The RETRAN Newsletter

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International RETRAN Meeting

Garry C. Gose, CSA

The Tenth International RETRAN Meeting was held in Jackson Hole, Wyoming, during October 14-17, 2001. Fifty individuals representing 31 organizations from Canada, Japan, Korea, Switzerland, Spain, Taiwan and the United States participated in the meeting. The participants included members of electrical utilities, government research agencies, research laboratories, and independent consultants.

One objective of these international meetings is to provide a forum for the exchange of information concerning the EPRI sponsored computer programs, RETRAN, CORETRAN and GOTHIC. Discussions of analysis results, the use of the programs for new applications, and transient analysis modeling techniques were elements of many of the presentations. This meeting included a panel discussion on the recent NRC review of RETRAN-3D and the interpretation of the Safety Evaluation Report (SER). Following the opening remarks from Mr. Jack Haugh of EPRI, Mr. Lance Agee, the RETRAN Project Manager at EPRI, delivered the key address of the plenary session. His presentation summarized some of the significant EPRI activities in the nuclear safety analysis area. This presentation included information of the EPRI Strategic Bridge Plan to support the industry's vision of nuclear power expansion for 2002. A specific item to support this plan is the role of RETRAN-3D in the area of Risk Informed Regulation. He presented his vision of the future for applications, and identified important new application areas.

The plenary session continued with an invited panel discussion, "RETRAN-3D SER Review Process". The panel was comprised of EPRI, Electric Utility, and code development individuals. The session involved participation by all

the attendees in the question and answer session that followed the panel discussion.

The technical sessions for RETRAN included presentations of RETRAN-3D analysis results as well as some of the current development activities. Technical papers included descriptions of analyses performed in support of plant operations as well as for licensing, topical reports, and plant support activities. Papers were presented on the use of RETRAN-3D as an analytical engine for real time simulators, an exciting and significant new application area for the code.

International RETRAN Meeting (Cont'd)

The third day focused mainly on the CORETRAN and GOTHIC programs. One new application area for CORETRAN is to support the operational problem of Axial Offset Anomaly (AOA).

Presentations by APS and CSA reported on the progress made in this effort in both the analysis and model development areas.

The final session was devoted to the GOTHIC code and many presentations were made on the modeling capabilities and applications of this multi-dimensional flow analysis tool.

The continuing interest in RETRAN, CORETRAN and GOTHIC, as demonstrated by the participation in the meeting and the variety of presentations, is encouraging to EPRI and CSA, the co-sponsors of the meeting. The Proceedings of this meeting, including complete papers of the presentations and a list of participants, will be distributed to those individuals who attended the meeting. Others may obtain a copy of the Proceedings from the Research Reports Center.

Ken Moore Honored at the Tenth International RETRAN Meeting

Garry C. Gose, CSA

A Pioneer in the development of Thermal-Hydraulics Analysis codes was recognized for his achievements during a special award ceremony at the Tenth International RETRAN Meeting. Ken Moore, who was a principal developer of the RELAP code and who later went on to the same role in the RETRAN code was honored for his pioneering work.

A Certificate of Appreciation for his lifetime of dedication to nuclear safety analysis was presented to Ken by Jack Haugh and Lance Agee of EPRI.

Following the award presentation, Ken gave a talk about the early days of code development.

Summary of RETRAN-02 Trouble Reports

The following is a summary of RETRAN-02 Trouble Report/Code Maintenance Activity as of December 31, 2001. There are five outstanding trouble reports. A list of trouble reports and the status can be obtained directly from the EPSC (1-800-763-3772). Additional information is available from the RETRAN-02 Trouble Report Page at http://www.csai.com/retran/r02trpt/index.html.

NO.	TROUBLE REPORT TYPE OF PROBLEM COMMENTS	CORRECTION NO.	IDENT
354	Large Step Change in PHIR	***	*******
376	Control Reactivity, No Motion	***	*******
394	Anomalous Heat Trans. Behavior	***	*******
408	OTSG Heat Transfer Problems	***	*******
442	Poor Diagnostics	***	*******

From the Editor

This has been a significant year for the RETRAN project. With the issue of the RETRAN-3D SER, many groups can now go forward with plans to migrate to the newer code from the earlier RETRAN-02 versions. This is a goal that we all have been working towards for some time.

This issue of the newsletter contains a summery of the 10th international meeting which was another very successful gathering of the RETRAN community. It is always good to see colleagues and friends from all parts of the globe exchanging information and renewing relationships.

Two items from the meeting particularly struck me. First was an inspiring after dinner presentation given by EPRI's Jack Haugh on the significance and impact of what we nuclear safety analysts do. The idea that we are doing something important in the world is sometimes lost in the daily grind. His thoughts and ideas brought a big picture focus to what we are really accomplishing in this industry.

The second item was a post presentation talk given by Ken Moore (see the related article in this issue) on the early days of code development. Ken was one of my mentors in my early days as a code jock and even then he had a worldwide reputation as one of the best. Listening to his recollection of how things were and remembering what it was like in the "good old days" was pretty emotional. Part of this was because I realized that I was involved in part of this ancient technology, a little unnerving I must admit. But on the heels of Jack Haugh's remarks, I felt myself wondering where we would all be and what we would be doing 10 to 15 years from now.

Storing A Value With A RETRAN Control System

J. G. Shatford, CSA

One of the most powerful features of the RETRAN code is the control system. We use control systems for many purposes, from simple things like converting a flow to gallons per minute to sophisticated control systems such as complex feedwater controllers. Control systems are highly versatile, but occasionally there are limitations which seem to prevent us from performing the most basic of tasks. One such task is saving a value for later use.

A recent project involved a control system model that was dependent upon the normalized prompt power. The control system was designed such that the initial value of prompt power needed to be saved for later use.

Saving an initial value seems like a common item; many RETRAN models contain control systems that use initial values. But most involve user interaction by assuming initial value is already known which is 'manually' put in the input file. For these control systems, even small changes in the input model require the user to go back and reevaluate all of the initial conditions.

There is an easier way to solve this problem in many cases, based on the trick we describe below.

The description of a delay block (DLY) states that the output of the block is:

$y(t) = y0$ for $0 < t < \tau$.

If a time constant, τ, is larger than the transient time is used, the output of the DLY is always the initial value. The initial value is saved and can be obtained as the output from the DLY block. But why stop there? This idea can be extended to save a value at any point in the transient.

The time constant for a DLY block can be variable, defined by the output of another control block If the time constant is zero then there is no delay and the input is just passed through. On the other hand, if the time constant is suddenly increased to a very large value, the output of the block is frozen and the value at that point is saved.

As an example, let us define Control Block -9 as a delay on the normalized power (Control Input 8) where the time constant, τ, is defined by Control Input 9 as shown in Figure 1. The number of samples for Control Block –9 is set to 1. Control Input 9 samples Trip ID 4, which is the reactor trip. Since the value of the time constant is zero until the reactor trip, initially the delay block is transparent and the output of Control Block -9 tracks Control Input 8. When the reactor trips, the large gain on Control Input 9 makes the time constant big and the output of Control Block -9 is frozen. Figure 2 demonstrates that this simple trick has saved the value of normalized power at the time of the reactor trip.

So, with the simple addition of a DLY block we can use the output as a storing device for any control system variable.

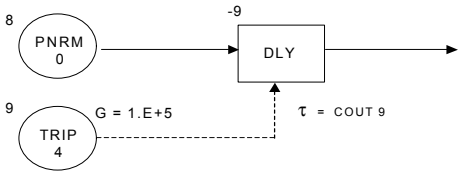

Figure 1. Flow Logic for Variable Time Constant Delay Block

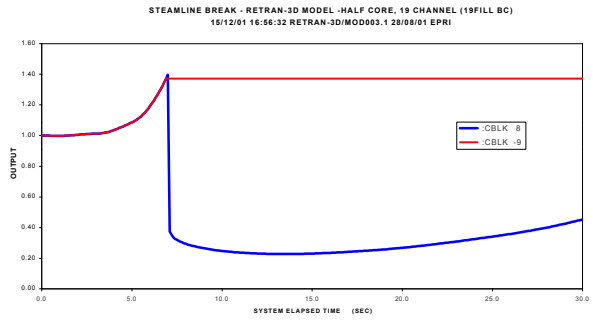

Figure 2. Normalized Power Saved at Time of Reactor Trip

Summary of RETRAN-3D Code Trouble Reports

A total of 255 trouble reports had been filed as of December 31, 2001. Of these, 224 reports have been resolved, while 31 remain unresolved. A summary of the unresolved trouble reports is shown below. Additional information for RETRAN-3D trouble reports is available at http://www.csai.com/retran/r3dtrpt/index.html.

NO.	TROUBLE REPORT TYPE OF PROBLEM	CORRECTION NO.	IDENT	COMMENTS
30	2-loop Oconee w/5-eq. fails in steady state	***	*******	
40	Results do not agree with data	***	*******	
48	Steady state fails after 6 iterations	***	*******	
		006	MOD001g	(partial fix)
52	MOC does not return to the initial temp.	***	*******	
54	MOC solution; no null transient for two-phase	***	*******	
60	Anomalous countercurrent flooding	***	*******	
70	Fails in subroutine DERIVS	***	*******	
81	Steady-state failure at iteration #6	***	*******	
116	Fails in steady-state initialization	***	*******	
122	Problems with EOS convergence	***	*******	(water packing)
152	Junct pressure lags vol pressure 1 time step	***	*******	Model limitation
168	Incorrect null trans w/3d Kin. mod ht & 5eq	***	*******	
170	PARCS numerics will not hold a null transient	***	*******	
181	No rod cusping treatment in 3D kinetics	***	*******	Preliminary update
200	SS failure for NCG (WAT0 error maybe WAT17)	***	*******	
201	SS failure when flow split option used	***	*******	
202	Error when pcrit reached during tran – 5-Eq	***	*******	
203	Pressurizer time step selectn when Przr solid	***	*******	
212	Possible errors in dynamic flow regime model	***	*******	
226	MOC error when flow reverses	***	*******	
240	Junction property error after 92sec transient	***	*******	
246	Control system floating point exception	***	*******	
247	Scratch space overlaps with other FTB files	***	*******	
248	Critical heat flux exceeded in SG secondary	***	*******	
249	PNM floating parameter defaults not set on PC	***	*******	
250	Index used before defined - Zolotar-Lellouche	***	*******	
251	Slip vel. incorrect for TDV with multiple con.	***	*******	
252	Volume description incorrectly printed	***	*******	
253	Concentration instability in surgeline press.	***	*******	
254	Model cannot hold a null transient	***	*******	
255	Segmentation Fault in 3D Kinetics Case	***	*******	

About This Newsletter

RETRAN Maintenance Program

The RETRAN Maintenance Program is part of a program undertaken by EPRI to provide for the support of the software developed in the Nuclear Power Division. The main features of the Subscription Service include:

- the code maintenance activities for reporting and resolving possible code errors,
- providing information to users through the User Group Meetings and this newsletter, and
- preparing new versions of RETRAN.

The RETRAN Maintenance Program now has 26 organizations participating in the program, including 22 U.S. utilities and 4 organizations from outside of the U.S. A Steering Committee, composed of representatives from the participating organizations, advises EPRI on various activities including possible enhancements for the code and the scheduling of future code releases. Information regarding the Maintenance Program can be obtained from

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Newsletter Contributions

The RETRAN Newsletter is published for members of the Subscription Service program. We want to use the newsletter as a means of communication, not only from EPRI to the code users, but also between code users. If this concept is to be successful, contributions are needed from the code users. The next newsletter is scheduled for May 2002 and we would like to include a brief summary of your RETRAN activities. Please provide your contribution to CSA, P. O. Box 51596, Idaho Falls, ID 83405, or to the E-mail addresses below by May 10, 2002. Contributors of a feature article will receive a RETRAN polo shirt. We are looking forward to hearing from all RETRAN licensees.

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The RETRAN Web Page is located at http://www.csai.com/retran/index.html.

Previous issues of the RETRAN Newsletter are available from the RETRAN Web Pages at http://www.csai.com/retran.

EPSC Contacts

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3412 Hillview Ave.
Palo Alto, CA 94307-1395
Hours: 9 a.m. to 8 p.m. EST

To Order EPSC Software: (800) 313-3774
EPSC Fax: (650) 855-1026
To Order RETRAN Products contact Colette Handy via email chandy@epri.com

Calendar of Events

RETRAN Training Course:
June 2002

User Group Meeting:
Fall 2002

Please supply us with technical tips for our

section and you will receive a RETRAN mouse pad.

Your contributions are greatly appreciated. We, EPRI and CSA, encourage everyone to participate in this newsletter.