

(This lecture was delivered by Dr. Placid Rodriguez, President IIW, during the Inaugural Function of The National Welding Seminar held at Bhilai on December 16 - 18, 1993)

**Dear Members,**

It is my great pleasure and privilege to communicate with you today through this key-note address on the occasion of our most important and prestigious annual event-The National Welding Seminar. The NWS is the single largest gathering of the members of IIW and it is only appropriate that I, as your newly installed President, use this opportunity to share my thoughts and concerns with you about our Institute.

The Institute will very soon be completing three decades of existence. It had a reasonable growth over the last 30 years, successfully overcoming a number of hurdles and impediments, as is quite normal in the life of a growing Institute. Today I will briefly appraise you of the status of the Institute, about exciting new developments taking place in the area of welding science and technology and the role of IIW in the new challenging scenario of globalisation of industry.

#### **FINANCIAL HEALTH OF THE INDIAN INSTITUTE OF WELDING**

Our Institute is passing through a financially difficult period and your Council is planning to pursue a number of different options to improve the situation. The first priority has to go to a set of actions aimed at streamlining the working of different agencies of the Institute such as coordination between HO and Branches, timely publication of the Indian Welding Journal with more features and technical articles reflecting the Indian needs and aspirations and increasing the IIW membership. We

need to enroll more number of Industrial and Corporate Members; timely renewal of membership by individual members is of continuous problem and a cause of concern.

The various Committees and Sub Committees of IIW will be restructured and their duties well defined with an aim to providing better service to the members. It is my firm belief that IIW is capable of playing a more pivotal and productive role in fulfilling the needs of the Indian Welding community and advancing the field of welding science and technology.

#### **RELATIONSHIP WITH THE INTERNATIONAL INSTITUTE OF WELDING**

The members must be aware that our Institute had been defaulting on membership subscription of the International Institute of Welding since 1988 and the arrears have now mounted to more than Rs. 10 lakhs. Moreover, there was a steep hike in the annual subscription mainly because of the rupee devaluation. The annual subscription of the International body - an amount almost equal to the total yearly revenue from membership subscription of our Institute - is linked to the steel consumption of a country whereas I feel a more rational approach would be the per capita consumption of steel. It is well known that steel production and consumption in developed countries is either stagnant or actually declining, whereas in developing countries, of necessity the production and consumption have to rise. Therefore, it is strongly felt that the subscription formula of IIW is biased

towards developed countries. It is interesting to note that India pays higher annual subscription to the International Institute of Welding than countries like UK and Australia. Only six countries, USA, Japan, China, CIS, Germany and Italy have higher subscription rates than India. These points were raised by me in the last Annual Meeting of IIW held at Glasgow. Though our case is wellfounded, there is little possibility of any revision of the subscription calculation formula in the near future.

Since the production of steel is bound to increase appreciably in the coming years, consequently our Institute will have to pay more and more to sustain our membership. The target steel consumption for the year 2000 AD is three times higher than present yearly consumption. By a rough estimate the annual subscription of our Institute in 2000 AD will be approximately Rs. 10 lakhs. It is also recognised that with increase in steel production the welding industry stands to gain, and therefore, both these industries are mutually dependent. It may not be a far-fetched idea to share the subscription burden with the steel industry. Your Council plans to explore such possibilities which may also involve some government agencies such as DST. But for present, our membership of the International body is only up to the end of December 1993. Consequently, the technical documents from IIW are not received anymore. It is regrettable that this situation with respect to our relation to the International Institute of Welding has come at a time when our Technical Committee sent a record number of technical

documents from India (more than 60) for consideration and possible inclusion in the agenda for the Annual Assembly. I am pleased to announce that for the first time three Indian documents belonging to Commission V were presented in the 1993 Annual Assembly and two of these documents have been recommended for publication in the *Welding in the World*, the official journal of the International Institute of welding.

### RECENT ADVANCES IN WELDING SCIENCE AND TECHNOLOGY

Both the science and technology of welding have seen unprecedented developments in the last few years. I will briefly dwell on some of the advances made recently.

The introduction of sleek and lean welding power systems using the inverter technology in the 1980s has been instrumental in decreasing the weight of power sources appreciably over the conventional power sources. The inverter technology has been made more user-friendly by its integration with microprocessors. The future (1990s) is going to see the introduction of new models which will utilise inverter technology along with microprocessor controls to give fast response times and precise control of arc characteristics. Further improvement in inverter technology is on the cards by increasing the operating frequency from the present levels of 20 KHz to 50 KHz thus providing improved control on arc quality and spatter. Probably the day is not far when the welding sources will become truly portable with the availability of superconducting materials.

Automation in welding technology has also come of age though in India we are yet to realise its vast potential which is in part due to

our different socio-economic conditions. But with the change in policy towards more free trade, globalisation of industry and the consequent competition, the Indian industry will be left with no option but to go for the latest in welding technology. Though automation provides unmatched advantage in productivity and quality, its cost-effective applications are limited mainly to mass produced items. In this context I feel that in India the demand for skilled welders will continue to grow in the years to come. The Indian Institute of Welding should take a lead in popularising welding education and training to ensure continuous supply of highly skilled welders to the industry. The application of Expert System Technology in welding is a relatively new development and already a number of first generation expert systems are available in the market. Further advances in this technology depend on developments taking place in the field of artificial intelligence and the possibility of its integration with neural network.

Some of the new materials, which were laboratory curiosities a few years ago, have now been commercialized. A welding engineer has to use newer welding techniques and consumables to weld materials like nitrogen strengthened and duplex stainless steels, modified Cr-Mo steels, new HSLA steels, Ti-alloys, Al-Li and Mg-Li alloys and metal matrix composite materials. In the next couple of years the Indian fabricator will be requiring consumables to weld these materials, therefore, the Indian consumable manufacturer should be ready with the newer welding fillers.

While the developments in welding technology have been remarkable, the progress in welding science has been equally spectacular. Fundamental investigations in the field of arc physics, high tem-

perature electrochemistry and thermodynamics, modelling and physical metallurgy of weldments have provided better understanding of the underlying mechanisms of the highly complex process of welding. The problem of hydrogen assisted cracking still remains an area of concern. The introduction of TMCP high-strength and high-toughness steels has only changed the location of cold cracking from the HAZ to the weld metal. Alternative approaches to matching weld metal strength to that of base metal by additional alloying are being prosued. Some of these are - (1) reducing diffusible hydrogen content by moisture-resistant coatings produced by sol-gel process which in addition are reported to provide more compositionally consistent and homogeneous welding fluxes and (2) increasing weld metal strength and toughness by judicious control on interstitial elements, inclusions and welding thermal cycles.

New techniques to study various material properties by destructive and non-destructive methods have been developed in India and abroad. At IGCAR, Kalpakam, two new toughness parameters have been proposed for estimating the ductile fracture toughness from the tension test of smooth cylindrical specimens. The chief attraction of this method is that for inhomogeneous materials, such as weld joints, the minimum toughness of the weakest section is automatically determined, without 'a priori' knowledge as to its location. The new toughness parameters have been successfully applied for characterising the minimum toughness of the HAZ in a dissimilar metal joint and employed for optimising its PWHT temperature. The application of such ingenious techniques of characterisation would certainly aid in designing better materials in future.

The modelling of any aspect of

welding presents of tough task but many workers have successfully developed models for arc temperature profiles, weld metal and HAZ thermal profiles and stress distribution and phase transformations in the weld metals and HAZs. Though these models are not universally applicable they nevertheless from a beginning and in the years to come we are going to see the metamorphosis of welding from an art from to a highly advanced discipline of science.

#### **INDIAN INSTITUTE OF WELDING - FUTURE PROSPECTS AND STRATEGY**

Besides improving the financial position of the Institute and providing better service to the members, I feel the responsibility and perspective of IIW should extend beyond its conventional boundaries. The change in attitude may become mandatory in the present regime of free trade and globalisation of Industry where the bottomline is survival-of-the-fittest. The survivor is always well equipped with the latest technology and market database. The emphasis of successful companies has already shifted from labour-productivity which is show-

ing signs of saturation of improving technology-productivity. For us in India the latest technology is generally not available, obsolete technologies are provided at an exorbitant cost to the Indian industry. The global competitiveness of the Indian product thus is checkmated. This scenario is the outcome of a number of peculiar circumstances. In the changed regime the industry should invest heavily in technology absorption and technology innovation in order to remain competitive. The synergism between science and technology should be recognised and exploited. After having absorbed a technology its upgradation by R & D should lead to new and appropriate technology which can be further improved by investing more in R & D thus forming a technology-science-technology helix. It is noticed that research and development effort in welding in our country is not to the desired level. We do not have any board based research programmes which address our short-term and long-term needs. The interaction between the government research laboratories and industry is, sadly, at a very low level. The Indian Institute of Welding can play a vital role in bringing together various agencies and catalyze the pro-

cess of interaction which will, I am sure, benefit both the industry and Nation.

IIW can become a source of latest information to the members on various subjects of interest. The Indian Welding Journal can also act as a platform for two-way communication channel between different agencies and members. In view of the possible discontinuation of our membership of the International body, alternative strategies for international cooperation has to be adopted. it could be through conduct of regular International Conferences and Exhibitions and collaboration with the Welding Institutes of other Nations for exchange of information and collaborative research. An Indo-US collaborative research effort in welding science is expected to shortly while attempt to initiate an Indo-Portuga research programme in welding is on the anvil. Needless to say, all this and much more is possible if continuous cooperation of all the IIW members is assured. I am sure your Council will strive its best to come up to the expectations of our esteemed members. To conclude I would like to quote Richard Hooker- "Change is not made without inconvenience, even from worse to better".

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