Unique Solutions to Global Competition

bcp
Engineers
and Consultants

New Orleans, Louisiana

Incore Flux Thimble Services

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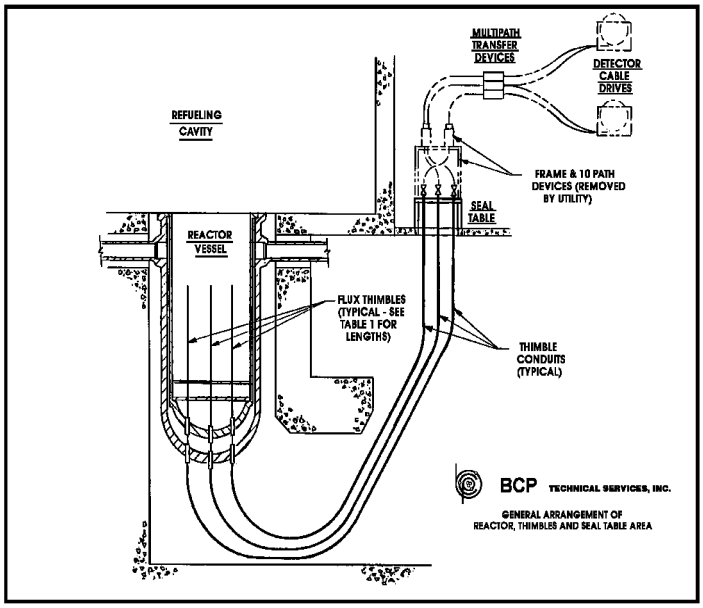
FLUX THIMBLE CLEANING AND LUBRICATION

The **BCP** method of flux thimble cleaning and bore lubrication (optional) has become a mainstay preventive maintenance practice at PWR plants.

The **BCP** thimble cleaning process has proven to be very effective and has contributed significantly to reactor operation. In the last few years we have added the capability to utilize a water soluble solvent for cleaning those thimbles that have special problems.



The thimble cleaning and lubrication process consists of the equipment and site services necessary to water flush, air dry, and vacuum dry the individual thimbles, and then (optional) to apply and dry a thin film of Neolube lubricant to the full length of the thimble bore. No strong solvents or mechanical devices are used that could hang up or be lost in the thimble, or that could damage the inner diameter surfaces.

This figure shows the general arrangement of the Seal Table and Flux Thimbles relative to the Rx Vessel flange

The primary steps in the cleaning operation are:

- Flush foreign material from the thimble bore with demineralized water through a flexible tube assembly inserted into the full length of the thimble.
- Remove the majority of the flush water from the thimble by applying instrument air through the flexible tube assembly.
- Vacuum dry the thimble bores to remove all residual moisture.
- Apply (optional) a thin film of Neolube lubricant to the entire length of the thimble bore.

- Air dry the thimble bore a second time to remove the alcohol vehicle from the lubricant, leaving a thin uniform lubricant film along its entire length.

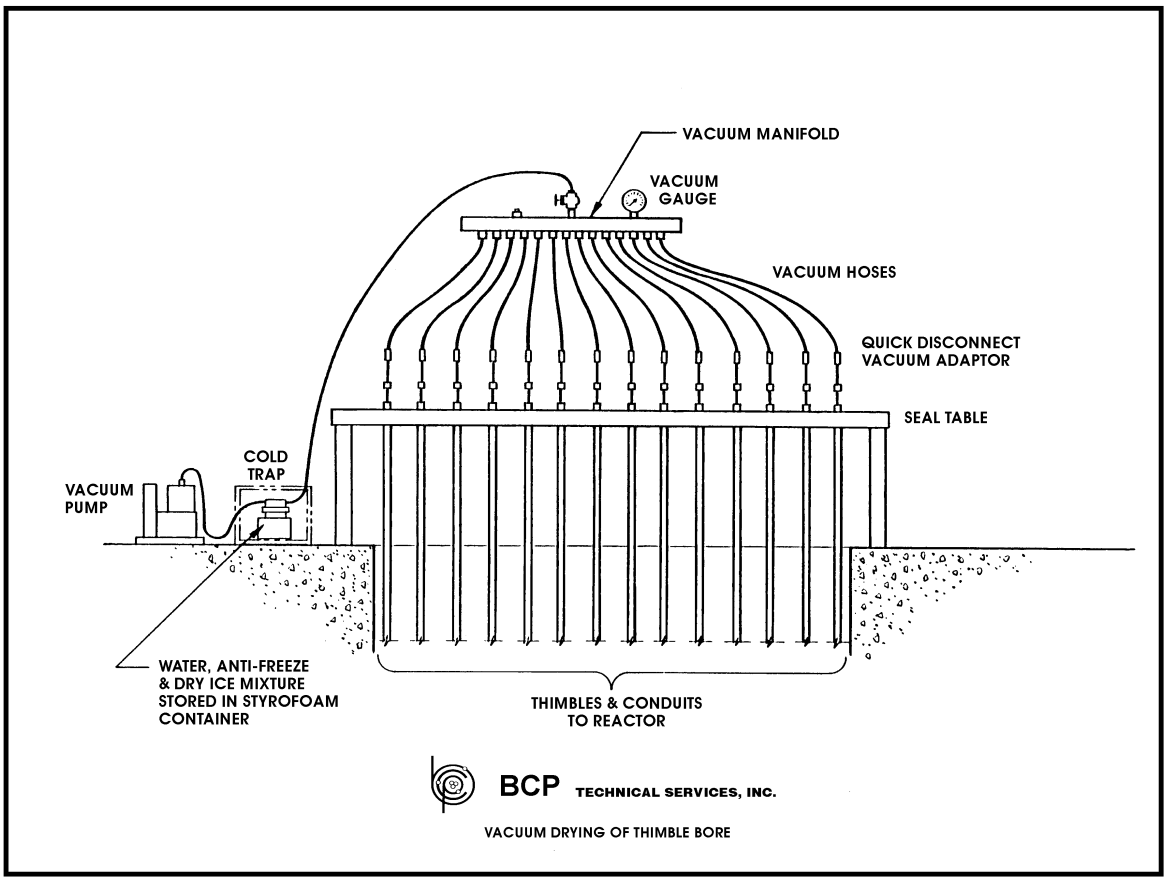
- Insert a dummy cable in all thimbles to the far end of the bore to verify that no obstructions or other problems will be encountered when inserting instrumentation for flux mapping.

Thimble Cleaning Equipment

The incore flux thimbles are cleaned, flushed, and air-dried using the **BCP** system located at the seal table as shown below. High pressure demineralized water is forced into the thimble at high velocity to flush out the debris and to clean the tube bore.

Discharge water filters collect the debris and solid material flushed from the thimbles. The discharged filtrate water is handled by the plant radwaste system. Dry instrument air removes the majority of the water from the tubes, providing the initial drying.

BCP site service technicians are very experienced in the use of the BCP manifolds, tooling and equipment, and as can be seen here, are equally experienced in the use of respiratory equipment and contamination control. Here the third row of Thimbles are being flushed while the second row is on vacuum.



This arrangement shows the Vacuum Manifold, Cold Trap, Vacuum Pump and Adapter Fittings as they are used in the vacuum drying process that is exclusive to the BCP method.

Thimble Vacuum Drying Equipment

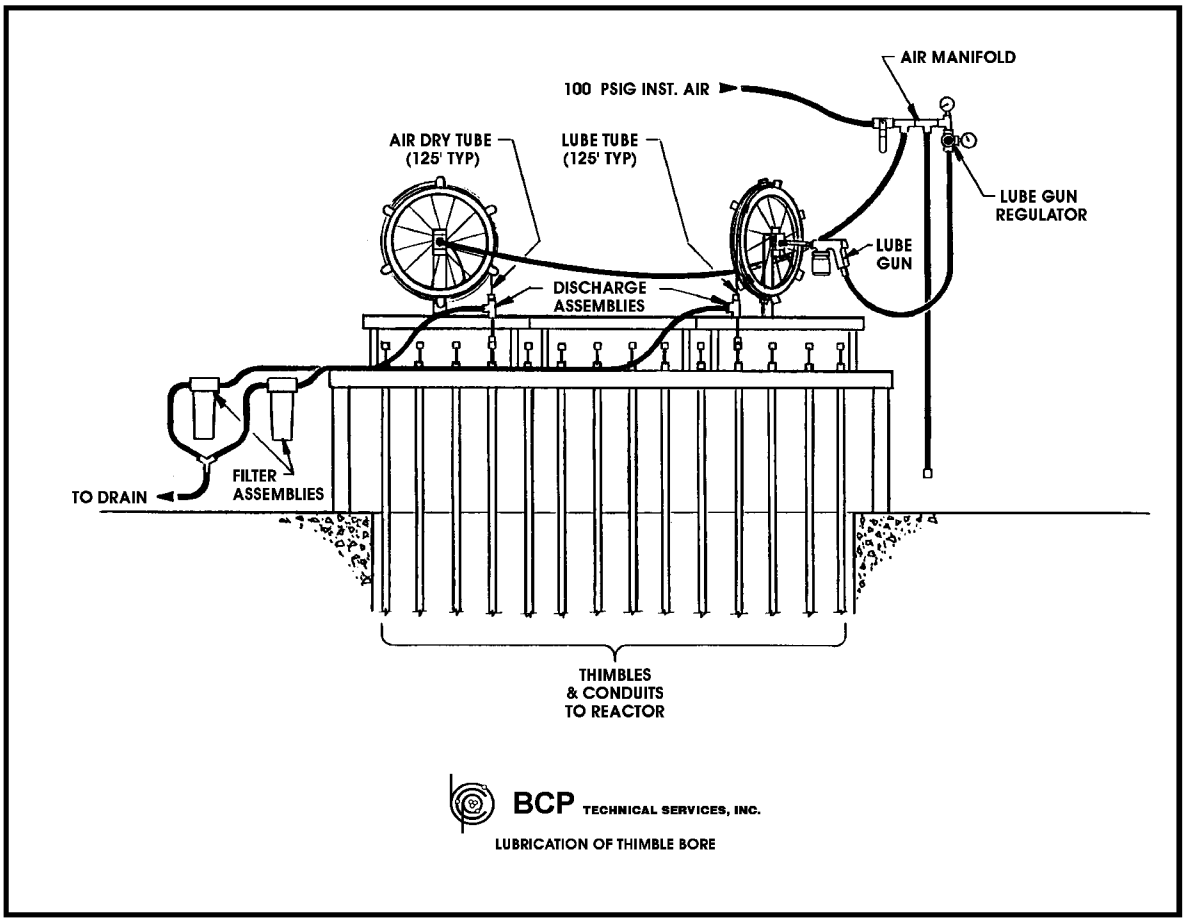
The **BCP** equipment arrangement for the vacuum drying system removes the remaining water from the individual thimbles, leaving them completely dry. The system is designed to vacuum dry a row of up to fifteen thimbles simultaneously. Water removed from the tubes is condensed in a cold trap maintained at a low temperature by dry ice in a chilled glycol solution.

The completion of the vacuum drying process enables the thimbles to be immediately returned to service, or to be ready to receive the light coating of Neolube used in the optional lubrication process.

Thimble Lubrication Equipment

After the thimbles have been cleaned and vacuum dried, **BCP** applies a thin film of Neolube lubricant to the complete length of the thimble bore using a special nozzle at the end of the lube tube. This controlled application of the lubricant is then air-dried to reduce it to a very thin, uniform film, facilitating detector instrument insertion and removal, and minimizing future problems. This system uses less than 5 cc of Neolube per thimble.

BCP provides skilled engineering and technical personnel at the plant site to perform the cleaning and lubrication operations for all thimble locations at the seal table. This work includes equipment set-up, cleaning, air drying, vacuum drying, lubrication application, and test cable insertion, followed by equipment teardown and pack-up for plant storage. These operations can be performed on either a 12-hour or 24-hour per day basis. The typical shift crew size is three people, consisting of one engineer and two technicians.

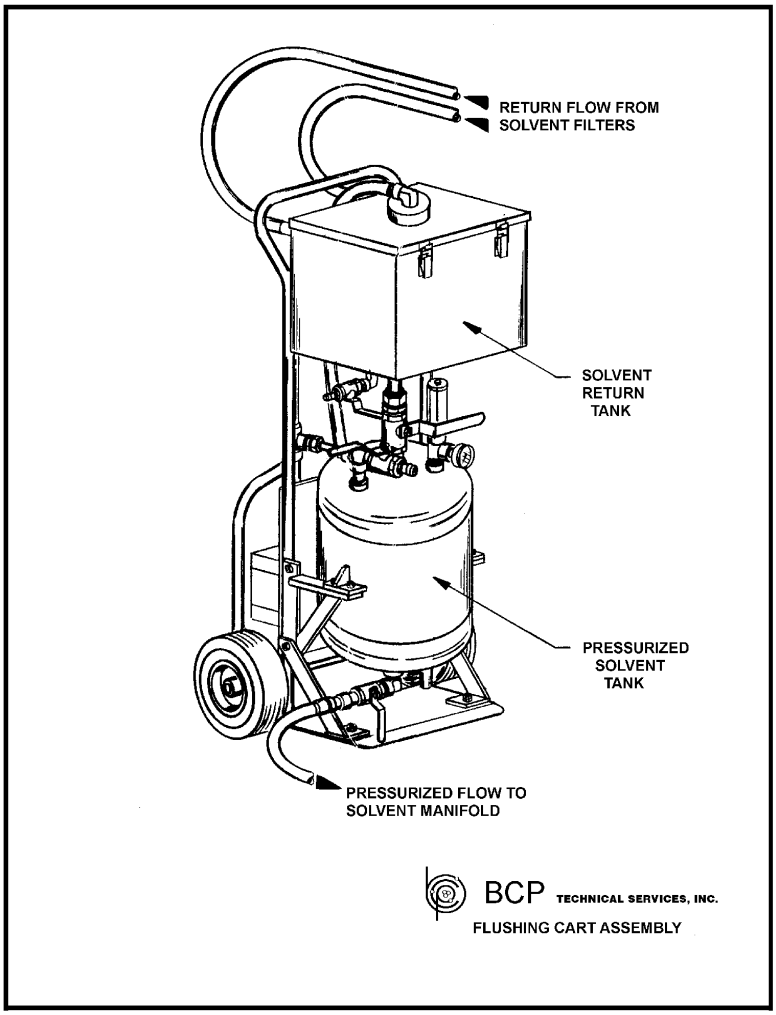


Lubrication is an optional service that many utilities desire, and is another exclusive operation that BCP can provide when requested. It is done with a very light coating of Neolube, and can be applied to the full thimble length or only up to the Rx Vessel, including the 'U' bend under the Vessel but not the 'heat-affected zone' within the Vessel.

BCP's complete set of Thimble Cleaning Equipment includes all of the reels, manifolds, filters, pumps, fittings and clamps necessary to do the intended work. If Solvent Flushing is requested, that equipment and tooling would be provided in addition to what is shown above.

SOLVENT CLEANING

As specialty situations have arisen in recent years, the need grew for a method to remove non-water-soluble materials (greases and oils) and debris from the inside of the flux thimbles. In answer to this industry need **BCP** developed a system that will flush the thimbles with a water soluble cleaning solvent that removes Neolube grease, oil, Never-Seize, and other sticky substances. This system uses a flushing cart that fills the thimble with solvent through the same thimble cleaning tubes and reels, utilizing its own special manifold and solvent filters.

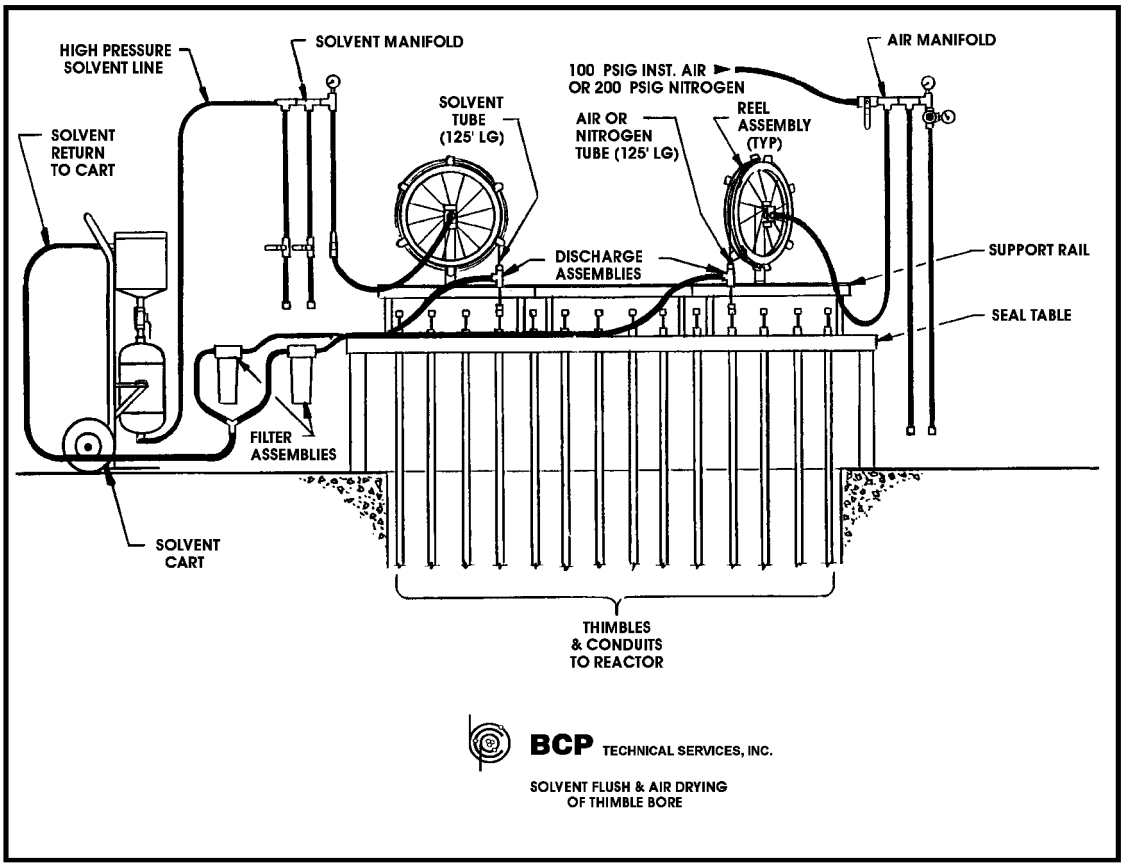


The BCP Solvent Cart showing the flow paths and location of manifold and return filter connections.

The solvent is allowed to soak for 10 - 15 minutes and then air pressure is used to blow the solvent through the dedicated filters and back into the solvent tank. The thimble is flushed with demineralized water and dried as normal. Through full scale testing and site use, this process has proven to be effective in completely cleaning the thimble bores down to bare metal, removing all Neolube that has been built up over the course of years.

The key to this system is a water soluble solvent (non-petroleum) that has been tested and found to be well within reactor coolant system (RCS) chloride and fluoride leach test limits.

During this process **BCP** contains all the solvent used (it is not flushed to the radwaste sump) and flushes four thimbles at one time. This system requires the additional equipment of the solvent flushing cart, solvent manifold and solvent filter assemblies.



The BCP Solvent Flushing system utilizes the regular Thimble Cleaning Equipment and maintains the same flow process. Solvent is inserted into the thimbles to soak for several minutes, and then is removed through the filters and returned to the cart.

Experience

BCP used this system at three different nuclear sites in 1995. We have seen much more interest in the use of this methodology among our clients due to the age of operating plants and the buildup of materials within the thimbles that are not water soluble or able to be removed through normal pressurized water flushing.

BCP Solvent Cart shown with high pressure solvent manifold attached to pressure tank.

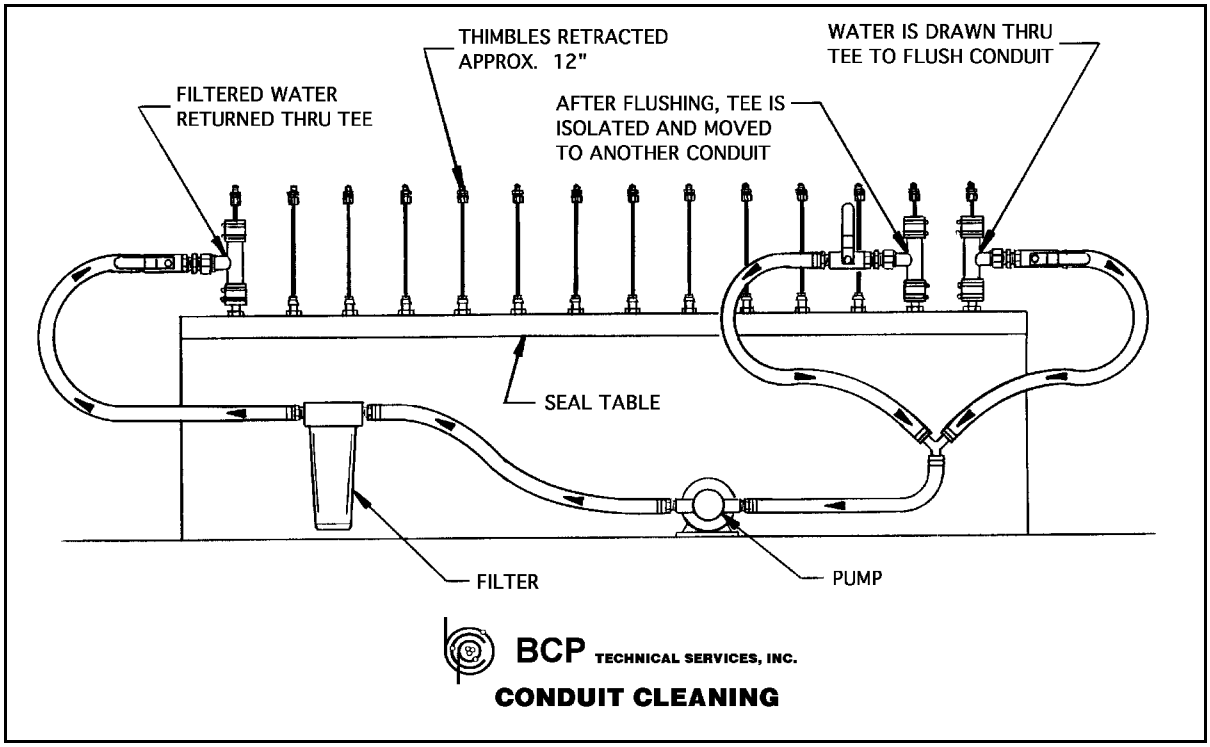
CONDUIT CLEANING

Background

After a few years of operation, many plants experience difficulty in pulling (or retracting) the thimbles back to allow for the fuel shuffle and reload. When this problem is caused by debris falling into the bore of the thimble conduits (or guide tubes), **BCP's** process of conduit cleaning draws the debris away from the reactor vessel and flushes the loose debris out at the seal table. The debris is caught in replaceable filters before returning the reactor coolant to the vessel inventory, typically flushing only a few gallons to the plant radwaste sump.

Description of Service

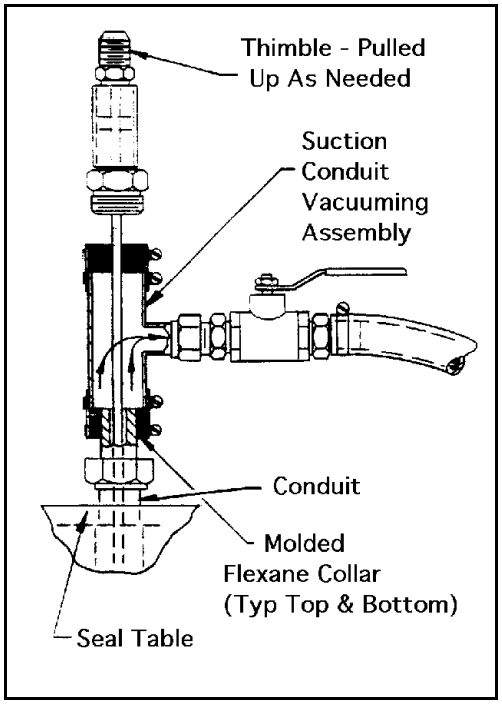
The incore flux thimble conduit (or guide tube) cleaning equipment provided by **BCP** consists of hoses, pumps, filter housing, filter cartridges, valves, fittings, etc., necessary to water flush the individual conduit bores outwardly from the reactor vessel for the full length of each conduit (i.e. from the reactor vessel to the seal table).



The Conduit Cleaning usually takes one shift to perform, and can be done with the Thimbles in place (as shown in this figure), or during Replacement services when the Conduit is empty and the best flow is obtained.

The process is applied by equipment fitted directly to the Seal Table end of each conduit. No strong solvents or mechanical devices are used that could hang up in the conduit or damage the inner surfaces. A supervising engineer and three technicians are provided for this work.

The conduits are flushed clean by **BCP** equipment located only at the Seal Table. Using this equipment, RCS water is drawn from the reactor vessel at a high velocity to flush out the loose crud, debris, and metal particles, thus cleaning the conduit bore of loose debris prior to incore flux thimble withdrawal or insertion. Small micron water filters are used at the Seal Table suction/discharge outlet of a single conduit to collect the loose debris and solid material withdrawn from each individual conduit using the filtered pump vacuum-cleaning process.



This detail shows the flow path of the suction side of the Conduit Flushing Tee, and illustrates the operation with the thimble still in place.

As applicable, the pump discharges filtered RCS water from the first conduit cleaned into the plant liquid radwaste system. This involves a loss of only a few gallons from the RCS. For the remaining conduits, the filtered RCS water is pumped back into the reactor vessel through the first conduit cleaned, thereby causing no further change in the RCS water inventory. The conduit water filter is temporarily shielded, as necessary, with plant supplied lead blankets to reduce local radiation levels. Filter cartridges are changed out by the **BCP** crew.

Experience

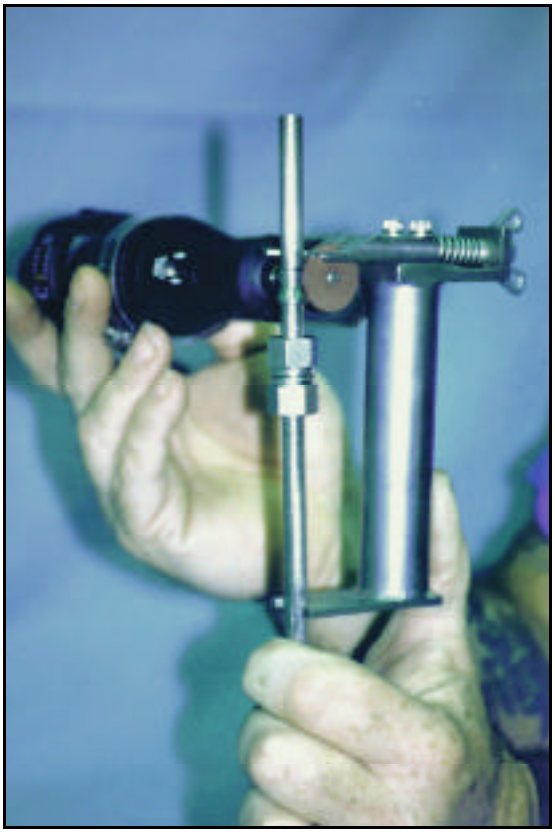
BCP conduit cleaning equipment has been used many times for several different purposes, including debris removal, foreign object retrieval and dose rate reduction in the "keyway" below the Seal Table and reactor vessel. The system has been used successfully at several operating plants.

BCP is the only vendor able to perform this cleaning process with the flux thimble still in place in the conduit, as shown in the above figure.

HIGH PRESSURE SEAL REFURBISHMENT

Background

As plants age, inevitably the high pressure seal fittings on the thimbles and conduits of the seal table are used -- and sometimes misused -- requiring the complete changeout of the fittings and ferrule sets.



BCP can refurbish (remove and replace) the high pressure seals, and it has been proven that these fittings can be safely replaced in the same locations with optimum results: **ZERO LEAKAGE**. It is unnecessary to shorten the thimbles or use deeper bore thimble and conduit fittings to avoid leakage.

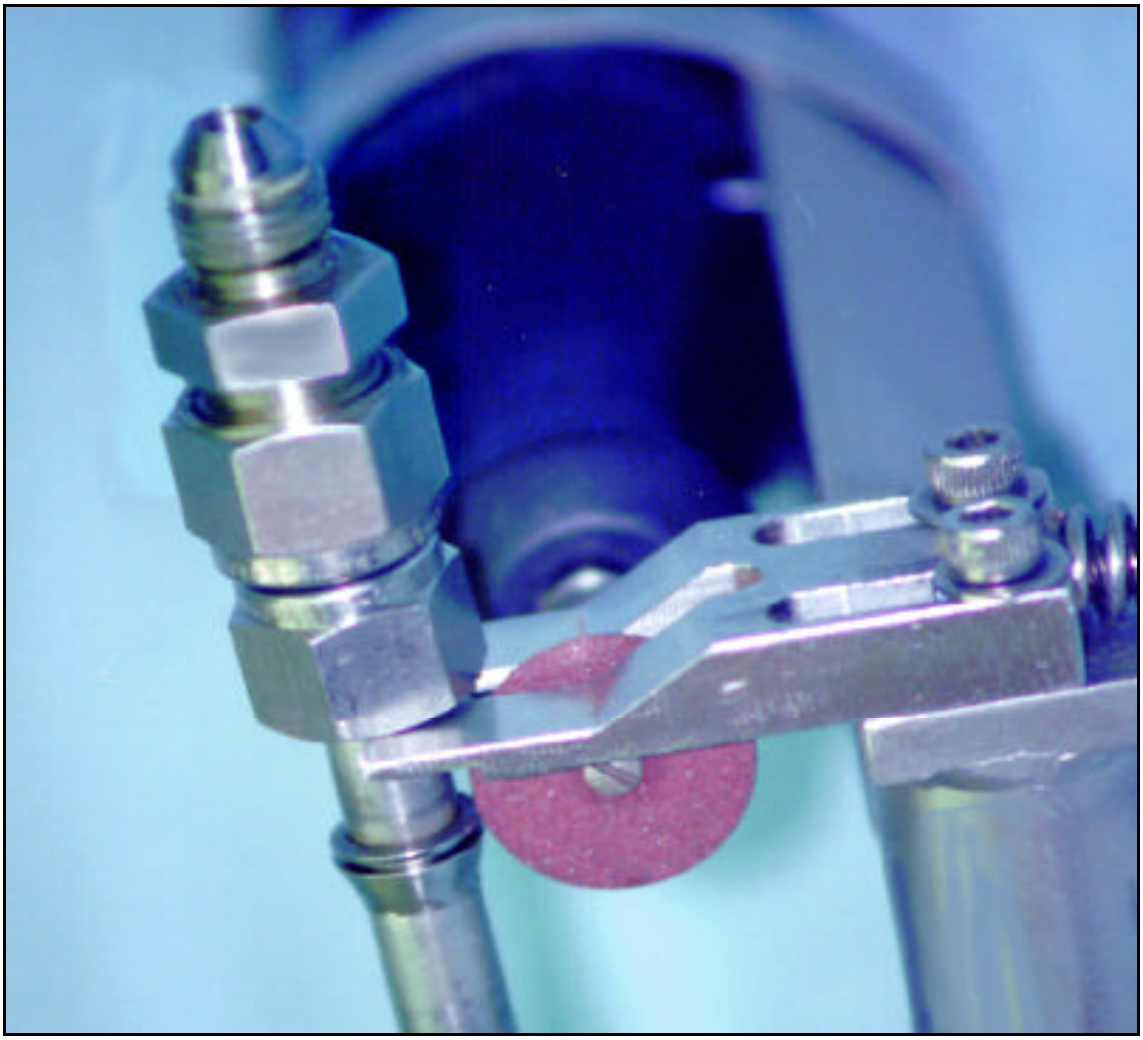
BCP seal table high pressure seal refurbishment personnel use special tools and procedures to remove and replace the Swagelok tubing compression seal (5/8", 3/4", and 5/16" sizes) ferrule sets at the plant specified locations of the thimble-to-conduit seal table locations.

This picture shows the tool as it is used for ferrule removal. Take note of the "thimble extension" that is inserted into the top of the thimble to enable the tool to guide above and below the cutting wheel.

The **BCP** method of refurbishment of the high pressure seals consists of:

- Providing the special refurbishment tooling, adapters, guides, gauges, and procedure for removal of the old Swagelok ferrule sets from their originally installed upper, middle, and lower seal locations.
- Polishing and reconditioning the seal surfaces .
- Replacing the components of the 5/8" or 3/4" conduit x 5/16" thimble Swagelok reducing unions and the 5/16" tube Swagelok flare unions.

The new 5/8" and 3/4" conduit lower high pressure seal ferrule set and nut replacement requires the **complete removal** of the middle and upper 5/16" tube ferrule sets and components. New replacement connector components and seals are provided by the plant and installed by **BCP** to produce excellent sealing for the high pressure reactor operating conditions at the specified seal table thimble-to-conduit.



This close-up shows the adjustable top V guide that enables variable clearance adjustment as the cutting wheel wears down. This adjustment allows us to keep a one to two mil clearance between the wheel and the thimble wall, while enabling the ferrule to be slit apart and removed.

Description of Service

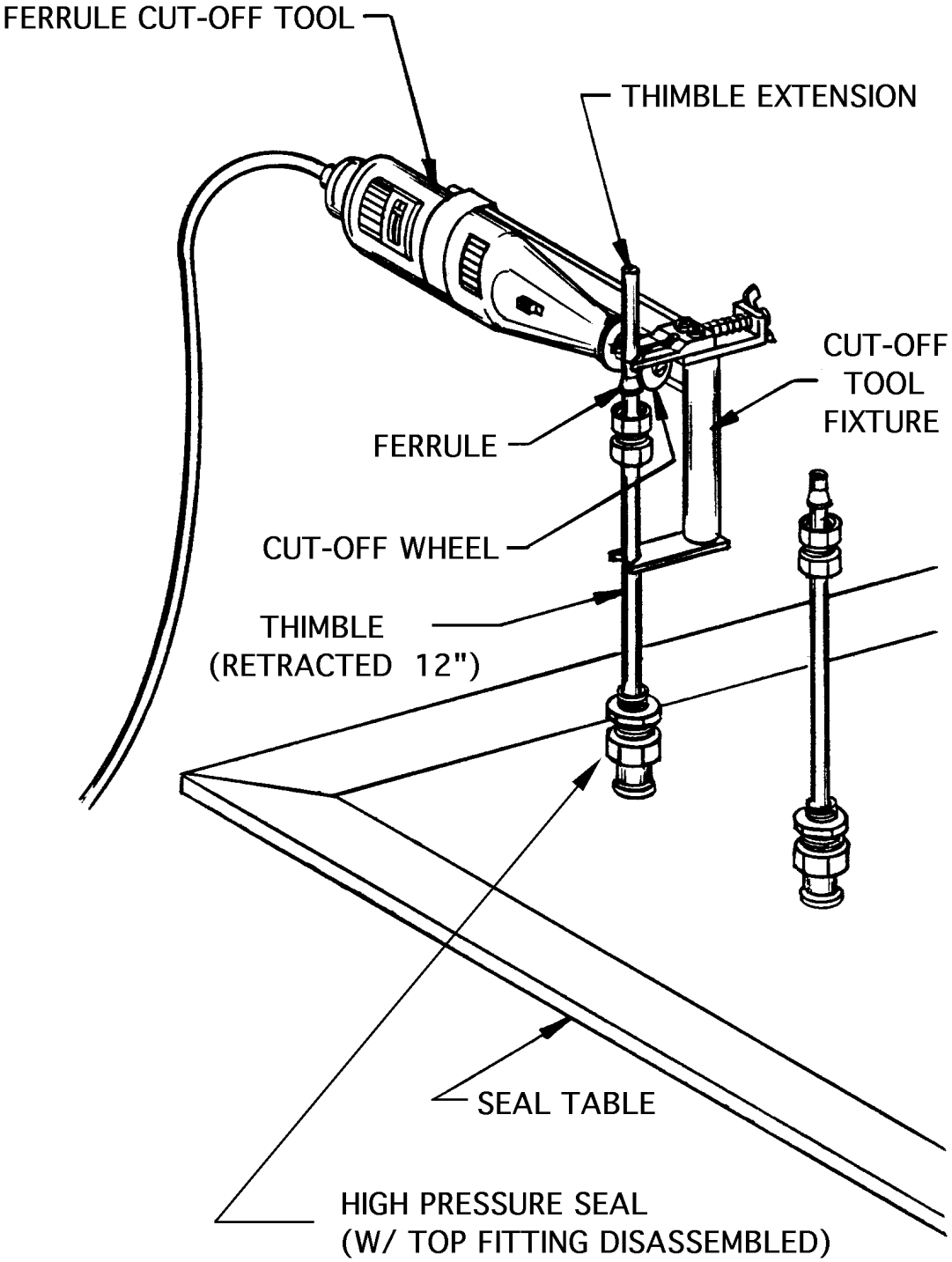
BCP designs and manufactures the special tooling and adapters used in these carefully performed ferrule removal and replacement operations. Each set of adapters for thimble and conduit extensions are custom fitted to plant specific dimensions. Site work is performed by a three or four-man crew on a single shift, or a full 24-hour around the clock critical path time frame. The seal removal operation is theoretically simple to perform, but is very conscientiously controlled due to the close clearances required. Only the most experienced personnel are approved for these removal operations.

The new seals are made up so that the thimble height is set to exactly match its pre-refurbishment position for consistent remake-up to the guide tube rack jumper tube connections. This height setting is the single most frustrating and time consuming experience that plant personnel are faced with when they have allowed others to make thimble height adjustments. They find upon re-assembly that the rack won't seat properly due to different thimble heights. Variances as little as 1/8" cause substantial misalignment.

This attention to detail is what sets **BCP** above the competition.

Experience

This type of **BCP** High Pressure Seal Refurbishment tooling and procedure has been used for a total of over 1500 seals refurbished with 100% success (**no leakage**).



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THIMBLE REFURBISHMENT

100%
Seal Table Thimble Refurbishment

BCP was awarded a contract from Carolina Power & Light Company to clean all fifty incore thimbles, associated guide tubes, and replace all fifty high pressure seals at the Harris Nuclear Plant during a Fall refueling outage.

BCP designs and manufactures the special tooling and adapters used in these carefully performed ferrule removal and replacement operations. Each set of adapters for thimble and conduit extensions were custom designed and built to Harris Seal Table dimensions. The seal refurbishment was performed by the **BCP** crew on a full 24-hour around the clock critical path time frame. The seal removal operation is theoretically simple to perform, but is very carefully controlled due to the close clearances required.

The new seals were made up so that the thimble height was set to exactly match its pre-refurbishment position for consistent make-up to the movable rack jumper tube connections. This height setting is potentially the most problematic operation to plant personnel, because if the refurbished heights aren't set correctly, the rack won't seat properly due to different thimble heights. Variances as little as 1/8" cause substantial misalignment, and result in either correcting a thimble height, or more likely, making a new jumper tube to fit.

Attention to detail places **BCP** above the competition.

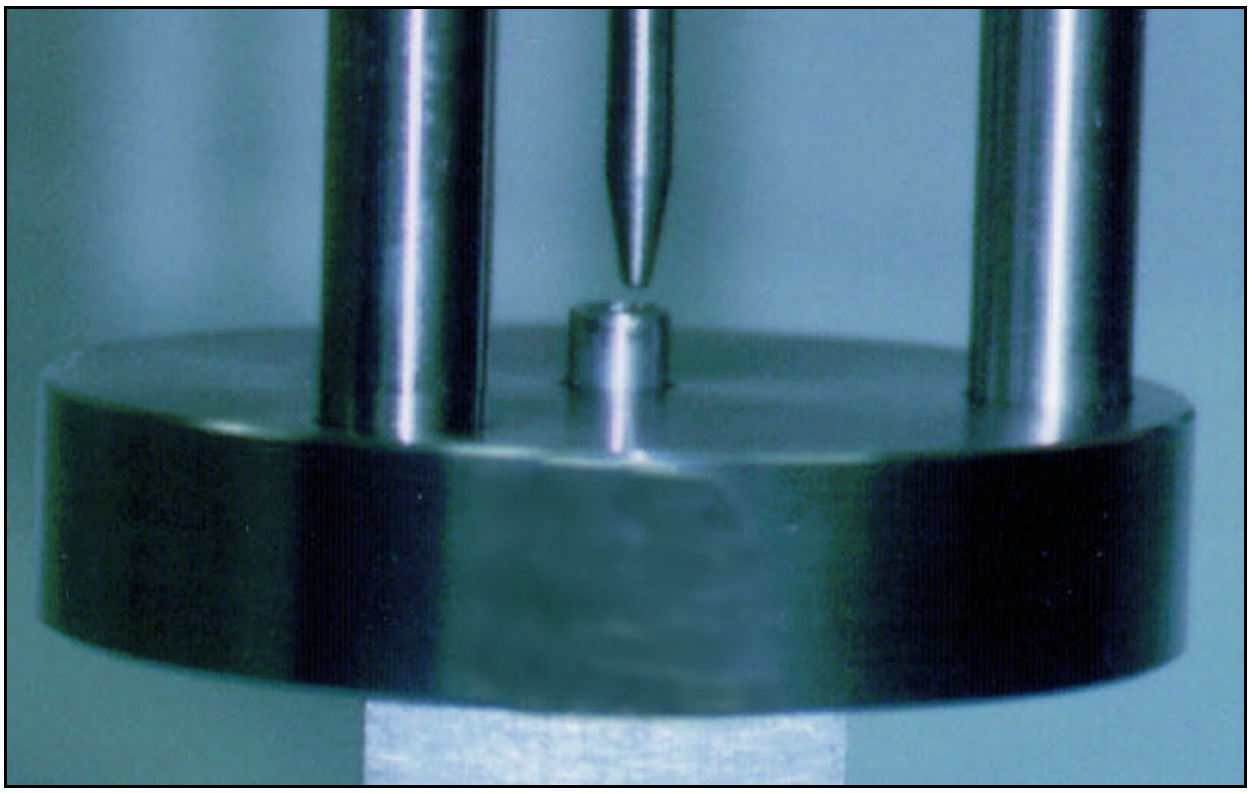
BCP was an integral part of the Harris Plant RFO-8 outage when performing these tasks. Harris Plant personnel support was critical in accomplishing the tasks efficiently and safely. All work conformed to ALARA guidelines, radwaste volume reduction guidelines, and most importantly, the RFO-8 schedule.

The Harris Nuclear Plant RFO-8 was completed in 35 days, 23 hours, which establishes the best outage ever at the Harris Plant.

FLUX THIMBLE REPOSITIONING AND EXPANSION

Background

Due to vibration of flux thimbles in certain reactor vessels, it becomes necessary to reposition the thimbles as an economical fix. **BCP** shortens the thimble by withdrawing the thimble from the core and cutting off a 1" to 3" length, then reestablishing a new high pressure seal at the seal table. This type of repair has been performed many times when a thimble demonstrates wall loss or a defect due to flow induced vibration, fretting or even erosion.



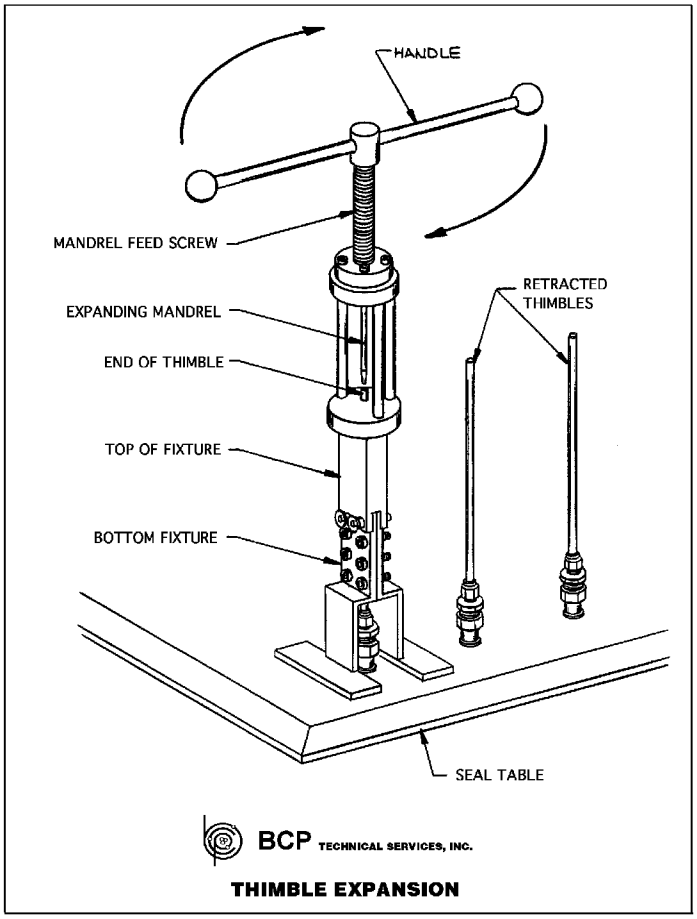
In this picture you can see the tapered mandrel entering the upper end of the thimble. As the expansion work progresses, increasingly sized mandrels will be sequentially inserted until the proper thimble OD is obtained.

The defect areas are usually just above the lower core support plate and near the lower nozzle of the fuel assembly. In this area the thimble is unshielded from the high velocity coolant flow against and past it. When the defect occurs in this area, the thimble can be pulled back a few inches so that the defect location on the thimble tube wall is retracted downward into the lower core support plate and therefore is protected and no longer exposed. This retraction then places a new area of the thimble tube that has full wall integrity in the high axial and transverse flow position between the lower core support plate and the fuel assembly lower nozzle.

This full length view of the Expansion Tooling shows the thimble clamp that sits on the Seal Table and the screw arrangement that presses the mandrel into the thimble bore.

Description of Service

To effect this repair, the designated thimble is pulled up at the seal table, the front and back ferrules are cut off the thimble, and appropriate length of thimble tubing (approximately 1" to 3") is cut off with a tubing cutter. The tube end is deburred, being careful to use a chip catcher in the thimble bore. As necessary, (on nominal



.301" OD thimble tubing), the upper 1-1/2" of the thimble is expanded to allow the OD to accept the standard Swagelok 5/16" fittings for the new high pressure middle and upper seals.

The new thimble sealing surface area is then polished to receive the high pressure seal ferrule set. The thimble height is reset (recall from the Refurbishment section how important this height setting can be) at the Seal Table and the new high pressure seal is made up using new fittings.

This figure demonstrates how the tooling is mounted to the thimble and the Seal Table. The mandrels are inserted and retracted by turning the "T" handle at the top of the tooling while the thimble is firmly gripped in the clamp.

Experience

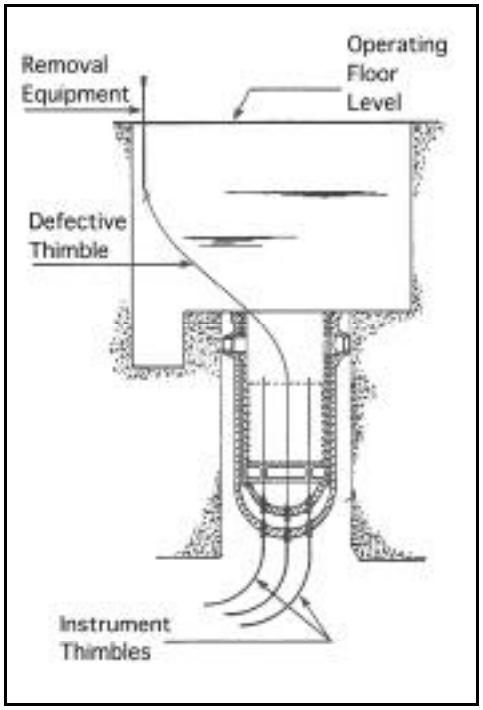
This type of repair is very useful as plants are finding thimble wall loss or thinning in this high flow area. **BCP** personnel have performed this work many times, and especially in situations where the plant is not ready or willing at that time to replace damaged thimble(s).

THIMBLE REMOVAL AND REPLACEMENT

Background

When plants determine that some or all of their incore flux thimbles require replacement, **BCP** provides safe, efficient and convenient removal, reinsertion, and seal fitting make-up operations.

BCP has developed a system to remove specific thimbles with a minimum of surrounding fuel assemblies required to be removed, or the system can be used with a full core offload for the most efficient removal and replacement of all incore thimbles.



General position of Reactor, Refueling Pool and Operating Floor during thimble removal operations

Description of Service

BCP has designed and manufactured the specialty tooling used in this work. The equipment and tooling can either be sold to the utility or used on a lease arrangement for a specific site project. The equipment consists of special Seal Table pushrods, slide-seal assemblies, Seal Table valves, thimble grappling/handling tools, thimble underwater cutter assembly, and fuel protective devices (required for selective thimble replacement) necessary for the work.

There are three phases of site work, each of which occurs at different times (and different water levels) in the outage schedule. The three phases and their initial conditions are as follows:

Phase 1 Seal Table Preparation

The RCS water level is low -- at reactor vessel flange and Seal Table.

This phase of the operation would be done by **BCP**, using the **BCP** supplied procedures and special equipment. It is performed at the Seal Table only, and generally can be done by a two-man crew in one day.

It includes:

- Pulling the selected thimble "cold ends" approximately 15 feet upward -- that is, withdrawn as is normally done just prior to fuel shuffle.
- Cutting off the thimbles with a tubing cutter at the top of the thimble guide tube or conduit.
- Installing the special **BCP** Seal Table valve assemblies.
- Plugging the closed valves.

This completes the Phase 1 Preparation at the Seal Table of the desired thimbles to be removed during Phase 2 by the **BCP** crew. After completion of other reactor vessel preparations, the refueling water level can then be raised during reactor vessel head lift to the required high refueling water level.

Phase 2 Old Thimble Removal

The RCS water level is high -- at normal refueling level.

The prepared flux thimbles can be removed either with the selected fuel assemblies removed, or after all fuel is offloaded. This work is usually a critical path activity and is therefore performed on a 24-hour around - the - clock schedule.

This phase is initially performed by a seven-man **BCP** crew per shift, with four men at the seal table and three men over the reactor. This phase is later completed by the seven-man crew at the refueling cavity pool for the remainder of removal activities. The operations of Phase 2 include:

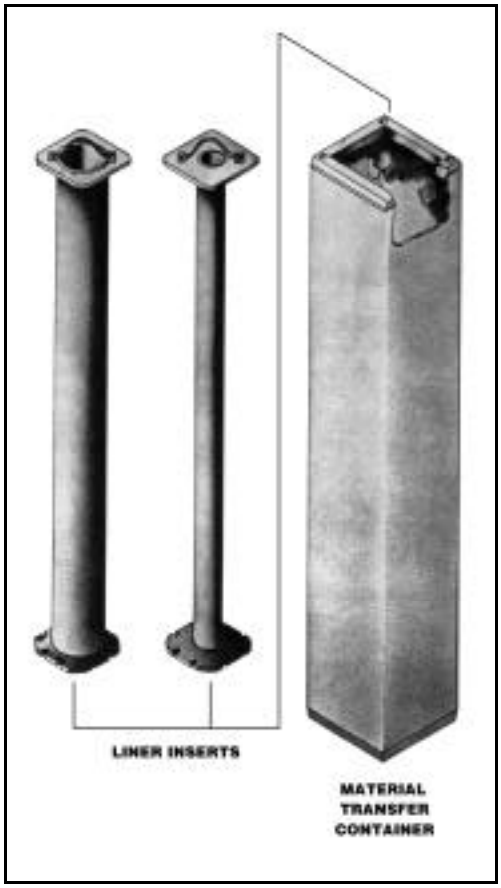
- Installing the slide seal and push rod assemblies at the special Seal Table valve assembly (above the cut thimble "cold end").
- Pushing the thimble "cold end" downward until the "hot end" bullet is moved upward 2-1/2 feet above the lower core support plate.
- Grappling the thimble "hot end" (above the lower core support plate) with the **BCP** grapple tools to extract the thimble "hot end" and "cold end" from the reactor vessel.

- Performing the "cold end" (above water) cutting and "hot end" (below water) cutting of the thimble using **BCP** special long handled removal tools and cutting equipment.

- Handling and placing the unwanted "hot end" segments safely in a suitable underwater Material Transfer Container (MTC) and liner inserts shown in the figure, or a suitable trash basket supplied by the plant.

  NOTE: **BCP** can furnish the MTC and liner assemblies if desired.

- Transferring the cut-up "hot end" and the MTC to the spent fuel storage rack for interim storage and ultimate liner and load disposal by the site.



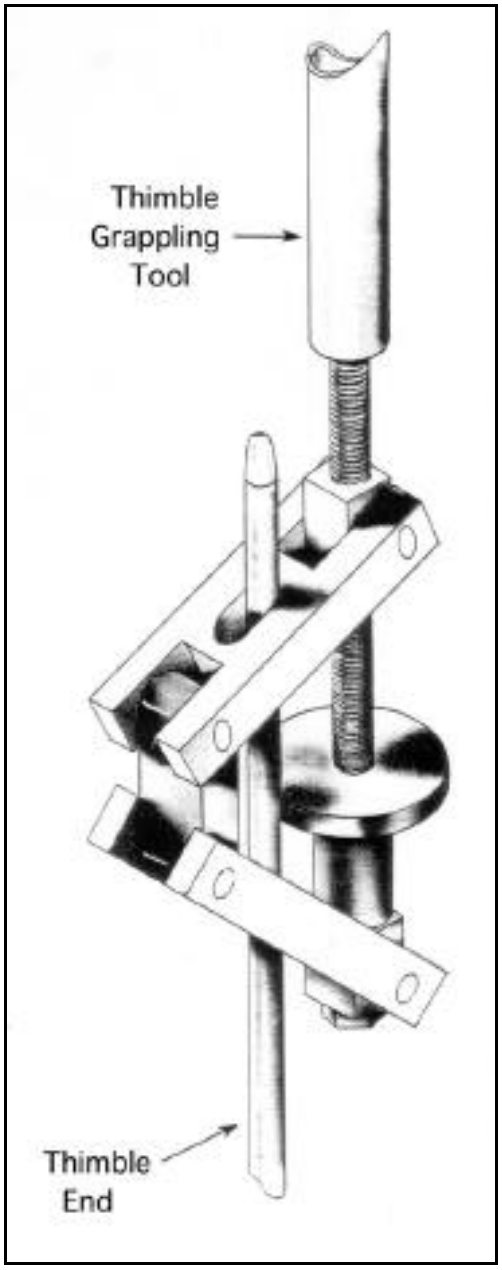
Typical configurations of Material Transfer Container (MTC) and Liner Inserts

Phase 3 New Flux Thimble Installation

The RCS water level is low at the reactor vessel flange and the Seal Table.

Phase 3 is performed after all fuel movement has been completed, and the RCS water level has been lowered to the reactor vessel flange. A single four to six man **BCP** crew at the Seal Table completes this work only (crew size depends on the plant support available for handling the 120' long thimbles).

This non-critical path effort can be accomplished in a one shift (12-hour) per day or a two shift (24-hour) per day basis after the initial preparations of the new thimbles. The new thimbles will have already been prepared for insertion by having been cut to length and deburred as required by plant specifications.



BCP's proprietary Thimble Grapple is designed to be simple and effective, owing its strength to mechanical advantage and trouble free operation.

The operations conducted as a part of Phase 3 include:

- Conduit (Guide Tube) bore cleaning in preparation for new thimble insertion.
- Removal of the special Seal Table valve assemblies.
- Insertion of the new pre-cut thimble assemblies with the thimble cut length matched to the specific location.
- Make-up of the high pressure seals of the new thimble location at the Seal Table, including top end OD expansion if required.

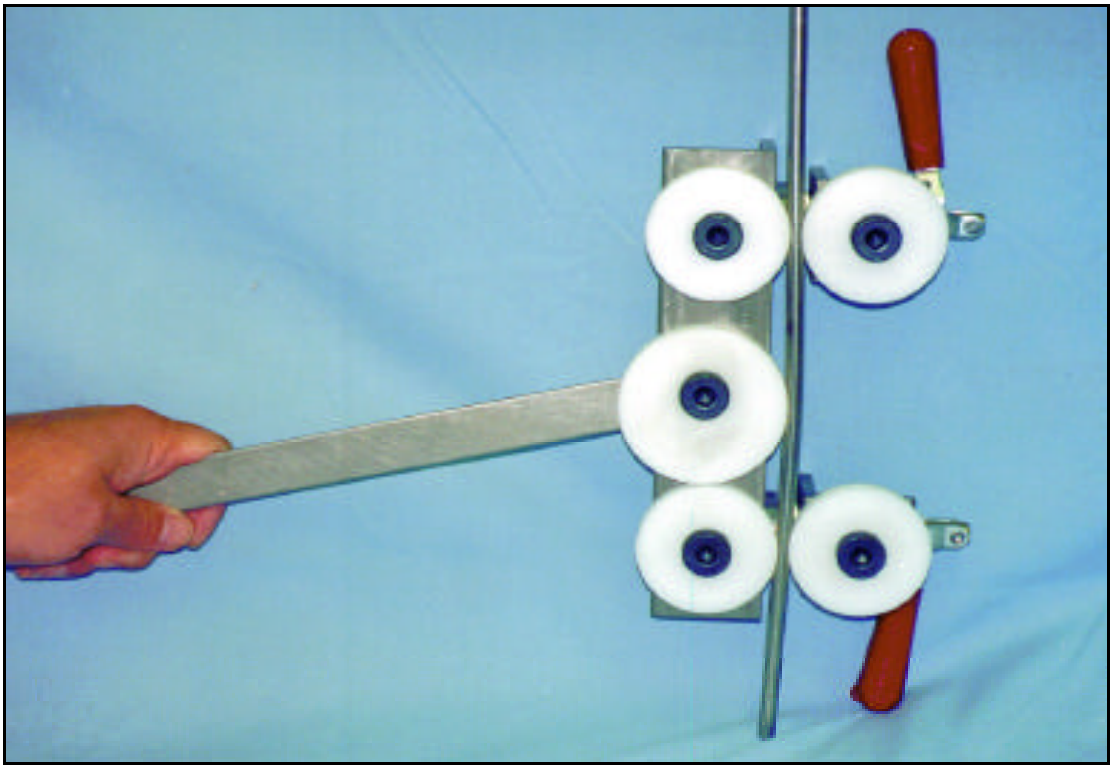
Upon completion of the new thimble installation, the contaminated special **BCP** tools will be packaged by the crew for retention at the site for storage and potential future use, or (if leased for the job) they will be packaged and removed by **BCP**.

Experience

The **BCP** system of tools and procedures has been successfully used to replace over 400 thimbles at several plant sites. As always, please contact us for detailed references.

FLUX THIMBLE STRAIGHTENING

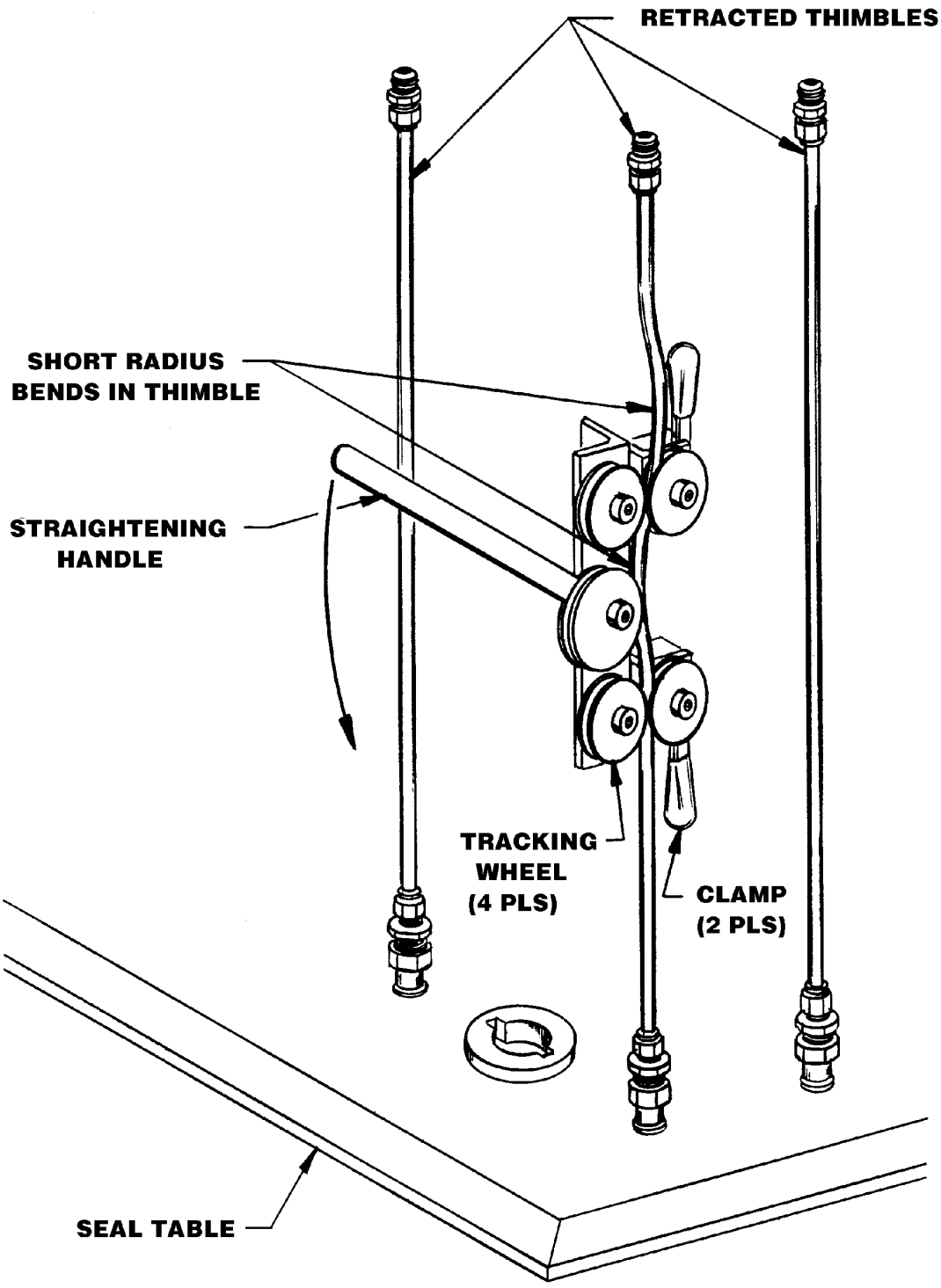
BCP Seal Table Division personnel have designed and built a flux thimble straightening tool. This tool has been used successfully in several nuclear power stations to straighten multiple thimbles. The operation itself is a one-entry job, requiring just minutes per thimble. Use of this specialized tooling greatly reduces unnecessary radiation to personnel and the production of radioactive waste materials from thimble disposal. This repair is effective anytime the bend has not actually "kinked" the thimble and damaged the metal.



This picture depicts our Straightening Tool gripping the thimble above and below the affected bend area, and shows how the cam roller can induce an over-center correction. A bent thimble can be straightened in just a few minutes with excellent results.

Typically, a short radius bend in an Incore Flux Thimble takes the thimble out of service, and generally has required a plant to replace it. Early attempts to correct these bends (straighten the thimble) have been ineffective, including some attempts made by ourselves. Usually a clamp arrangement would be used to bring the thimble back to 'straight', but the memory of the bend would prevent the Flux Detector from passing by. **BCP's** revised design was made to specifically answer that problem, and enables us in a very controlled manner to take the bend back 'over-center' to overcome the memory of the bend and effect a fix that works properly and continuously. We have used this tool at both Farley and Shearon Harris in 1995 with excellent results.

The **BCP** flux thimble straightening tool has also been successfully decontaminated following each plant site usage.



BCP TECHNICAL SERVICES, INC.

THIMBLE STRAIGHTENING

ADDITIONAL SPECIALIZED SERVICES

Flux Detector Drive Transfer Tube Cleaning

During the years that **BCP** personnel have been performing basic Incore Flux Thimble Cleaning, there have been many innovations. For example, we have added services such as Solvent Cleaning and designed Thimble Expansion and Straightening tooling. Another example is the adaptation of our equipment to allow us to clean and dry the transfer tubing leading from the flux detector drives down through the movable rack to the seal table. This includes all tubing connecting the five-path transfer devices, the ten-path devices, the isolation valves, and the "Y" block valve devices.

Whether the tubing has been contaminated by boron due to a thimble failure, or simply exhibits dirty or sticky characteristics, the high pressure demineralized water flushing and air drying satisfactorily cleans the tubing bore. The **BCP** crew is experienced at disconnection, tagging, and reconnection of the tubing from the ten-paths and five-paths, and can manage the project from start to finish with minimum burden on plant maintenance or I&C departments.

Emergency Thimble De-Watering

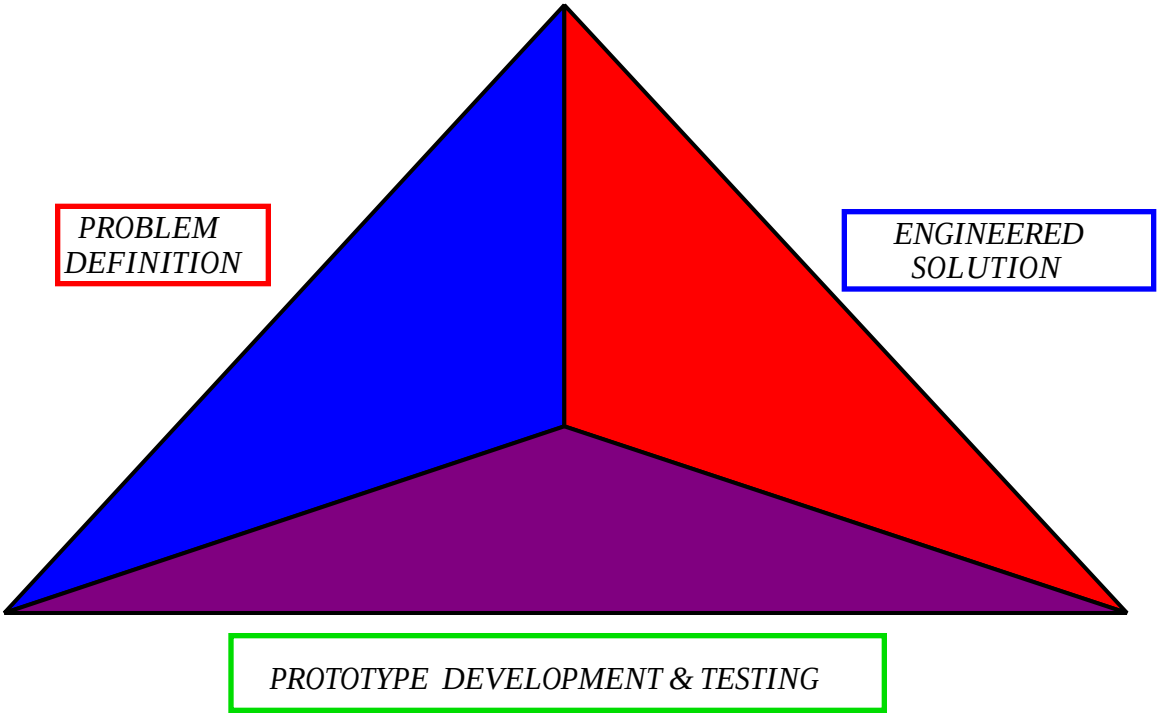
When an incore flux thimble fails at power, the thimble becomes flooded and the reactor pressure forces coolant up past the Seal Table and through the open isolation valve passages to fill several other thimbles after flooding the interior of the 10-path rotary transfer device. This flooded condition causes all of the affected thimbles to be out of service until they can be de-watered. **BCP** has provided the equipment (thimble cleaning components), procedure and service to de-water thimbles **both during power operations and after shutdown**. This work enables the unit to remain operating until a scheduled shutdown, at which time a complete cleaning is performed on the thimbles.

Five and Ten Path Transfer Device Decontamination

BCP's Seal Table Division personnel are experienced at assembly and disassembly of the 5 and 10 path transfer devices for the purposes of cleaning and decontaminating them. This work was performed recently with much improved results for general area dose rate reduction. In most cases, this is not a consideration for a plant as the general area dose rates are less than 5mr/hr, but in the unusual case where this becomes a consideration, the plant wants an experienced group that can accomplish the task with good results, care and efficiency. That description is **BCP**.

Prototype Engineering & Testing Laboratory

During the years that **BCP** personnel have been performing basic Incore Flux Thimble Cleaning, there have been several requests for unique project capabilities. Often, our Engineering and hardware solutions have resulted in new products or services (such as Thimble Straightening). For example, we have performed loose parts retrieval, designed underwater lighting systems, designed and tested remote tooling, and conducted testing and qualification programs on materials. Some examples of our projects are listed on the following page.



BCP clients

- *Power Plants - Nuclear & Fossil*
- *Engineering & Consulting Firms*
- *Inventors*

BCP projects

- *Internal Conduit Machining to allow Thimble passage at DC Cook*
- *Triangular and Other irregularly shaped waste containers for Spent Fuel Pool corners or other unusual condition*
- *Loose Parts Retrieval from Rx Diffuser Plate at Zion Station*
- *Dummy Detector Cable Retrieval from Flux Thimble at DC Cook*
- *Underwater Side Entry Grapple for Incore Instrument Strings for San Onofre Station*
- *1000 Watt Underwater Lighting Fixtures Designed and Fabricated for Reactor Vessel Core Plate Holes*
- *Loose Parts Retrieval Tooling and Field Service*
- *Remote Swagelok Fitting Make Up Tooling for Underwater Use at Yankee Rowe*
- *B-8 Thimble Retrieval for Zion Station*
- *ECT Probe Driver and Trolley Assembly for Seabrook Station*
- *Spent Fuel Pool Rack Venting Tooling and Field Work at Salem Station*
- *Core Baffle Assembly Plugs for Yankee Rowe*
- *Solvent Investigation,Testing,and Qualification for Flux Thimble Cleaning*
- *Poison Test Coupon Trees for Spent Fuel Storage Racks*
- *New Thimble Preparation for Plant Installation*

BCP New Products Announcement

BCP has recently completed development, testing, and field service of two new products which have been designed to provide the power generation industry with reliable yet economical alternatives for remote camera technology and specialized test cable applications.

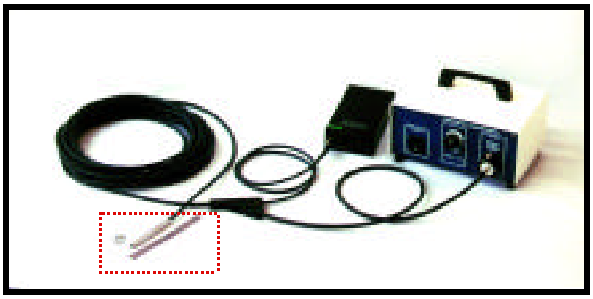
We are enclosing information sheets on these new products. These sheets may be placed within your **BCP** Seal Table booklets within tab #8,"Additional Specialized Services".

We at **BCP** are continually listening to our clients and responding to their needs with reliable and economical solutions.

Should you or your staff have any questions about these new products or would like to know more about **BCP's** capabilities, please call Anthony Stough @ 727-734-3813.

BCP Micro Video Probe for Remote Visual Inspection

BCP has recently completed a developmental and testing program to make available an economical and reliable multi-purpose micro video probe, the MVP-250. This camera, with a length of 50' has the working capability for adverse conditions such as radiation and underwater environments. Originally designed for use in Seal Table conduit inspections, it provides clear, high resolution, color images. Based on the smallest industry-available 7 mm CCD, our camera OD is .345", and is an easy fit into any .400" ID or larger opening. This tiny camera provides the ultimate video representation of a conduit's internal condition, and can deliver S-video or NTSC output, enabling VCR recording for historical viewing of actual encountered conditions. Our MVP-250 system also includes a 250-watt halogen light source working through the integrated fiberoptic pathways to deliver excellent lighting to the viewing area, particularly underwater. The entire camera and cabling is mounted on a reel assembly, which is easily managed in your inspection area.



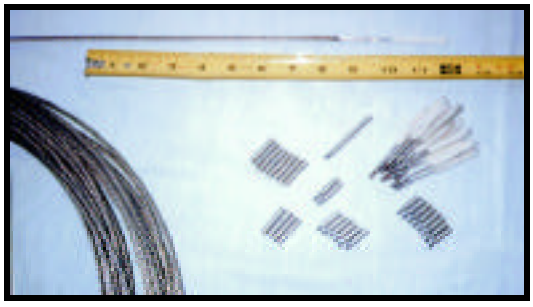
BCP initially tested the micro video probe through replication of actual flux thimble/conduit mock-up conditions at our Dunedin, Florida R & D facilities. Following testing, actual plant field conditions were encountered when contracted to investigate and record suspected conduit blockage in a D.C. Cook thimble conduit. The entire procedure took less than two hours and provided high resolution color video images displayed upon a local monitor, and videotaped for viewing and analysis in the reactor engineering offices. The camera and cable were easily decontaminated and transferred off-site following the successful completion of the work scope.

Other uses for the MVP-250 are condenser and U-tube heat exchanger visual inspections, drain lines or pipeline internal viewing, and close or small clearance inspections in Spent Fuel Pool or other difficult underwater areas. The MVP-250 is readily available for sale or can be provided in a service package to suit client needs.

References, detailed information and pricing are available upon request.

BCP Multi-Function Test Cable with Special Purpose Adapters

As a standard conclusion of Incore Flux Thimble cleaning operations, a dummy detector cable is inserted into the bore of the cleaned thimbles. It's purpose is to provide verification that the thimble is indeed clean and clear along its complete bore length, enabling monthly flux mapping operations. These cables are expensive, have a relatively short lifetime, and tend to kink due to their solid wire core. **BCP** has recently completed a development and testing program to provide a more economical and reliable multi-purpose test cable for Flux Thimble applications. Our cable is fabricated primarily from 304 Stainless Steel (thereby reducing the corrosion flaking common with the conventional carbon steel cables) that measures 150' in length. The assembly has a 2" long x .188" OD SS dummy detector on one end for thimble bore ID clearance testing, and a multi-purpose threaded adapter on the opposite end for other functions. The dummy detector is welded to a 12" section of conventional detector cable with a .188" OD, which is then welded to the spiral strand core wire rope. Threaded end fittings for extraction, brushing, and swabbing are available for all size thimbles at any plant. The test cable is delivered to the plant ready for service, and an optional reel assembly is available to facilitate cable usage at the Seal Table. ***Advantages beside price and the multi-use design are the balance of stiffness and flexibility of the SS cable for ease of insertion, as well as its good kink resistance.***



BCP has used this new cable in several plants, both for the primary job of bore testing, and also for retrieval work. In late 1996 we first developed tooling to grapple and extract a short section of detector cable that had fallen into an operating flux thimble during ten path transfer device testing. The loose section of cable was 90 feet from the open end of the thimble and we were able to successfully extract the section in ***less than five minutes*** after a brief setup of equipment at the Seal Table.

References, detailed information and pricing are available upon request.

Nuclear Power Utilities Serviced by BCP

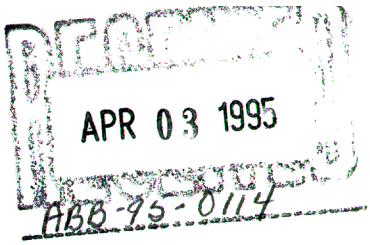
UNITED STATES

Arizona Public Service Co.
Carolina Power & Light Company
Commonwealth Edison Co.
Connecticut Yankee Atomic Power Co.
Consolidated Edison Co.
Dusquene Light Co.
Florida Power & Light Co.
Georgia Power Co.
Indiana Michigan Power Co.
New York Power Authority
North Atlantic Energy Service Corp.
Northeast Utilities
Northern States Power Co.
Pacific Gas & Electric Co.
Public Service Electric & Gas Co.
Rochester Gas & Electric Corp.
South Carolina Electric & Gas Co.
Southern Nuclear Operating Co.
Texas Utilities Electric Co.
TVA Nuclear
Union Electric
Virginia Power Co.
Wisconsin Public Service Corp.
Wisconsin Electric Power Co.
Wolf Creek Nuclear Operating Corp.

INTERNATIONAL

Beznau 1/2	**Switzerland**
Qinshan 1	**P. R. of China**

ABB
ASEA BROWN BOVERI



Mr. Ron Rowley
BCP Technical Services, Inc.
Suite 314
401 Whitney Avenue
Gretna, Louisiana 70056

March 30, 1995
OM95ZN-3427

Dear Mr. Rowley:

Over the past six years I have contracted BCP for ICI thimble tube cleaning services in support of the ABB Combustion Engineering integrated outage services contract at Zion Station. I am writing to you to praise the performance of several employees in your Dunedin, Florida office --- Tony Stough, Fred Bodell, Bill DeWitt, Matthew Beggs and Mark Beggs.

In early 1994 Zion Unit 2 was faced with a somewhat unique technical problem, in that the ICI thimble tube at core location B-8 refused to insert into the reactor vessel after refueling. Plant mechanics and engineers applied abnormal force, however remained unsuccessful in returning the tube to its proper location. The conduit area beneath the reactor vessel was designated a radioactive exclusion area due to the retracted thimble tube's high dose rate. The Unit was returned to service with the tube out of position. During the subsequent operating cycle, plant personnel developed a B-8 thimble tube recovery plan, in which the tube would be withdrawn from the seal table into a shielded device.

In November 1994 I was asked by Zion management to accept the task of providing details and personnel to implement the plant's general recovery plan for the refueling outage starting in January 1995. I called Tony Stough to ask if he was interested in the job. He enthusiastically researched the plant's problem, and with the help of Fred Bodell and Bill DeWitt, developed a far less radiologically risky alternative to the plant's recovery plan. This innovative plan, which involved the bubbling of nitrogen into the B-8 conduit, was successfully executed by Tony and his crew on January 23, 1995. The highly radioactive section of the thimble tube was inserted into the reactor vessel under full reactor cavity water shielding.

The creativity and ability demonstrated by your personnel saved Zion Station from considerable radiation exposure, eliminated adverse impact to other work groups, saved at least 8 hours of critical path time, and minimized regulatory risk. Tony Broccolo, Zion Plant Manager, and Greg Kassner, Zion Radiation Protection Department Head, personally expressed their appreciation to me separately for the job excellently done by Tony Stough and his crew. I feel it was the greatest success of the integrated outage services project this year, and perhaps the plant's greatest outage success.

Mr. Rowley, I wanted you to know what a great job your people did for Zion Station recently. I am very proud to be associated with their success and look forward to further projects involving BCP Technical Services. Thank you for consistent, excellent performance.

If you have any questions or comments, feel free to call me at 708-746-2084 extension 2776.

Sincerely,

Richard J. Polek
Project Manager
Zion Integrated Outage Services

cc: Warren Martel
Paul Gallant

P.O. Box 3088, Florida City, FL 33034-3088

FPL

October 16, 1995

BCP Corporation
Mr. Ron Rowley, President, BCP Technical Services
PO Box 6876
New Orleans, LA 70174

Subject: Refueling Outage Performance

Dear Mr. Rowley,

Florida Power & Light Company's Turkey Point Nuclear plant has recently completed the Unit 3 cycle 15 refueling outage. This outage was completed ahead of schedule, in a record 34 days. The contractors who augment and perform critical outage tasks are significant contributors to our overall success.

We at Turkey Point would like to acknowledge the excellent performance of Mr. Tony Stough. Tony's job knowledge, professionalism, and "can do" attitude was essential to this record outage.

Competitive pricing and flawless execution by our contractors are key elements to the success of Florida Power & Light and Turkey Point Nuclear. We look forward to having the services of Mr. Stough and BCP Corporation at our plant again.

Sincerely,

J. R. Hartzog,
Business System Manager
Turkey Point Nuclear Plant

JRH/JAS/js

cc: Contract File

FYI

Gil,

At the 1430 Meeting today Don Jernigan gave everyone involved, you in particular, credit for the fine work done on the seal table. He called it a "Genuine Sucess Story"

MB.

FUEL USERS GROUP

September 1995

GIL	*Gilbert Richardson ; System Engineer responsible for Thimble Cleaning and Seal Table services*
DON JERNIGAN	*Turkey Point Plant Manager*
MB	*Marty Bowskill; Reactor Engineering Supervisor*

American Electric Power
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616 465 5901

AEP
AMERICAN ELECTRIC POWER

May 16, 1996

Mr. Anthony Stough
Project Manager
Seal Table Services
BCP Technical Services, Inc.
1251 Pinehurst Rd., Ste. 107
Dunedin, Fl. 34698

Dear Tony,

I am writing this letter to share some appreciative feedback for your work during our recent outage here at D. C. Cook. As you know, we set some challenging goals for ourselves in reducing the total outage duration. I am pleased to inform you that we met those challenges and are currently at 100% power. This goal could not have been realized, however, without the excellent work performed from outside contractors like yourself. Once again you showed that even with some minor rough spots on our part in getting you started, you still maintained your usual high degree of performance which allowed the total seal table package to come in on time without sacrificing quality.

I also wish to thank you for your assistance in the retrieval of the piece of dummy cable which was inadvertently dropped into one of our thimble tubes. Your retrieval tool which you designed worked exactly like planned. This again saved valuable outage time while giving us back this thimble location for use in the present cycle.

Again, thanks for your hard work and I look forward to working with you again in the upcoming refueling outages.

Sincerely,

Randy Keppeler
Unit 2 Reactor Engineer
D. C. Cook Nuclear Plant

c: P. G. Schoepf
K. R. Baker

SCE&G
A SCANA Company

South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, SC 29065
(803) 345-5209
(803) 635-1461

June 5, 1996

Mr. Ron Rowley
President, BCP Technical Services
BCP Corporation
P. O. Box 6876
New Orleans, LA 70174

Dear Mr. Rowley,

I'm writing to state the obvious as you may already know, I'm referring to the simple fact that the employees in your Dunedin, Florida office have once again worked exceptionally well to help during our recent refueling outage in a manner which we feel is commendable.

As unusual in a refueling outage, there are many task scheduled, each having an overall impact in the total success of the entire outage as well as goals which are established prior to the start. It is with great confidence that I state that each member of the crew who reported to the site for the incore thimble cleaning was eager, understanding, well trained and displayed a very positive attitude towards the task at hand. Each member took an active part in helping our plant in meeting it's schedule, even finishing ahead of the already tight schedule. I must also add that going into the outage each crew member was cooperative even with the "nuclear holds" and the unknown such as whether the actual job would start on day or night shift, whereas they adjusted their sleep schedule in anticipation of the moments notice of job start.

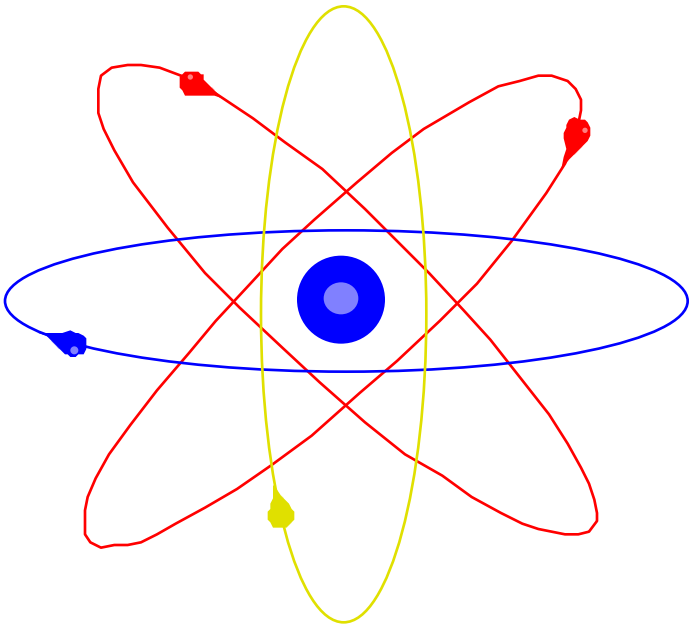
I speak for many others here at V. C. Summer Station in saying a sincere THANKS to the guys for again displaying a professional well done job and hope the future holds many more opportunities to work together.

Sincerely,

George Fogle
Supervisor, I & C Maintenance

sat

c: BCP Contract File



BCP Case Histories

We at BCP are pleased to provide you with these recent examples of our ability to respond to client needs in their times of crisis.

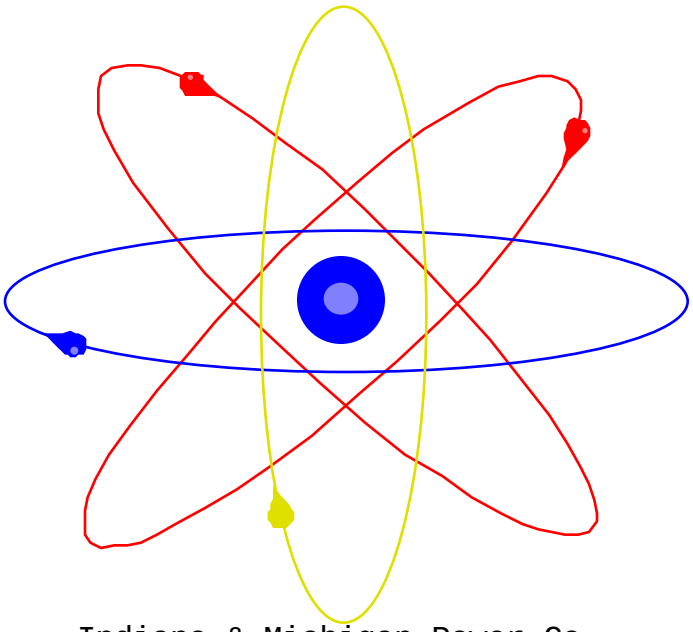
The enclosed case histories represent unique work and research efforts by BCP involved in the maintenance of client seal tables and their associated ancillary systems.

We will periodically update you as to additional work projects conducted for our clients. We also invite you to visit our website @ www.bcpengineers.com.

We invite you to call our contact persons to learn more details about these particular case histories. As always we look forward to providing you with the best possible service for your seal table needs.

Sincerely, Tony Stough
BCP Seal Table Division Manager

BCP ***Case History Saving Time/Dose***



Utility Indiana & Michigan Power Co.
Plant D. C. Cook Unit #1
Status Refueling Outage
Problem Lost Dummy Cable
Response R & D and On-Site
Solution Special Design Retrieval Tool

Reactor Engineering at the D. C. Cook Nuclear Station called BCP and asked if they could conduct a research and development project in an effort to develop a method and/or tooling to assist in retrieving a lost dummy cable inside a thimble.

BCP agreed to undertake this project and work closely with the client to develop the tooling and procedures necessary to retrieve this cable.

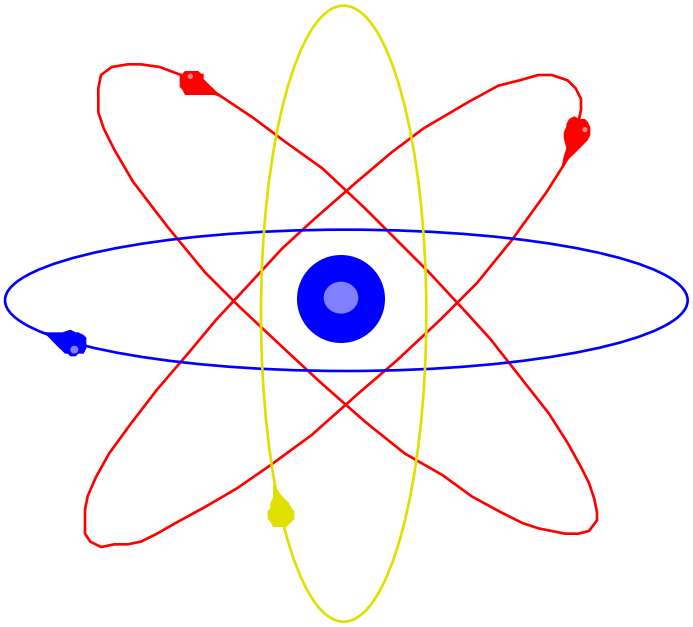
BCP designed, constructed, and performed full scale mock-up testing to prove their design prior to actual on-site implementation. This full-scale mock-up exactly duplicated the thimble size, length, geometry, and actual lost dummy cable positioning within this thimble.

The method for retrieval was proven at the BCP offices in Dunedin, Florida. The BCP crew retrieved the lost dummy cable their first attempt at the seal table.

This successful retrieval program saved valuable outage time and also gave the unit back this thimble location for use in their following fuel cycle.

Contact: Alberto Verteramo @ 616-465-5901, ext. 1537

BCP ***Case History Saving Time/Dose***



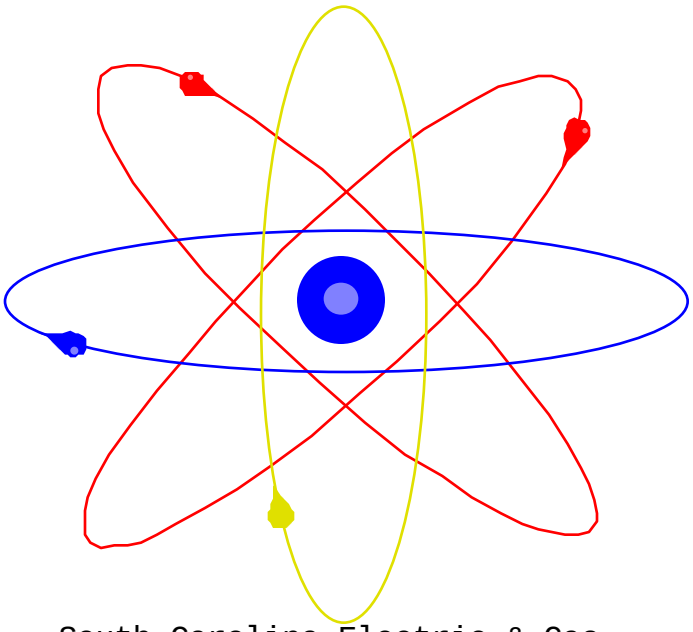
Utility	Wisconsin Electric Power Company
Plant	Point Beach Unit #1
Status	Refueling Outage
Problem	Thimble Removal and Cutting
Response	Provide Technology and Manpower
Solution	Perform Task Safely and Efficiently

BCP's task was more difficult than a normal Thimble Replacement job because the lower internals had been removed, leaving the reactor vessel entirely empty, with only the conduit weldments visible above the vessel curvature. This required the grappling of the thimbles from the conduits from a position 60' distant rather than the normal 50'. The additional 10' coupled with the geometry of the conduit pipes provided subtle and complex complications to the normal task. Additionally, this phase involved extracting thimbles whose hot ends were estimated to be in the range of 10,000 to 12,000 R/hr. It was imperative that BCP perform their task with extreme caution and particular attention to ALARA.
Personnel involved with support and performance of this task included Reactor Engineering, Operations, Health Physics, Quality Assurance, and the BCP Technical team.

Total Job Dose for all involved
219 millirem

Contact: Rick Wood @ 920-755-6317

BCP Case History Saving Time/Dose



Utility South Carolina Electric & Gas
Plant V. C. Summer
Status Power Ascension-30% Power(**HOLDING**)
Problem Flux Mapping Failures
Response Immediate
Solution Remove Water From Thimbles

An urgent phone call from the Summer plant was made to the BCP offices one Sunday morning asking for assistance in evaluating and correcting a flux mapping problem with 12-14 thimbles which was preventing the power plant from continuing power ascension.

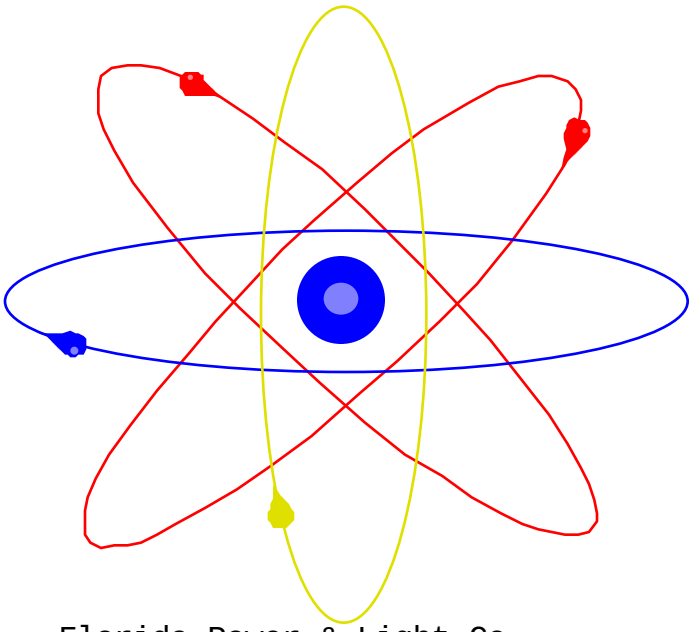
A BCP crew was dispatched immediately in response to this request and went directly from the airport to the plant, discussed the problem with the client, and presented a plan for diagnosing and solving their problem with flux mapping.

The BCP crew did a containment entry while at power in an effort to evaluate and formulate corrective action for the flux mapping problems. The BCP crew worked throughout the night using specialized equipment brought with them. Next day, the BCP crew again worked at the site to finish their program.

The BCP crew spent approximately 24 hours working under adverse conditions and extreme time constraints while assisted by plant personnel in returning the thimbles necessary for the plant to continue power ascension in accordance with plant startup procedures.

Contact: George Fogle @ 803-345-4406

BCP Case History Saving Time/Dose



Utility	Florida Power & Light Co.
Plant	Turkey Point Unit #3
Status	Refueling Outage
Problem	Dose Rates/Seal Table Area
Response	On-site
Solution	Decontaminate Drives/Tubing

During a scheduled outage at Turkey Point #3, the client wanted to reduce the dose rates at their 5 and 10 path flux mapping drive units and the movable rack assembly consistent with ALARA.

BCP was on site performing normal seal table thimble cleaning services using a solvent solution procedure.

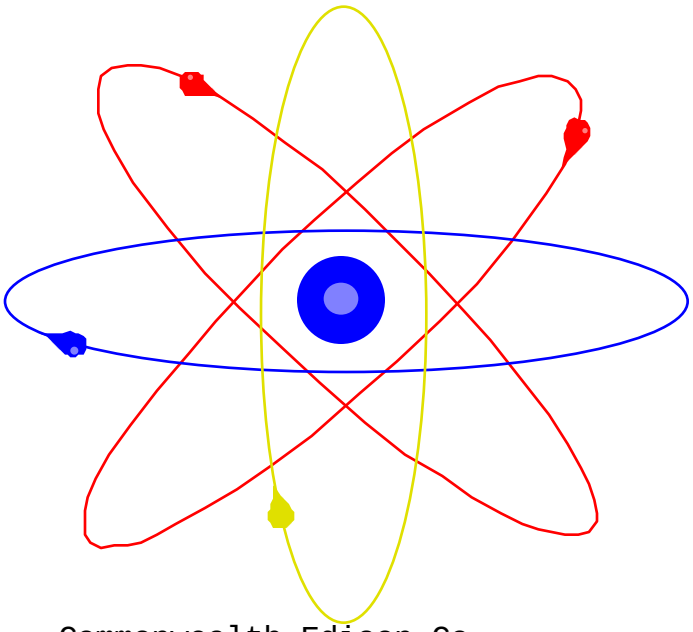
BCP had been asked as part of their contract to provide a method and manpower to reduce the radiation dose rates at the drive units and movable rack assembly. BCP has performed similar dose reduction tasks at other client sites.

The BCP crew of seven industry experienced personnel worked through two shifts using downdraft HEPA units, rags, alcohol, and swabs to complete this task successfully and within outage schedule requirements.

The radiation dose rates were reduced significantly from those originally identified in a plant specific area dose rate chart, enabling longer stay times for I&C technicians performing required tasks.

Contact: Gil Richardson @ 305-246-6529

BCP Case History Saving Time/Dose



Utility	Commonwealth Edison Co.
Plant	Zion Nuclear Station Unit #2
Status	End Refueling Outage
Problem	Thimble Tube Failure to Insert
Response	Immediate
Solution	Nitrogen Injection Program

Zion Unit 2 was faced with a rather unique technical problem. The Incore Instrumentation thimble at core location B-8 refused to insert into the reactor vessel after refueling, even using abnormal forces.

The unit was returned to service with the tube cut off and capped at the seal table. A call was made to BCP asking for assistance in developing a safe and effective solution to this problem.

An innovative plan was developed by BCP using high pressure nitrogen injection into the conduit to eject the foreign material that prevented thimble insertion.

The highly radioactive section of this thimble was inserted into the reactor vessel under full cavity water shielding.

This far less radiologically risky alternative plan was executed by the BCP crew, negating the need for the utility plan of dry thimble removal through the seal table.

This response and highly successful solution by BCP saved the unit approximately 8 hours of critical path time and thousands of dollars of additional equipment needs.

Contact: Richard Polek @ 708-746-2084, ext. 2776

Unique Solutions
to Global Competition

bcp
Engineers and Consultants

1251 Pinehurst Rd.
Dunedin, Florida 34698

http://www.bcpengineers.com Phone: (727)734-3813 Fax: (727)734-3941