

PROCEEDINGS OF THE 8th ICOLD EUROPEAN CLUB SYMPOSIUM

Dam Safety - Sustainability in a Changing Environment

22nd – 23rd September 2010
Innsbruck, Austria

Edited by

ATCOLD

Austrian National Committee on Large Dams

Stremayrgasse 10/II, A-8010 Graz

Published by

Verlag der Technischen Universität Graz
Graz University of Technology



© 2010
Verlag der Technischen Universität Graz
www.ub.tugraz.at/Verlag
ISBN 978-3-85125-118-0

The authors are responsible for the content of their contributions. The texts of the various papers in this volume were set individually by typists under the supervision of each of the authors concerned.

Cover pictures copyright by
Innsbruck Tourismus, Innsbruck, Austria
TIWAG - Tiroler Wasserkraft AG, Innsbruck, Austria
Verbund AG, Vienna, Austria

Layout, Design and Cover Artwork by Graz University of Technology
Printed by Medienfabrik Graz GmbH, Graz, Austria – www.mfg.at

Forward Contents

The International Commission on Large Dams recently celebrated its 80th anniversary. One of the aims of ICOLD is to gain a common understanding about how “to deal with” dams, the environment and related infrastructure.

Tailored to meet the regional needs the International dam community concentrates its efforts in “Clubs” for a suitable approach. The “ICOLD European Club” already discussed the following European related topics:

- Repair and Upgrading of Dams
- New Trends and Guidelines on Dam Safety
- Dams in a European Context
- Long-term Benefits and Performance of Dams

The 8th ICOLD European Club Symposium is devoted to the topic “Dam Safety under the Sustainability in a Changing Environment”. Several key aspects as e.g. education and knowledge transfer are of high interest.

Education considering the historic development, the social, regional and ethic differences is a future key issue to an open minded society. Due to the “Bologna Process” the educational system in the European member countries is currently being reshaped. The changing abilities of engineers need a modified approach of the knowledge transfer in companies. An individual adaptation to this situation can be assumed but a systematic approach is required.

The way how to provide the safety of dams and to carry out the required measures is widely discussed within the contributions of the proceedings under the topics Sustainability of Know How, Public Awareness of Dams and Dam Safety, Maintenance and Rehabilitation, Regulations and Guidelines, Small Dams and Surveillance Practice.

Additionally, the entire dam safety process needs to be economically optimized. However, economy has to be reshaped in a way to better serve for the development of civilization. On the one hand it is essential to consider good performing economic figures, on the other hand each process has its’ natural optimum – which should widely be discussed during our Symposium and eventually reached. The discussion upon the “dam safety” process for a change to unification or retaining of national divergent approaches in Europe will be of future benefit.

The contributions from the authors to the proceedings herein, the support of the reviewers, the scientific and organizing committee as well as the members of the organizing Institutes are gratefully acknowledged.

Gerald Zenz

President of Austrian National Committee on Large Dams

...the

...the

...

...

... ..

...

... ..

... ..

... ..

... ..

... ..

... ..

... ..

Table of Contents

Conference Organization

Acknowledgements

Overview of Contributions

Topic A

Sustainability of Know How

Topic B

Public Awareness of Dams and Dam Safety

Topic C

Maintenance and Rehabilitation

Topic D

Regulations and Guidelines

Topic E

Small Dams

Topic F

Surveillance Practice

Author Index

Conference Organizations

The conference is jointly organized by

Graz University of Technology, Graz, Austria

University of Innsbruck, Innsbruck, Austria

Federal Ministry of Agriculture, Forestry, Environment and Water Management,
Vienna, Austria

TIWAG - Tiroler Wasserkraft AG, Innsbruck, Austria

Verbund AG, Vienna, Austria

Conference Chairman

Gerald Zenz (ATCOLD, Graz University of Technology, Austria)

Scientific Committee

Markus Aufleger (University of Innsbruck, Austria)

Helmut Czerny (Federal Ministry of Agriculture, Forestry, Environment and Water Management, Austria)

Helmut Knoblauch (ATCOLD, Graz University of Technology, Austria)

Rudolf Melbinger (ATCOLD, Austria)

Pius Oberhuber (Verbund - Austrian Hydro Power AG, Austria)

Ernst Pürer (Vorarlberger Illwerke AG, Austria)

Peter Tschernutter (Vienna University of Technology, Austria)

Auspices and Supporting Organizations

International Commission on Large Dams (ICOLD)

<http://www.icold-cigb.net/>

European Club Member Countries

Austria	Austrian Committee on Large Dams	http://www.atcold.at
Belgium	Comité Belge des Grands Barrage	
Bulgaria	Bulgarian Committee on Large Dams	
Czech Republic	Czech Committee on Large Dams	
Finland	Finnish Committee on Large Dams	http://www.fincold.org
France	Comité Français des Barrages et Réservoirs	http://www.barrages-cfbr.org/index2.html
FYR of Macedonia	MACOLD	
Germany	Deutsches Talsperren Komitee (DTK)	http://www.germannatcom-icold.de
Ireland	Irish Committee on Large Dams	
Italy	Comité Italien des Grands Barrages	http://www.itcold.it
Netherlands	NETHCOLD	http://www.nethcold.org/
Norway	Norwegian Committee on Large Dams	http://www.nve.no/nncold
Portugal	CNPGB	http://cnpgb.inag.pt/
Romania	Comitetul Roman al Marilor Baraje	http://www.rocold.ro
Slovenia	Slovenian Committee on Large Dams	http://www.slocold.si/
Spain	Comité Nacional Español de Grandes Presas	http://www.spancold.es
Sweden	SWEDCOLD	http://www.swedcold.org
Switzerland	COMITÉ SUISSE DES BARRAGES	http://www.swissdams.ch
Turkey	Turkish Committee on Large Dams	http://www.dsi.gov.tr/tricold/
United Kingdom	British Dam Society	http://www.britishdams.org

Members of International Advisory Committee

Maria Bartsch	(Sweden)	Urban Norstedt	(Sweden)
Luis Berga	(Spain)	Brian O'Mahony	(Ireland)
Tuncer Dincergok	(Turkey)	Wolfgang Pircher	(Austria)
Imo Ekpo	(Nigeria)	José Polimón López	(Spain)
Günther Heigerth	(Austria)	Jaromir Riha	(Czech Republic)
Michael Heiland	(Germany)	José Rocha Afonso	(Portugal)
Bjorn Honningsvag	(Norway)	Giovanni Ruggeri	(Italy)
Andy Hughes	(United Kingdom)	Anton Schleiss	(Switzerland)
Anders Isander	(Sweden)	Andrej Sirca	(Slovenia)
Jinsheng Jia	(China)	Antonio Soriano	(Spain)
Juha Laasonen	(Finland)	Dan Stematiu	(Romania)
Peter Mason	(United Kingdom)	Ljubomir Tancev	(FRY Macedonia)
Norihisa Matsumoto	(Japan)	Ergün Üzücek	(Turkey)
Peter Mulvihill	(New Zealand)	Cees - Jan van Westen	(Netherlands)

Acknowledgements

The editors are grateful to the following persons reviewed the manuscripts of the proceedings.

Aufleger Markus	(University of Innsbruck)	Melbinger Rudolf	(ATCOLD)
Czerny Helmut	(BMLFUW)	Oberhuber Pius	(Verbund - Austrian Hydro Power AG)
Dorfmann Clemens	(Graz University of Technology)	Ortner Simone	(Graz University of Technology)
Feldbacher Rupert	(Graz University of Technology)	Schneider Josef	(Graz University of Technology)
Hammer Alfred	(Graz University of Technology)	Semprich Stephan	(Graz University of Technology)
Jöbstl Cornelia	(Graz University of Technology)	Tschernutter Peter	(Vienna University of Technology)
Knoblauch Helmut	(Graz University of Technology)	Zenz Gerald	(Graz University of Technology)
Kohler Roman	(Poyry Energy GmbH.)		

Overview of Contributions

Topic A - Sustainability of Know How

- | | | |
|--------|--|----|
| A - 1 | Sustainability of Know How through Swedish Hydropower Centre (SVC) | 1 |
| | Cristian Andersson | |
| A - 2 | Design, Surveillance and Rehabilitation of Dams as Means of Professional Education | 5 |
| | Bernhard Hofer, Sebastian Perzлмаier | |
| A - 3 | Dams and Dam Safety - Education from a Swedish Perspective | 9 |
| | Sam Johansson, Gunnar Sjödin | |
| A - 4 | The Dam Safety Engineering Course - 17 Years of Experience and Development | 13 |
| | Leif Lia | |
| A - 5 | The Contribution of the ICOLD Committee on Computational Aspects of Dam Analysis and Design to the Diffusion of the Knowledge in the Numerical Modelling Process and to the Transfer of Know-How between Generations | 17 |
| | Guido Mazzà, Alain Carrère, Iñacio Escuder | |
| A - 6 | Lifelong Competence for Long-Living Dams in Austria - Challenges and Answers | 23 |
| | Rudolf Melbinger | |
| A - 7 | Lifelong Learning - How can it be Fostered by Blended Learning Approaches? | 27 |
| | Heribert Nacken | |
| A - 8 | Some Introductory Reflections | 31 |
| | Wolfgang Pircher | |
| A - 9 | The Education of Hydraulic Engineers in the GDR | 35 |
| | Reinhard Pohl | |
| A - 10 | Current Issues in Dam Engineering Education in the Czech Republic, the History of Brno University of Technology and the Present Situation | 41 |
| | Jaromir Říha, Vlastimil Stara | |
| A - 11 | Keeping and Developing the Know-How in Slovenian Dam Engineering | 47 |
| | Andrej Širca, Branko Zadnik | |
| A - 12 | The Norwegian Dam Safety Education System | 53 |
| | Siri Stokseth | |

A - 13	The Dam Engineer's Future – Is Our Profession Losing its Foundation?	57
	Theodor Strobl, Roland Hoepffner, Marco Conrad, Patrick Schäfer	
Topic B - Public Awareness of Dams and Dam Safety		
B - 1	The Effect of Failure Mode and Construction Type of Embankment Dams on The Geometrical Characteristics of the Breach	63
	Thair M. Al-Taiee	
B - 2	Peer Review of High Consequence Dams in Sweden	69
	Maria Bartsch, Lars Hammar	
B - 3	Public Safety around Dams and Waterways - Canadian, French and Swedish Concepts	75
	Tony Bennett, Alain Petitjean, Urban Norstedt	
B - 4	Dams and Floods in Europe. Role of Dams in Flood Mitigation	81
	Luis Berga	
B - 5	Developments in the Use of Event Trees Methods to Estimate the Probability of Failure of Embankment Dams by Internal Erosion and to Evaluate the Effectiveness of Potential Risk Reduction Measures.	87
	Malcolm Eddleston, Richard Margrett, Pamela Rigby, Keith Gardiner, John Cyganiewicz, Peter Mason	
B - 6	The World Water Problem – A Dam Engineer's View	95
	Jonathan Hinks	
B - 7	Possible Consequences of Deterministic Design of Concrete Dams – a Comparison to Probabilistic Design	101
	Fredrik Johansson, Marie Westberg	
B - 8	Case Studies of 6 Different Hydro Power Dams under Construction	105
	Şükrü Kaya, Taylan Evcimen, Mustafa Üçok	
B - 9	Failure Mode Analysis - Part of the Dam Owners Emergency Preparedness Planning	111
	Petra Leijon, Mattias Roslin	
B - 10	Engineering Genius in Designing and Construction of Offshore Gated Intake of Abbasabad Dam in the North of Iran	117
	Mohsen Masoudian, Mohammad Gharegezlou	
B - 11	Assessment of Social and Environmental Impact Management of Large Dams in Italy	121
	Guido Mazzà, Luigi Doria, Luca Fantacci, Antonella Frigerio, Elisabetta Garofalo, Massimo Meghella	
B - 12	A Risk Analysis Framework for the Safety Assessment of Dams in Italy	127
	Massimo Meghella, Giorgia Faggiani, Enrico Spacone, Guido Camata, Giuseppe Brando	

B - 13	Hydraulic Modeling of Future Hydro Power Plants on Lower Sava	133
	Gašper Rak, Sašo Šantl, Matej Müller, Franci Steinman, Gorazd Novak	
B - 14	Improvement of Flood Protection through Reservoirs and Stream Intakes by Example of the Sellrain-Silz Group of Power Stations	139
	Robert Reindl, Helmut Schönlaub	
B - 15	Current Perspectives on Dam Safety in Turkey	147
	Cagdas Simsek, Nuray Denli Tokyay	
B - 16	Aspects of Public Safety in Hydropower Design and Operation at TIWAG-Tiroler Wasserkraft AG	153
	Stefan Thonhauser, Sebastian Perzlmaier	
B - 17	Safety Evaluation of Large Dams in Southeast Turkey	159
	Hasan Tosun	
Topic C - Maintenance and Rehabilitation		
C - 1	Raising of an Earth Dam to Restore the Freeboard Reduced by the Consolidation Settlements of the Foundation	165
	Sergio Adami, Paolo Chemello, Paolo Gigli, Stefano Salvati, Vittorio Vanin	
C - 2	Construction of Nemiscau-1 Dam, the First Asphalt Core Rockfill Dam in North-America, a Key Experience for the Design of Larger Similar Structures in Northern-Quebec	171
	Vlad Alicescu, Jean-Pierre Tournier	
C - 3	Securing Watertightness of Papadia Dam Foundation	177
	Konstantinos Anastasopoulos, Christos Oikonomidis, Zacharoula-Rea Papachatzaki, Sofia Siachou	
C - 4	Role of the Dam Monitoring System within Romanian Water Authority in the Rehabilitation of Some of its Major Dams	183
	Iulian Asman, Petru Dan Diacon, Eva Panduru	
C - 5	Renaissance of the Historical Lentini Lake	189
	Ezio Baldovin, Giuseppe Baldovin, Mario Toti	
C - 6	Gerlos Power Plant, Gmünd Dam, Stabilization of a Reservoir Slope - Grassegger Slope	195
	Andreas Blauhut, Alois Leobacher	
C - 7	Structural Rehabilitation and Raising of Badana Dam	203
	Gianluca Gatto, Giuseppe Sembenelli	
C - 8	Comparative Cavitation Erosion Tests for Tsankov Kamak Concrete Probes	209
	Franz Geiger, Richard Huber, Peter Rutschmann	

C - 9	Retention Basins – Experience of Flood Control in Styria Alfred Hammer, Cornelia Jöbstl, Rudolf Hornich, Gerald Zenz	213
C - 10	Strengthening of the Spullersee Dams – an Uncommon Solution Thomas Höckner	219
C - 11	Analysis, Instrumentation and Upgrading of the Krokströmmen Arch Dam Fredrik Johansson, Anders Gustafsson, Karl-Erik Löwen, Håkan Stille	225
C - 12	Reconstruction of the Bostalsee Reservoir Dam Crest Incorporating a New Staircase Sealing System Karl Kast, Ulrich Saucke, Klaus Bonaventura, Michael Dorscheid	231
C - 13	Reduction of Hoisting Forces on High-Head Roller Gates Volker Kienberger	237
C - 14	Study on Influence of Fly Ash Quality on Inhibiting Effect Against Alkali Reactivity of Sandstone Zhen Li, Liang Xiao, Zaiqin Wang	243
C - 15	Rehabilitation Interventions on Italian Dams Aldo Marcello, Francesco Fornari	249
C - 16	Safety Enhancement and Strengthening of Les Toules Arch Dam Olivier Müller, Alexandre Wohnlich	255
C - 17	Some Aspects on Inspection Galleries for Fill Dams using the Example of the Kühtai Dam Project Sebastian Perzlmaier, Markus Mähr, Bernhard Hofer	261
C - 18	Refurbishment of the Ship Lock Wallsee-Mitterkirchen Romeo Ralón-Rosales	267
C - 19	Stabilisation of River Dykes with Drainage Elements – Results of Model Tests on a Natural Scale Tobias Riegger, Andreas Bieberstein	273
C - 20	The Defects in Waterstops at the Zermanice Concrete Gravity Dam, and the Proposals for their Repair Jaromir Říha, Miroslav Špano, Frantisek Glac	279
C - 21	Spillway Inadequacy Remediation at Badana Dam Marco Scarella, Pietro Groppo Sembenelli	285
C - 22	Risk of Crack Formation in the Periphery of Large RCC-Gravity Dams with Reinforced Conventional Mass Concrete Facing Dirk Schlicke, Viet Nguyen Tue	291

C - 23	Experiences with the Pressure Controlling System of Zillergründl Arch Dam	297
	Peter Schöberl	
C - 24	Influence of Water Losses in Canal of Hydro-Power Plant Zlatoličje on the Embankment Stability	303
	Stanislav Škrabl, Alenka Pernaver	
C - 25	Numerical Simulation of a Model Test of Zillergründl Arch Dam	309
	Bernhard Valentini, Günter Hofstetter, Herrmann Lehar	
C - 26	Special Challenges for Filter Production in Remote Areas	315
	Egil Andreas Vartdal	
C - 27	Use of Fusegates to Upgrade Dams with Inadequate Spillways	321
	Russell Wyckoff, Ugo Spinazzola, Van Kennewell	
Topic D - Regulations and Guidelines		
D - 1	Regulations and Engineering Judgment have to Complement Each Other	327
	Helmut Czerny, Gerald Zenz	
D - 2	ICOLD Bulletin on Dam Safety Management	331
	Des Hartford, David S. Bowles, Francisco Giuliani, Hans Janssen, Raymond Lafitte, Shane McGrath, Michel Poupard, Andy Zielinski	
D - 3	Managing Uncertainties in Dam Design - Abutment Stability Studies of Karun IV Dam in Iran	339
	Ali Reza Manafpour, Mehrdad Zargari, Mohammad Ali Karimi, Amir Faraji Azad	
D - 4	The New Technical Bulletin DWA-M514 "Bauwerksüberwachung an Talsperren" (Surveillance of Dams)	347
	Jochen Mehl, Holger Rosenkranz, Matthias Goltz, Markus Aufleger	
D - 5	New Norwegian Dam Safety Regulations	351
	Grethe H. Midttømme, Egil Hyllestad, Lars Grøttå	
D - 6	Mountain Reservoirs for Snowmaking	357
	Laurent Peyras, P. Mériaux, G. Degoutte, A. Evette, D. Laigle, D. Poulain, L. Deroo, M. Lefranc	
D - 7	New Portuguese Dam Safety Regulation. Present State of the Potential Hazard Classification of the Existing Dams	363
	António Pinheiro, Catarina Campos, Marta Duque, José Avillez	
D - 8	New French Guidelines for Structural Safety of Embankment Dams in a Semi-probabilistic Format	369
	Paul Royet, Laurent Peyras	

D - 9	"Dam Regulations" in the European Countries	375
	Giovanni Ruggeri, Patrick Le Delliou	
D - 10	For Long-Term Survival of Infrastructural Endowments	379
	Jappelli Ruggiero, Francesco Iadevaia, Angelica Catalano	
Topic E - Small Dams		
E - 1	A German Guideline for Small Dams and Small Flood Control Reservoirs	385
	Volker Bettzieche, Reinhard Pohl	
E - 2	Status of Safety of Small Dams in the Canton of Zurich, Switzerland	391
	David Felix, Heinz Hochstrasser	
E - 3	Woody Vegetation on Small Embankment Dams	397
	Ronald Haselsteiner	
E - 4	Hollersbach Dam, Salzburg AG Enhancement of Dam Sealing, Headwater Extraction and Overflow Safety	403
	Jörg Henzinger, Stephan Seiwald, Wilhelm Putz, Oswald Neuner	
E - 5	Internal Erosion and Duration of Grouting Works. Case History of a Small Embankment Dam	409
	Juha Laasonen	
E - 6	Small Dams in Italy	413
	Alberto Masera, Paolo Valgoi, Francesco Sainati, Arturo Magno, Elia Cassese, Nino Frosio, Silvia Castelli, Paolo Ropele	
E - 7	Incidents and Failures Affecting Small Dams in the Czech Republic	419
	Jaromir Říha, Jan Jandora	
E - 8	Romanian Small Dams Safety Law	425
	Dan Stematiu, Altan Abdulamit	
E - 9	Standards for Design and Maintenance of Torrential Barriers	431
	Jürgen Suda, Florian Rudolf-Miklau	
E - 10	Small Dams - Conventional or Easygoing Approach?	437
	Ljubomir Tancev, Ljupcho Petkovski, Stevcho Mitovski	
Topic F - Surveillance Practice		
F - 1	Control of Uplift Pressure and Erosion in Spillway Foundation Comprised Of Silty Soil, A Case Study - Germei Chay Dam in Iran	443
	Hamed Farshbaf Aghajani, Hamid Farshbaf Aghajani	
F - 2	Monitoring of Earthdams Leaks and Stability with Fibre-Optics based Monitoring System	449
	Olivier Artières, Yves-Laurent Beck, Cyril Guidoux, Patrick Pinettes, Jean-Jacques Fry	

F - 3	Sediment Management in the Solis Reservoir Using a Bypass Tunnel Christian Auel, Thomas Berchtold, Robert Boes	455
F - 4	Thermal Monitoring of Embankment Dams by Fiber Optics Yves-Laurent Beck, Amir-Ali Khan, Pierre Cunat, Cyril Guidoux, Olivier Artières, Jérôme Mars, Jean-Jacques Fry	461
F - 5	Piping Flow Erosion in Water Retaining Structures - Inferring Erosion Rates from Hole Erosion Tests and Quantifying the Failure Time Stephane Bonelli, Nadia Benahmed	467
F - 6	Behaviour of the Dams Involved in Seismic Sequence Occurred in April 2009 in Abruzzo (Italy) Rosella Caruana, Angelica Catalano, Giuliano Spogli	473
F - 7	In Situ Detection of Internal Erosion Jürgen Dornstädter, Barbara Heinemann	481
F - 8	Multi-Beam Sonar for Analysing Upstream Dam Slope Movements Per Elvnejd, Peter Viklander, Mikael Östlund	487
F - 9	Contribution to the Study of Piano Key Weir Hydraulics Sebastien Erpicum, Olivier Machiels, Benjamin J. Dewals, Pierre Archambeau, Michel Piroton	491
F - 10	The Monitoring and Remedial Work associated with the Maintenance of Earthen Embankments, Containing the Headrace Canal, Traversing Naturally Occurring Tributary Valleys, on the Shannon Hydroelectric Scheme Caoimhe Fitzpatrick, Thomas A. Hayes, Senan P. McEvoy	497
F - 11	Long time Monitoring of Hydraulic Pore Water Pressure Cells at Gepatsch Rockfill Dam Michael Holzmann, Bernhard Hofer, Sebastian Perzlmaier	503
F - 12	A Simple Experience with a 'new means' of Leakage Detection Andy K. Hughes	509
F - 13	A Simple Labyrinth Weir Installation at a Dam in a National Park in the UK Andy K. Hughes	515
F - 14	Malta Power Plant Upper Stage / Kölnbrein Reservoir Benjamin Kaden	521
F - 15	The Effect of Consolidation and Compaction on Internal Erosion of Earth Dam's Core Mehdi Khoshkhoo, Mohamad Ali Zomorodian, Mehdi Mokhbri	525

F - 16	Automated Monitoring, Strategy and Procedure employed by Verbund-Austrian Hydro Power	531
	Bernhard Kofler	
F - 17	Tsankov Kamak Dam - Design, Construction and Impounding	537
	Roman Kohler, Gerald Zenz, Peter Steyrer	
F - 18	Water Reservoirs for Production of Artificial Snow "Javor" and "Kohútka" - Experience from the Construction of the Reinforced Earth Dams	543
	Frantisek Kresta, Martin Marecek	
F - 19	Ermenek Dam - Monitoring During Impounding	547
	Johannes Linortner, Roman Kohler, Gerald Zenz, Tuncer Dinçergök	
F - 20	Dam Concrete - Fracture Toughness Determination - A Mandatory Requirement ?	553
	Herbert Linsbauer	
F - 21	A State of the Art Review - Design and Surveillance Practice of Water Storage Reservoirs for Snow-Making Systems in the Alps	559
	Thomas Marcher, Hans Georg Wechsler, Alexander Speckle	
F - 22	Quality Control of Dam Monitoring Measurements	565
	Juan Mata, Antonio Tavares de Castro, Jose Sa da Costa	
F - 23	The Recent Earthquakes and Dam Safety in Japan	571
	Norihisa Matsumoto	
F - 24	Seasonal Fluctuations of the Monitoring Data of a Large Powerhouse Founded on Glacial Till	577
	Sophie Messerklinger, R. Peter Brenner, Zoja Zegele	
F - 25	Improving Dam Safety through Re-Operation of Multi-Purpose Reservoir	583
	Amir Mobasher, Manfred Ostrowski	
F - 26	Ambient Vibration Survey Trials of Two Arch Dams in South Africa	589
	Pilate Moyo, Chris Oosthuizen	
F - 27	Dam Break Flood Analysis for Small Dams, Example of Use - Problems and Approaches	595
	Johannes Nemmert, Erich Fritsch, Siegfried Ploner	
F - 28	Birecik Dam Monitoring	599
	Markus Nepraunig	
F - 29	Performance of Birecik Dam	605
	Pius Oberhuber, Jürgen Türk	

F - 30	Structural Monitoring Test of Aged Large Arch Dams in High Seismicity Regions	611
	Nobuyuki Okuma, Taiji Mazda, Kenji Kanazawa	
F - 31	The Use of "Homogeneous Sections" to Support the Surveillance of Long Embankments on the River Shannon Hydro-electric Scheme	617
	Brian O'Mahony	
F - 32	Displacements of Concrete Dams Determined from Recorded Temperatures	623
	Franz Perner, Benedikt Weber, Pius Oberhuber	
F - 33	ORSADEM - An Interactive Tool for Dam Break Studies	629
	Gabriella Petaccia, Luigi Natale	
F - 34	Safety of the San Valentino Earth Dam after 60 Years of Operation	635
	Paolo Pinamonti, Mauro Scienza, Angelica Catalano, Francesco Federico, Andrea Montanaro, F. Del Gizzi, R. Jappelli	
F - 35	Organizational Aspects for Dam Safety for Operating Companies	641
	Ernst Pürer	
F - 36	A Possibility to Identify Piping Erosion in Earth Hydraulic Works Using Thermal Monitoring	643
	Krzysztof Radzicki, Stephane Bonelli	
F - 37	Thermal Seepage Monitoring in the Earth Dams with Impulse Response Function Analysis Model	649
	Krzysztof Radzicki, Stephane Bonelli	
F - 38	Abnormal Behavior of Tarnita Dam Revealed By Monitoring Data	655
	Radu Sarghiuta, Tudor Bugnariu	
F - 39	Automated Dam Monitoring - 25 Years of Experience at EDF	659
	Jerome Sausse	
F - 40	Numerical Simulation of Avalanche Induced Impulse Waves in Storage Lakes	663
	Michael Seitz, Peter Rutschmann	
F - 41	Reinstatement of Vibrating Wire Piezometers in Zoned Earth-Fill Dams	667
	Alexandre Simon, L. Rongieras	
F - 42	Failure Scenarios and Dam Breach Flood Routing Analysis for Dridu Dam	673
	Dan Stematiu, Nicolai Sirbu, Maria Cheveresan	
F - 43	Post Construction Performance of the DrtijišĆica Earth Dam	679
	Mojca Ravnikar Turk, Janko Logar	

F - 44	Exposed Geomembrane System at Messochora Concrete Face Rockfill Dam	685
	Gabriella Vaschetti, Alberto Scuero, Heinz Brunold	
F - 45	Numerical Modeling of Dam Breaching Processes Due to Overtopping Flow	691
	Christian Volz, Patric Rousselot, David Vetsch, Renata Mueller, Roland Faeh, Robert Boes	
F - 46	Automated Geodetic Monitoring of Reservoir Slopes	697
	Harald Wackenreuther	
F - 47	Leakage Scenario for Design of Toe Revetment for Trängslet Embankment Dam	703
	Anders Wörman, Anders Gustafsson, Carl-Anders Andersson, Lars Marklund	
F - 48	Automation of the Technical Monitoring of the Dams of HPP's on the Drava River in Slovenia	709
	Pavel Žvanut, Alenka Prnaver	

Sustainability of know-how through Swedish Hydropower Centre (SVC)

E. Andersson*

Department of Business Administration, Stockholm University, Stockholm, Sweden

andrew@kth.se

1144

Journal of Knowledge Management and Information Technology

Volume 11

Number 1

2009

ISSN 1744-4019

DOI: 10.1108/JKM-01-2009-0004

Copyright © Emerald Group Publishing Limited

0175-1758

EMERALD GROUP PUBLISHING LIMITED

100 Brook Hill Drive, Westborough, MA 01581, USA

100 Brook Hill Drive, Westborough, MA 01581, USA

100 Brook Hill Drive, Westborough, MA 01581, USA

100 Brook Hill Drive, Westborough, MA 01581, USA

The purpose of this paper is to describe the development of the Swedish Hydropower Centre (SVC) and to discuss the sustainability of know-how through SVC.

The paper is structured as follows. First, the development of SVC is described. Then, the sustainability of know-how through SVC is discussed. Finally, conclusions are drawn.

Keywords: Hydropower; Knowledge management; Sustainability; Sweden

Journal: Journal of Knowledge Management and Information Technology

Background

Hydropower is a renewable energy source. In Sweden, hydropower is a major energy source. The Swedish Hydropower Centre (SVC) is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987.

SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987.

SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987.

This paper is structured as follows. First, the development of SVC is described. Then, the sustainability of know-how through SVC is discussed. Finally, conclusions are drawn.

Keywords: Hydropower; Knowledge management; Sustainability; Sweden

Journal: Journal of Knowledge Management and Information Technology

Volume: 11

The purpose of this paper is to describe the development of the Swedish Hydropower Centre (SVC) and to discuss the sustainability of know-how through SVC.



Figure 1. Technical development of hydropower in Sweden. Source: Swedish Hydropower Centre (SVC) (2008), p. 10. Reproduced with permission from the Swedish Hydropower Centre (SVC).

The Swedish Hydropower Centre (SVC) is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987.

SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987. SVC is a national organization for hydropower. SVC is a non-profit organization, established in 1987.

Conclusions

Thanks to the automatic measurement of various important parameters within the scope of dam monitoring, continuous monitoring of these parameters can be performed, which means that rapid decisions can be made in the case when something begins to go wrong, i.e. when measured values exceed the limit values.

Technical monitoring of the dams on the Drava River in Slovenia is now performed to an extent which is comparable, with regard to quality and quantity, with systems used on similar dams across Europe. The aim of future technical monitoring of dams in Slovenia is to obtain as large as possible a data-base about the results of the measurements, which could be useful for diagnosis of the condition of the dams and their surroundings.

References

- [1] DEM (2010). *Hydro-power plants and generation – Vuhred power plant: the result of domestic knowledge*. Dravske Elektrotrane Maribor - Hydroelectric power generation company website. <http://www.dem.si>, Slovenia.
- [2] Prmaver A. (2010). *Technical monitoring of civil engineering structures – Monitoring of the Drava River HPP's*. In: Sedej, A., Sirca, A. and Ravnikar Turk, M. (eds), Proc. of the 12th SLOCOLD Symposium, Krško, Slovenia, pp. 45-52 (in Slovenian).
- [3] SLOCOLD (2010). Slovenian National Committee on Large Dams website. <http://www.slocold.si>, Slovenia (in Slovenian).
- [4] Slovenian Codes (1966). *National regulations about the technical monitoring of large dams*. (in Slovenian). 2 pages.
- [5] Zadnik B. (2000). *Renovation project of the HPP's on the Drava River - second phase, revitalization and upgrading of the Vuhred HPP. Safety assessment of the Vuhred Dam*. Project No. H1VH-A301/53, H1VH-MG05. IBE, Ljubljana, Slovenia (in Slovenian) – unpublished.
- [6] Zenz G. (2008). *Design, construction and maintenance of large dams*. Invited lecture at the Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia – unpublished lecture, 47 pages.
- [7] Zvanut P. (2006). *Updating of the project of technical monitoring of the Vuhred dam*. Report No. P 1054/05-710-20. ZAG, Ljubljana, Slovenia (in Slovenian) – unpublished report, 35 pages.
- [8] Zvanut P. (2006). *Updating of the report on the establishing of monitoring system of the Vuhred dam*. Report No. P 1054/05-710-21. ZAG, Ljubljana, Slovenia (in Slovenian) – unpublished report, 37 pages.
- [9] Zvanut P. et al (1999-2009). *Annual reports about the technical monitoring of the Vuhred Dam*, ZAG, Ljubljana, Slovenia (in Slovenian) – unpublished reports.
- [10] Zvanut P. (2010). *Long-term monitoring of the Vuhred concrete dam*. Proc. of the 30th Annual USSD Conference, Sacramento, California, USA, pp. 415-428.

Author Index

A

Abdulamit, Altan, 425
 Adami, Sergio, 165
 Al-Taiee, Thair M., 63
 Alicescu, Vlad, 171
 Anastasopoulos, Konstantinos, 177
 Andersson, Carl-Anders, 703
 Andersson, Cristian, 1
 Archambeau, Pierre, 491
 Artières, Olivier, 449, 461
 Asman, Iulian, 183
 Auel, Christian, 455
 Aufleger, Markus, 347
 Avillez, José, 363

B

Baldovin, Ezio, 189
 Baldovin, Giuseppe, 189
 Bartsch, Maria, 69
 Beck, Yves-Laurent, 449, 461
 Benahmed, Nadia, 467
 Bennett, Tony, 75
 Berchtold, Thomas, 455
 Berga, Luis, 81
 Bettzieche, Volker, 385
 Bieberstein, Andreas, 273
 Blauhut, Andreas, 195
 Boes, Robert, 455, 691
 Bonaventura, Klaus, 231
 Bonelli, Stephane, 467, 643, 649
 Bowles, David S., 331
 Brando, Giuseppe, 127
 Brenner, R. Peter, 577
 Brunold, Heinz, 685
 Bugnariu, Tudor, 655

C

Camata, Guido, 127
 Campos, Catarina, 363
 Carrère, Alain, 17
 Caruana, Rosella, 473
 Cassese, Elia, 413
 Castelli, Silvia, 413
 Catalano, Angelica, 379, 473, 635
 Chemello, Paolo, 165
 Cheveresan, Maria, 673
 Conrad, Marco, 57
 Cunat, Pierre, 461
 Cyganiewicz, John, 87
 Czerny, Helmut, 327

D

Degoutte, G., 357
 Del Gizzi, F., 635
 Denli Tokyay, Nuray, 147
 Deroo, L., 357
 Dewals, Benjamin J., 491
 Diacon, Petru Dan, 183
 Dinçergök, Tuncer, 547
 Doria, Luigi, 121
 Dornstädter, Jürgen, 481
 Dorscheid, Michael, 231
 Duque, Marta, 363

E

Eddleston, Malcolm, 87
 Elvnejd, Per, 487
 Erpicum, Sebastien, 491
 Escuder, Iñacio, 17
 Evcimen, Taylan, 105
 Evette, A., 357

F

Faeh, Roland, 691
 Faggiani, Giorgia, 127
 Fantacci, Luca, 121
 Faraji Azad, Amir, 339
 Farshbaf Aghajani, Hamed, 443
 Farshbaf Aghajani, Hamid, 443
 Federico, Francesco, 635
 Felix, David, 391
 Fitzpatrick, Caoimhe, 497
 Fornari, Francesco, 249
 Frigerio, Antonella, 121
 Fritsch, Erich, 595
 Frosio, Nino, 413
 Fry, Jean-Jacques, 449, 461

G

Gardiner, Keith, 87
 Garofalo, Elisabetta, 121
 Gatto, Gianluca, 203
 Geiger, Franz, 209
 Ghareglou, Mohammad, 117
 Gigli, Paolo, 165
 Giuliani, Francisco, 331
 Glac, Frantisek, 279
 Goltz, Matthias, 347
 Groppo Sembenelli, Pietro, 285
 Grøttå, Lars, 351
 Guidoux, Cyril, 449, 461
 Gustafsson, Anders, 225, 703

H

Hammar, Lars, 69
 Hammer, Alfred, 213
 Hartford, Des, 331
 Haselsteiner, Ronald, 397
 Hayes, Thomas A., 497
 Heinemann, Barbara, 481
 Henzinger, Jörg, 403
 Hinks, Jonathan, 95
 Hochstrasser, Heinz, 391
 Höckner, Thomas, 219
 Hoepffner, Roland, 57
 Hofer, Bernhard, 5, 261, 503
 Hofstetter, Günter, 309
 Holzmann, Michael, 503
 Hornich, Rudolf, 213
 Huber, Richard, 209
 Hughes, Andy K., 509, 515
 Hyllestad, Egil, 351

I

Iadevaia, Francesco, 379

J

Jandora, Jan, 419
 Janssen, Hans, 331
 Jappelli, R., 635
 Jöbstl, Cornelia, 213
 Johansson, Fredrik, 101, 225
 Johansson, Sam, 9

K

Kaden, Benjamin, 521
 Kanazawa, Kenji, 611
 Karimi, Mohammad Ali, 339
 Kast, Karl, 231
 Kaya, Şükrü, 105
 Kennewell, Van, 321
 Khan, Amir-Ali, 461
 Khoshkhoo, Mehdi, 525
 Kienberger, Volker, 237
 Kofler, Bernhard, 531
 Kohler, Roman, 537, 547
 Kresta, Frantisek, 543

L

Laasonen, Juha, 409
 Lafitte, Raymond, 331
 Laigle, D., 357
 Le Delliou, Patrick, 375
 Lefranc, M., 357
 Lehar, Herrmann, 309
 Leijon, Petra, 111
 Leobacher, Alois, 195
 Li, Zhen, 243

Lia, Leif, 13
 Linortner, Johannes, 547
 Linsbauer, Herbert, 553
 Löwen, Karl-Erik, 225
 Logar, Janko, 679

M

Machiels, Olivier, 491
 Mähr, Markus, 261
 Magno, Arturo, 413
 Manafpour, Ali Reza, 339
 Marcello, Aldo, 249
 Marcher, Thomas, 559
 Marecek, Martin, 543
 Margrett, Richard, 87
 Marklund, Lars, 703
 Mars, Jérôme, 461
 Masera, Alberto, 413
 Mason, Peter, 87
 Masoudian, Mohsen, 117
 Mata, Juan, 565
 Matsumoto, Norihisa, 571
 Mazda, Taiji, 611
 Mazzà, Guido, 17, 121
 McEvoy, Senan P., 497
 McGrath, Shane, 331
 Meghella, Massimo, 121, 127
 Mehl, Jochen, 347
 Melbinger, Rudolf, 23
 Mériaux, P., 357
 Messerklinger, Sophie, 577
 Midttømme, Grethe H., 351
 Mitovski, Stevcho, 437
 Mobasher, Amir, 583
 Mokhbri, Mehdi, 525
 Montanaro, Andrea, 635
 Moyo, Pilate, 589
 Müller, Matej, 133
 Müller, Olivier, 255
 Mueller, Renata, 691

N

Nacken, Heribert, 27
 Natale, Luigi, 629
 Nemert, Johannes, 595
 Nepraunig, Markus, 599
 Neuner, Oswald, 403
 Norstedt, Urban, 75
 Novak, Gorazd, 133

O

O'Mahony, Brian, 617
 Oberhuber, Pius, 605, 623
 Östlund, Mikael, 487
 Oikonomidis, Christos, 177
 Okuma, Nobuyuki, 611

Oosthuizen, Chris , 589
Ostrowski, Manfred, 583

P

Panduru, Eva, 183
Papachatzaki, Zacharoula-Rea , 177
Pernaver, Alenka, 303
Perner, Franz, 623
Perzmaier, Sebastian, 5, 153, 261, 503
Petaccia, Gabriella, 629
Petitjean, Alain, 75
Petkovski, Ljupcho, 437
Peyras, Laurent, 357, 369
Pinamonti, Paolo, 635
Pinettes, Patrick, 449
Pinheiro, António, 363
Pircher, Wolfgang, 31
Piroton, Michel, 491
Ploner, Siegfried, 595
Pohl, Reinhard, 35, 385
Poulain, D., 357
Poupart, Michel, 331
Prnaver, Alenka, 709
Pürer, Ernst, 641
Putz, Wilhelm, 403

R

Radzicki, Krzysztof, 643, 649
Rak, Gašper, 133
Ralón-Rosales, Romeo, 267
Ravnikar Turk, Mojca, 679
Reindl, Robert , 139
Riegger, Tobias, 273
Rigby, Pamela, 87
Říha, Jaromir, 41, 279, 419
Rongieras, L., 667
Ropele, Paolo, 413
Rosenkranz, Holger, 347
Roslin, Mattias, 111
Rousselot, Patric, 691
Royet, Paul, 369
Rudolf-Miklau, Florian, 431
Ruggeri, Giovanni, 375
Ruggiero, Jappelli, 379
Rutschmann, Peter, 209, 663

S

Sa da Costa, Jose, 565
Sainati, Francesco, 413
Salvati, Stefano, 165
Šantl, Sašo, 133
Sarghiuta, Radu, 655
Saucke, Ulrich, 231
Sausse, Jerome, 659
Scarella, Marco, 285
Schäfer, Patrick, 57

Schlicke, Dirk, 291
Schöberl, Peter, 297
Schönlaub, Helmut, 139
Scienza, Mauro, 635
Scuero, Alberto, 685
Seitz, Michael, 663
Seiwald, Stephan, 403
Sembenelli, Giuseppe, 203
Siachou, Sofia, 177
Simon, Alexandre, 667
Simsek, Cagdas, 147
Sirbu, Nicolai, 673
Širca, Andrej, 47
Sjödin, Gunnar, 9
Škrabl, Stanislav, 303
Spacone, Enrico, 127
Špano, Miroslav, 279
Speckle, Alexander, 559
Spinazzola, Ugo, 321
Spogli, Giuliano, 473
Stara, Vlastimil, 41
Steinman, Franci, 133
Stematiu, Dan , 425, 673
Steyrer, Peter, 537
Stille, Håkan, 225
Stokseth, Siri, 53
Strobl, Theodor, 57
Suda, Jürgen, 431

T

Tancev, Ljubomir, 437
Tavares de Castro, Antonio, 565
Thonhauser, Stefan, 153
Tosun, Hasan, 159
Toti, Mario, 189
Tournier, Jean-Pierre, 171
Tue, Viet Nguyen, 291
Türk, Jürgen, 605

U

Üçok, Mustafa, 105

V

Valentini, Bernhard, 309
Valgoi, Paolo , 413
Vanin, Vittorio, 165
Vartdal, Egil Andreas, 315
Vaschetti, Gabriella, 685
Vetsch, David, 691
Viklander, Peter, 487
Volz, Christian, 691

W

Wackenreuther, Harald, 697
Wang, Zaiqin, 243
Weber, Benedikt, 623

Wechsler, Hans Georg, 559
Westberg, Marie, 101
Wörman, Anders , 703
Wohnlich, Alexandre, 255
Wyckoff, Russell, 321

X

Xiao, Liang, 243

Z

Zadnik, Branko, 47
Zargari, Mehrdad, 339
Zegele, Zoja, 577
Zenz, Gerald, 213, 327, 537, 547
Zielinski, Andy, 331
Zomorodian, Mohamad Ali , 525
Zvanut, Pavel, 709

