REPORT ON THE IIW INTERNATIONAL CONFERENCE ON 30th & 31ST AUGUST 1993 AT GLASGOW, U.K., PERTAINING TO COMMISSION V ACTIVITIES

INTRODUCTION

This conference on the occasion of the 46th annual assembly of IIW was held in the prestigious large conference hall of the scottish exhibition and conference centre It was inaugurated with Porterin lecture by Shri Robert Easton on the significance to industry of achieving long life in structures with particular reference to ship building and work on the Clyde at Glasgow. In all, there were six sessions covering the following topics :

Session 1 : Design and choice of materials for long life.

Session 2 : Industrial Examples

Session 3 : Pre-service and In-service Inspection Aspects

Session 4 : Operational Monitoring and Surveillance

Session 5 : The Assessment of any flaws found in service

Session 6 : Repair and Maintenance

Sessions 3,4 and 5 were related to the activities of commission V of IIW and the following are the salient points emphasized in the papers presented

SESSION 3 : Pre-Service and In-Service Aspects

Chairman :
Prof B Koch, Force Inst Denmark.

Prof U Forli, Det Norske Veritas, Norway

There were four papers presented namely "The role of Quality Assurance and Qualit, control in the life extension of structures" by A F Gifford et al. "Examples of recent developments in NDT techniques", by P Kriere et al, "The effectiveness and reliability of In-service Inspection", by S Crutzen et al and "ASME Section XI approach for ferritic steel pressure vessels", by O F Hedden

Mr. A F Gifford stressed the importance of Quality Assurance and quality Control in the life extension of structures

Mr P Kriere's paper covered the recent developments in non-destructive testing techniques used for the periodic inspection of welded structures He has emphasized the importance of signal processing

Mr Crutzen drew attention to the large differences in performance among inspection teams and highlighted the steps necessary in order to improve reliability, based on the results of the PISC research programmes The "Golden rules" given by him to achieve improvement in the effectiveness of NDT are

(i) Ensure correct choice of techniques and sensitivity levels

(ii) Characterise the findings to ensure correct judgement

(iii) Reduce human factors

(iv) Need for proper qualification of NDT operators and equipment

Mr Owen Hedden stressed the evolution of the rules for inservice inspection of nuclear power plants as per Section XI of ASME applicable to pressure vessel The approach to assessment of flaws found in service has changed compared to what it was 20 years before Advances are underway in flaw evaluation methodology Fatigue crack growth rates in the reactor environment are currently getting the most attention One additional new methodology, risk-based inspection, promises to bring some surprises in where it tells us flaws are most dangerous, and where flaws may have negligible effect on safety He concluded by saying that the challenge that remains is to efficiently incorporate these advances into section XI and obtain regularoty endorsement so that they can be adopted by the industry

SESSION 4 : Operational Monitoring and Surveillance

Chairman :
Dr R G Baker, Consultant (U K)

Dr. P Rodriguez, Director, IGCAR, India

There were 3 papers presented namely "Benefits in the life extension by advanced condition monitoring" by K Torrenen" "Leak detection and Acoustic emission" and "Non-destructive methods for surveillance of changes in material properties and material damage", by F A Wedgwood

Dr Nicholos gave a general review of condition monitoring of structures, particularly directed to thick-walled steel reactor pressure circuits of light water cooled nuclear power reactors He referred to the monitoring of operating parameters by local pressure and strain gauging He also stressed the need for measurements

of temperature by thermocouples or by infrared thermoelectric techniques, of chemical conditions and of flow, creep damage can be evaluated by remote replication metallographic techniques.

Mr. P. T. Cole talked about "Leak detection and Acoustic Emission". He gave a range of examples from numerous industries of how AE could be applied to non-metal and metal components including pressure vessels, pipe lines and offshore components. Mr. Cole agreed that the technique had some difficulties if there was only limited crack growth, if the material is ductile or of a type which only produced low emissions. However, he pointed out that in practical weldments, life limiting problems were normally associated with low toughness regions which would give detectable AE signals.

Mr. Wedgwood discussed NDT methods for surveillance of changes in material properties and material damage. He listed various possible NDT measurements but stressed that in most cases these can be affected by several different parameters. Hence more than one type of measurement must be made so that unwanted metallurgical variables can be eliminated, preferably by a model based on good understanding.

SESSION : 5

The Assessment of Any Flaws Found in Service

Chairman :
Prof. T. Konkoly, Budapest Technical University, Hungary

Mr. T. Hamilton, Consultant, CAPSIS, U.K.

There were 3 paprers presented in this session namely "A review of methods for fitness for purpose evaluation of defected parts in the field of extended plasticity" by Prof. D. Francois, "Standard integrity significance of ISI results", by S.Reale and T. Tognavelli and "The philosophy of when to repair", by P. S. Godfrey.

Prof. Franchois reviewed materials for fitness for purpose evaluation of defective parts in the field of extended plasticity. The major problem is that in elasto-plastic fracture mechanics the crack tip stress and strain fields are not characterised by a single parameter. He considered that the "local approach" involving the use of finite element analysis of stress and strain fields at the crack tip would resolve many problems but this would be an extensive operation requiring the intensive use of computers.

While presenting the paper on "Structural Integrity Significance of ISI", Prof. Reale cautioned about the ability of different teams of ultrasonic operators to size defects in welds. By means of sophisticated analysis the authors covered the conditions (a) size differences between actual size and estimated size from ultrasonic examination (b) undetected defects and (c) wrong indications. Using the R6 method (BSI PD 6493 : 1991) for assessing structural integrity, they were able to rate the performance of ultrasonic inspections teams.

While presenting the paper "The philosophy of when to repair", Mr. Godfrey discussed three cases (a) the "do nothing" base case that is how long the structure will fulfill the current functional objectives (b) the "Stich in time" case using a deterioration to illustrate its application (c) the "Urgent repair" case. He stressed the need for quality of in-service performance data and inspection results in making economic decisions on repair issues.

U-SEMINAR ON COMMISSION V

NDT in relation to lifetime extension of welded structures

This seminar was organised by Dr. G. Dobmann of Sub Commission-VE. Dr. P. Rodriguez, Director Indira Gandhi Centre for Atomic Research, Kalpakkam, India presented the following three papers in the seminar.

(1) Residual Stress Analysis in Weldments - Theoritical Approach S. Murugan, P. V. Kumar, Baldev Raj, M. S. C. Bose, IGCAR, Kalpakkam, India.

(2) In-situ Metallographic Examination of High Temperature Welded Pressure Parts, G Venkatraman, T.R.Ramesh, R Veera Ragahvan, BHEL, Trichy, India.

(3) Feedback from Weld Related failures in Austenitic Stainless Steel Bellows towards Indigenous Design and Fabrication, K V Kashiviswanathan and Baldev Raj.

The first two articles were accepted for publication in "Welding in the World" Journal and all the three papers were accepted for publication as documents.

CONCLUSION

The conference had given many examples of significant developments in Fracture mechanics in NDT, in welding and repair techniques in computer analysis and its software that could help to extend service life.

The most important aspect is still engineering judgement. This had to be applied covering design for long life. Design for easy inspection and Design for easy repair or replacement.