, Flicker, Fernsehgeräte. Die Schweiz sollte sich zweckmässigerweise an den Arbeiten einiger dieser Gruppen beteiligen. Sie dürfte auch in einem späteren Stadium, zu den Arbeitsgruppen industrielle Anwendungen und Rundsteuerungen teilnehmen.

G. Goldberg

The IEC and its future [1])

by V. I. Popkov

I highly appreciate the opportunity given to me, as the President of the U.S.S.R. National Committee of the IEC to give a speech on such an excellent occasion as the 70th Anniversary of the International Electrotechnical Commission. I thank the Romanian Organizing Committee for this honour.

On looking at both the past and present activities of the IEC, we must be grateful for the foresight of the founders of the IEC. We know that Sir William Thompson (Lord Kelvin), an outstanding British physicist, was the first President of the Commission. At that time, he obtained world-wide recognition on account of his scientific discoveries and his outstanding work in mathematics, thermodynamics, hydrodynamics, electrostatics and electrodynamics. Even now his name is still well-known in connection with a number of physical laws and equations as well as in connection with the Kelvin unit for absolute temperature, which was suggested by Sir William. I have mentioned all this in order to remind you that in 1974 we do not only celebrate the 70th Anniversary of the Commission but also the 150th Anniversary of the birth of its outstanding first President. Sir William was born in Glasgow on 26th January, 1824. It is significant that, at the cradle of the IEC, its godfather was a physicist, because we are deeply convinced that the future objectives in the fields of electrotechnology and electronics could be defined only by thorough consideration of what is being done in the field of physics. Even if we cannot precisely predict the future developments of our work, we can at least determine its direction.

Although the Commission was established a long time ago, we can surely say that it is now in the prime of life.

Electrotechnology and electronics being in the forefront of the development of industry and being developed more quickly than any of the other branches, it is very important that it should not delay the elaboration of international standards behind requests for them by spending too much time on oral discussion at the expense of the content and speed of more valuable work.

Now I want to speak not only on the current problems of the Commission but more on future tasks. These future tasks are dependent on new tendencies in electrotechnology and electronics and on scientific research which is well in hand in the field of physics, but which could soon be transferred into practice. The International Electrotechnical Commission have to take all this into account in order to keep its good name for being a forward looking organization, aiming at the inclusion of all new technological developments within its programme.

1) Ansprache gehalten am 16. September 1974 anlässlich der Réunion Générale der CEI in Bukarest.

First of all, I wish to say that the border line between electronics and electrotechnology is diminishing and we can expect that, in future, it will almost completely disappear. This is quite natural. It is due to the fact that the products of these two technologies are based on the same physical phenomena. Electrotechnology uses to a greater and greater extent the products of electronics, electronics in its turn produces products with such a capacity which we usually consider typical of the products of the electrotechnical industry. Not long ago, semi-conductors and thyristors, babies of physics of solid state, were only the domain of electronics. Nowadays, the thyristor convertors, rectifiers and invertors with a capacity of hundreds of thousands of kilowatts have become an essential part of the rapidly developing field of DC transmission. Power semiconductor convertors are becoming an inseparable part of electrical rotating machines, switchgear and control-gear and turbo-generators. Lasers of different types and the related equipment, during the last ten years, from the field of physics, have passed into the field of electronics and, in a short time, will have an impulse capacity of up to hundreds of kilowatts, thus becoming a new branch of industrial electrotechnology on one hand and serving a new means of telecommunications on the other.

One can also expect considerable changes in the fields covered by the IEC because of the development in cryogenics, the phenomena of superconductivity discovered by Kammerling Ones in 1911. The problems associated with this phenomenon have been studied extensively during the past ten years in the fields of theoretical and applied physics and opens further new possibilities. Cryogenic elements have already entered electronics in memory and logic units of computers, e.g. in the form of cryotrons and cryosars, commutating electrical circuits during the time measured at nanoseconds. The phenomena of superconductivity might change completely the working principles of well-known electrotechnical equipment. There exist already ideas to create, by using superconductivity, a new direction in the technology of switches with high breaking capacity, in order to obtain the control over the breaking and making time with high precision. This cannot be done with the use of conventional mechanical and pneumatic systems.

Work is going on in the construction of prototype models of cryogenic superconducting cables with a transfer capacity of thousands and more megawatts, a capacity which is not achievable with existing cable techniques. A further increase in the capacity of conventional turbo-generators above 2,000 megawatts is linked with the application of superconducting windings, both of rotors and stators. One may expect the appearance of a completely new type of turbo-generator, without any iron magnetic circuits, but with rotating cryostats.

The phenomena of super-conductivity opens for us the perspective for the creation of magnetic systems with a high density magnetic field, which is equal to tens and even hundreds of kilogauss. At present, these systems have a number of restricted particular applications, but extensive studies are being carried out in order to create quite a new type of electrotechnical equipment from the so-called electromagnetic energy storage devices. The energy condensed in such devices goes now only up to a few megaguyles, however, with the tendency of increasing this energy to the level of Giga/10 g and Tera 10^{12} joules. These storage devices are already applied in laser techniques. There exist projects to create storage devices for energetics to be used in conjunction with the electrical networks to produce so-called 'peak power'. Now these projects are considered unrealistic but nowadays, during the present period of technological revolution, such a dream becomes very quickly a reality.

The impact of superconducting devices on electrotechnology and electronics will become far greater if physics succeeds in resolving the problem of creating so-called 'hot super-conductors'. If it turns out to be possible to find a physical mechanism and appropriate materials which are capable of being in the state of super-conductivity in a high density magnetic field but at a temperature equal not to that of liquid Helium (4 ^{0}K) as now but at least to that of liquid hydrogen (20 ^{0}K) and of liquid Nitrogen (70 ^{0}K), then this will offer a new era of electrotechnology.

Speaking on this subject, we should also mention the new methods of electric energy generation and, first of all, the application of movement of plasma flow in magnetic fields (MGD) generators being developed in many countries in the world. Fifteen years ago, the electric power obtained from such systems could be measured in a few hundred watts and their life was equal to a few seconds. Nowadays there exist already experimental MGD generators, which produce electric power equal to thousands of kilowatts and which are able to function up to tens of hours. No doubt, we shall soon see the application of MGD generators and, perhaps, as the main means for power supply at peak hours in large systems and then perhaps for the generation of basic power. Generally speaking, the plasma devices are rapidly being introduced into practice and so-called plasmatrons are entering into industrial electrotechnology.

Now, if we look into the more distant future of electrotechnology and electronics, we should speak about future electric generating stations using the reaction of controlled thermo-nuclear synthesis. One of the positive consequences of the so-called energy crisis, which is being experienced in a number of countries nowadays, is the increase in the attention which governments show in the problems involved in the supply of energy and the encouragement to research in new energy sources as well as on new types of energy conversion.

Of course, the most important role will be played by conventional nuclear power stations and breeders. A number of the technical committees of the IEC chose the right moment to start the elaboration of international standards on nuclear instrumentation. No doubt, one of the reactions to the energy crisis will be the intensification of the research in the field of MGD convertors and thermo-nuclear synthesis, which may go a long way towards bridging the gap between the present and the future. Controlled thermo-nuclear reaction is still at the stage of research and it is not even clear what direction it will take, either towards so-called tokomaks, with the acceleration and pressure of thritium and deuterium plasma in circular electrical and magnetic fields or the explosion reaction of drops of the same gases in the liquid form, excited by a laser beam of high energy, the topic on which Professor Teller (USA) recently spoke, referring also to the research being done by Soviet scientists. Plasma density and temperature obtained in tokomaks are still one order below the level required to give a noticeable energy output.

In this field, also, there would be a need to have special electrotechnical and electronic equipment. Not only the means of measurement but also accelerators, energy storage devices of all types, including super-conducting ones, pulse equipment for extremely high currents and voltages, commutating devices for such currents and voltage with very short commutating time and others will be rapidly developed and applied.

I think that I have now spoken long enough to make you tired and it is high time to bring this presentation to a close, although I have not, of course, commented on all possible development possibilities in electrotechnology.

I am afraid, that, after you have listened to me, you will consider me a dreamer. I feel, however, that if, 70 years ago, someone who founded the IEC had enumerated the technical problems which have been dealt with by our technical committees now, he would have been regarded as a dreamer as well. Of course, there is some amount of imagination in what I have said above, but I should like to quote the great Albert Einstein who said: 'Imagination stimulates progress and becomes the source of its evolution.' No doubt the IEC has a programme of work which will make it busy for another 70 years, but what is important to my mind is that the Commission, in each particular case, should find the right moment to adapt its activities, following the development of technology. I am sure that the wisdom of collective leadership of the IEC will suceed in resolving the problems which I mentioned above.

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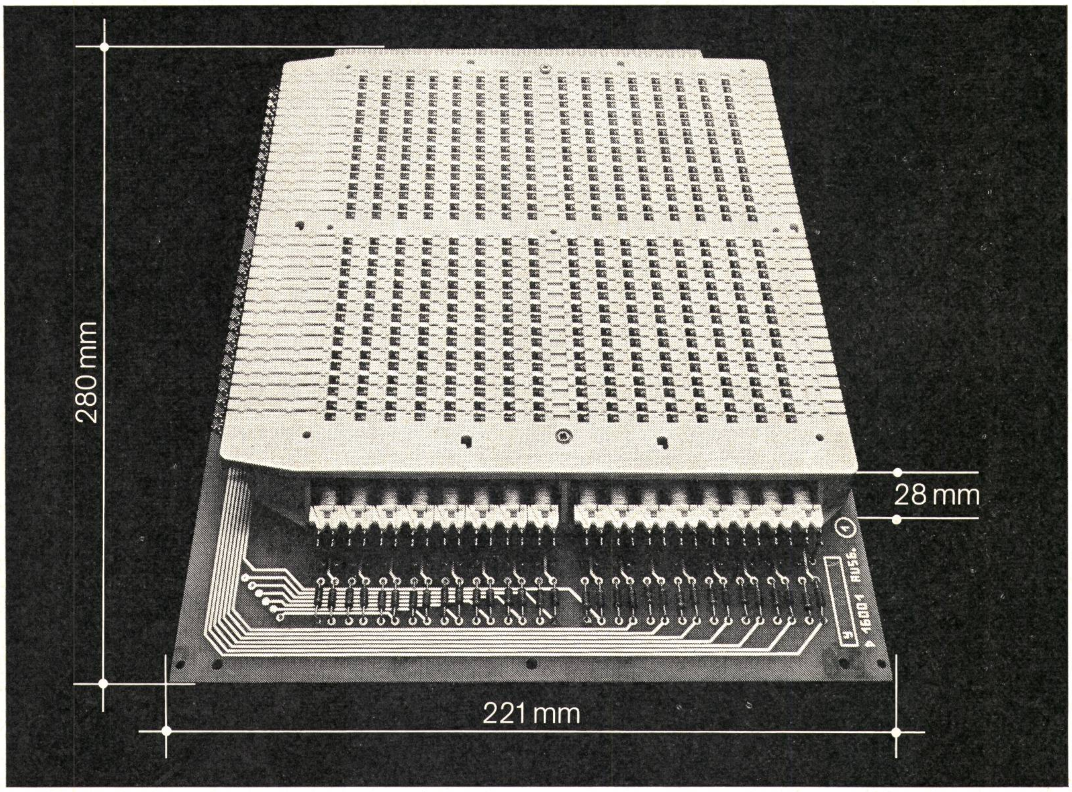

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