IGSCC

Extrabudgetary Programme on Mitigation of Intergranular Stress Corrosion Cracking in RBMK Reactors

Welcome to the IAEA's Extrabudgetary Programme on Mitigation of Intergranular Stress Corrosion Cracking (IGSCC) in RBMK Reactor web pages. IGSCC of chromium nickel stainless steel piping in BWRs has had a major impact on plant availability since the early seventies. Cracks in BWR piping have occurred mainly in the sensitised heat affected zones of welds subject to relatively high residual tensile stress due to welding processes and water chemistry. In 1997, a similar cracking phenomenon has been revealed on a number of RMBK reactor pipings in Lithuania, Russia and Ukraine. Early in 1998, the Agency initiated activities to assist the countries operating RBMK reactors to address the issue. In May 2000, the Agency started an Extrabudgetary Programme to assist countries operating RBMK reactors to mitigate effectively intergranular stress corrosion cracking in austenitic stainless steel piping. This Programme was completed mid-2002.

Programme history

The Agency initiated this Extrabudgetary Programme in May 2000 to assist countries operating RBMK reactors in effectively mitigating IGSCC in austenitic stainless steel 300 mm diameter piping. The Programme is implemented in line with recommendations of a workshop and follow-up expert group meetings, which were convened in 1998 - 1999 within the framework of the Agency's Technical Co-operation Department regional projects in Europe.

The Programme relied on extrabudgetary funding from Japan, Spain, UK and the USA, as well as in-kind contributions from Finland, Germany, Lithuania, Russia, Sweden and the Ukraine. Major input was provided through related national or bi-lateral activities, such as the Swedish International Project Nuclear Safety (SIP) and the US Department of Energy International Nuclear Safety Program (INSP).

The Programme objectives were achieved through technology and information transfer, training, and guidance formulated on managing IGSCC in RBMK reactors.

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Programme implementation

The activities of the Programme were conducted in four Working Groups, which focus on:

- Improvements to in-service inspection performance and qualification;
- Comprehensive assessment techniques;

- Qualification of repair techniques; and
- Water chemistry and decontamination techniques.

The Working Groups met regularly to co-ordinate work in their respective areas. The efforts of the Working Groups were guided, monitored and co-ordinated by the Programme Steering Committee, which was scheduled to meet four times throughout the Programme. The results of the work are summarized in the Minutes of the Steering Committee and Working Group Meetings.

Programme implementation relies on the work of experts from organizations involved, which includes all RBMK power plants, regulatory authorities and technical support organizations of RBMK operating countries as well as various organizations from countries supporting the Programme.

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Training

An important element of the Programme is training. Nine training courses/workshops have taken place to date:

- Risk based inspection;
- Advanced ultrasonic training seminar for detection, characterization and repair of IGSCC, IGSCC flaw sizing and weld overlay examination (including transfer of respective procedures);
- Advanced ultrasonic training course for detection and characterization of IGSCC in stainless steel piping;
- Advanced ultrasonic sizing seminar;
- Automated IGSCC ultrasonic inspection seminar;
- GTAW welding and repair methods;
- Water chemistry monitoring (Gundremmingen and Philippsburg NPPs);
- Weld overlay ultrasonic testing techniques; and
- Seminar on risk based inspection pilot study for Ignalina NPP.

Training course participants were provided with comprehensive training materials; results achieved are summarized in course reports.

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Information transfer

In addition to the information and technology transferred in the course of Working Group activities and training, a comprehensive information package on repair and mitigation techniques developed in the USA was made available by EPRI to each of the RBMK facilities.

The results of the International Piping Integrity Research Programme, "The Pipe Fracture Encyclopaedia", have been provided by the US NRC to the RBMK operating countries.

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Conventions and legal agreements
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IGSCC Programme Background

Workshop and Follow-up Expert Group Meetings:

Report of the Regional Workshop on environmentally assisted cracking of NPP austenitic piping (54mb)

Experts' discussion on follow-up activities on IGSCC of RBMK reactors austenitic stainless steel piping - Working Material (95kb)

Report of the Safety Assessment Group: Mitigation of IGSCC in austenitic stainless steel piping of RBMK reactors - Programme Proposal (23kb)

Programme participants

WG1: Improvements in In-Service Inspection Performance and Qualification

T. Taylor	PNNL, USA (WG leader)
V. Bykov	Leningrad NPP, Russia
B. Dikstra	Mitsui Babcock, UK
I. Kadenko	NDEF, Ukraine
I. Korobskaya	GAN, Russia
S. Kostenko	NRA, Ukraine
A. Miasniankin	Kursk NPP, Russia
J. Sanchez - Nieto	Tecnatom, Spain
P. Nikishov	Smolensk NPP, Russia
J. Saburov	Ignalina NPP, Lithuania
N. Timofeev	NIKIET, Russia
M. Trelinski	Precision Ultrasound, Canada
V. Vanyukov	MINATOM, Russia

Advanced Manual UT Training

T. Taylor	PNNL, USA
J. Mark Davis	Davis NDE, USA
M. Trelinski	Precision Ultrasd. Canada
D. Chnel	Leningrad NPP, Russia
A. Kirov	Ignalina NPP, Lithuania
N. Lobanov	Smolensk NPP, Russia
I. Paderine	Leningrad NPP, Russia
. Razdobarin	Kursk NPP, Russia
V. Skorozvon	Chernobyl NPP, Ukraine
V. Soglaev	Kursk NPP, Russia
S. Vechersky	Smolensk NPP, Russia

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Meeting reports

Steering Committee

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Training Materials and Reports

Z. Viliunas	Ignalina NPP, Lithuania
V. Zaicev	Ignalina NPP, Lithuania
V. Zinchenko	Chernobyl NPP, Ukraine

WG2: Comprehensive Assessment Techniques

B. Brickstad	DNV, Sweden (WG leader)
V. Abramov	NIKIET, Russia
A. Arzhaev	NIKIET, Russia
V. Chugunov	Chernobyl NPP, Ukraine
U. Ehrnsten	VTT, Finland
N. Karpunin	NTC GAN, Russia
R. Keskinen	STUK, Finland
R. Kilian	FRAMATOME, Germany
V. Kiselyov	NIKIET, Russia
A. Klimasauskas	LEI, Lithuania
W. Koo	US NRC, USA
A. Letzter	DNV, Sweden
Y. Morishita	ICTDC / JNC, Japan
A. Parshin	Smolensk NPP, Russia
A. Petrov	Leningrad NPP, Russia
S. Polyanskikh	Kursk NPP, Russia
L. Poulter	Serco Assurance, UK
J. Saburov	Ignalina NPP, Lithuania
H. Schaefer	GRS, Germany
G. Sund	DNV, Sweden
A. Tereshchenko	PROMETEY, Russia
V. Torop	IPP, Ukraine

WG3: Qualification of Repair Techniques

J. Lance	EPRI, USA (WG leader)
V. Apoutin	Smolensk NPP, Russia
N. Ivanov	Ignalina NPP, Lithuania
S. Kharakhnin	Leningrad NPP, Russia
V. Khavanov	NIKIMT, Russia
V. Makhanev	INSC / RINSC, Russia
G. Saprykin	NIKIET, Russia
I. Sivokhin	GAN, Russia
V. Tonkikh	Chernobyl NPP, Ukraine

WG4:Water Chemistry and Decontamination

U. Staudt	VGB PowerTech, Germany (WG leader)
V. Belous	NIKIET, Russia
R. Cowan	USA
L. Denissova	NTC GAN, Russia
A. Kholodov	Kursk NPP, Russia
T. Kitabata	Fugen NPP, Japan
P. Kachan	Smolensk NPP, Russia
A. Molander	Studsvik Nuclear, Sweden
A. Oryshaka	Ignalina NPP, Lithuania
A. Roberts	Battelle, USA
P. Stjazhkin	VNIPIET, Russia
V. Tishkov	Leningrad NPP, Russia

V. Yurmanov	VNIIAES, Russia
V. Zabolotnikh	Chernobyl NPP, Ukraine

Steering Committee

M. Mayfield	NRC, USA (Chairperson)
U. Staudt	VGB, Germany
S. Shibuya	Fugen NPP, Japan
G. Negrivoda	Ignalina NPP, Lithuania
G. Maksimovas	Permanent Mission, Lithuania
E. Brylev	Rosenergoatom, Russia
O. Tchernikov	Leningrad NPP, Russia
I. Kaliberda	GAN, Russia
A. Petrov	NIKIET, Russia
J. Sanchez	Tecnatom, Spain
B. Brickstad	DNV, Sweden
A. Letzter	DNV, Sweden
E. Liszka	SIP, Sweden
V. Gryshchenko	NRA, Ukraine
Y. Neretin	Chernobyl NPP, Ukraine
B. Bryce	Mitsui Babcock, UK
L. Poulter	Serco Assurance, UK
J. Lance	EPRI, USA
A. Roberts	Batelle, USA
T. Taylor	PNNL, USA

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Meeting Minutes

Minutes of the First Meeting of the Programme's Steering Committee, 14 May 2001 (16mb)

Minutes of the First Meeting of the Programme's Working Group 1 on Improvements in In-Service Inspection Performance and Qualification, 20 April 2001 (33kb)

Minutes of the First Meeting of the Programme's Working Group 2 on Comprehensive Integrity Assessment Techniques, 14 Nov 2000 (932kb)

Minutes of the First Meeting of the Programme's Working Group 3 on Qualification of Repair and Mitigation Techniques, 2 May 2001 (43kb)

Minutes of the First Meeting of the Programme's Working Group 4 on Water Chemistry and Decontamination, 23 April 2001 (36kb)

Programme Status update for the Steering Committee-November 2000, 14 May 2001 (21kb)

Minutes of the Second Meeting of the Programme's Steering Committee, 8 May 2001 (18mb)

Minutes of the Second Meeting of the Programme's Working Group 1 on Improvements in In-Service Inspection Performance and Qualification, 22 May 2001 (2.3mb)

Minutes of the Second Meeting of the Programme's Working Group 2 on Comprehensive Assessment Techniques, 7 August 2001 (5mb)

Minutes of the Second Meeting of the Programme's Working Group 3 on Qualification of Repair and Mitigation Techniques, 8 August 2001 (18kb)

Minutes of the Second Meeting of the Programme's Working Group 4 on Water Chemistry and Decontamination, 31 July 2001 (41kb)

Programme Status Update for the Steering Committee - May 2001, 17 May 2001 (53kb)

Minutes of the Third Meeting of the Programme's Working Group 1 on Improvement in In-Service Inspection Performance and Qualification, 20 Sep 2001 (327kb)

Minutes of the Third Meeting of the Programme's Steering Committee, 4 Sep 2001 (1.5mb)

IAEA-EBP-IGSCC-15: Minutes of the Third Meeting of the Programme's Working Group 2 on Comprehensive Assessment Techniques, Draft 10 Dec 2001

Minutes of the Third Meeting of the Programme's Working Group 4 on Water Chemistry and Decontamination - September 2001, 24 Dec 2001 (26kb)

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Training Materials and Reports

IAEA-EBP-IGSCC-31: Risk based inspection (IRBIS) Workshop

IAEA-EBP-IGSCC-32: Advanced ultrasonic training seminar for detection, characterization and repair of IGSCC, IGSCC flaw sizing and weld overlay examination (including transfer of respective procedures) - Training Materials

IAEA-EBP-IGSCC-33: Advanced ultrasonic training seminar for detection, characterization and repair of IGSCC, IGSCC flaw sizing and weld overlay examination (including transfer of respective procedures) - Training Course report

IAEA-EBP-IGSCC-34: Advanced ultrasonic training course for detection and characterization of IGSCC in stainless steel piping - Training materials

IAEA-EBP-IGSCC-35: Advanced ultrasonic training course for detection and characterization of IGSCC in stainless steel piping - Training Course report

IAEA-EBP-IGSCC-36: Automated IGSCC ultrasonic inspection seminar

IAEA-EBP-IGSCC-37: Advanced ultrasonic sizing seminar - Training materials

IAEA-EBP-IGSCC-38: Advanced ultrasonic sizing seminar - Report

IAEA-EBP-IGSCC-39: Workshop on GTAW welding and repair methods

IAEA-EBP-IGSCC-40: Workshop on Water chemistry monitoring (Gundermingen and Philipsburg NPPs)

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