PCI
ENGINEERED SYSTEMS GROUP

NUKON® THERMAL INSULATION SYSTEM

The NUKON® system is a nuclear containment thermal blanket insulation system.

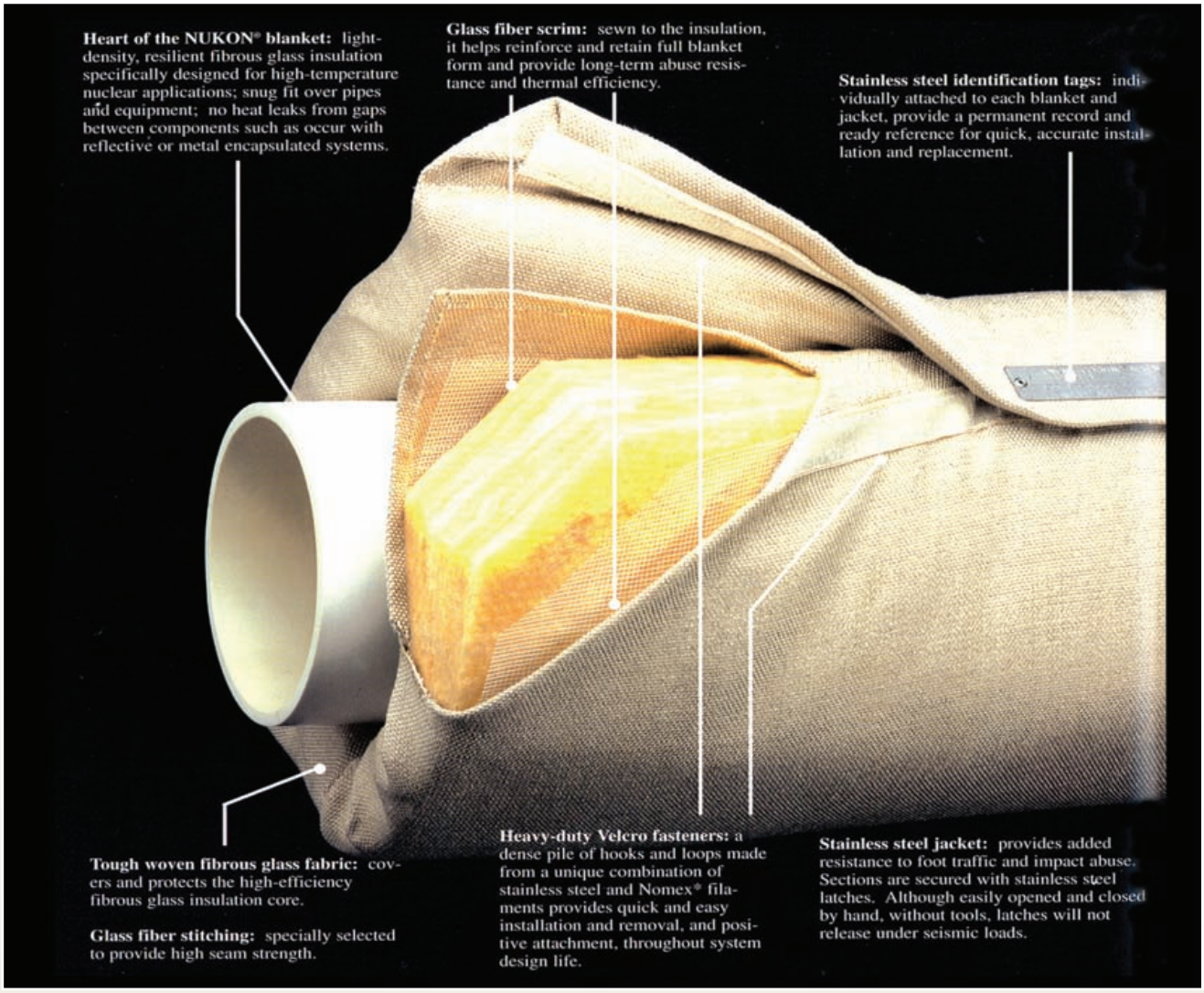
NUKON® design, craftsmanship, performance, safety and quality exceed industry standards.

THE NUKON® SYSTEM PROVIDES SUPERIOR PERFORMANCE AND DURABILITY COUPLED WITH EASE OF REMOVAL AND REINSTALLATION

The NUKON® Containment Insulation System is designed fabricated, and supplied to provide superior performance on hot service piping and equipment inside light water reactor nuclear power plants. Each component of the NUKON® system is supplied in such a way that it can be quickly removed and reinstalled, thereby keeping insulation handling off the plant's critical path. The NUKON® insulation system is also designed to be extremely durable. When subjected to normal usage, it will last the lifetime of the plant. In the event of an accident, it will have minimal impact on the safe shutdown of the plant. With the NUKON® system installed in over 100 nuclear containments worldwide, it has become the world's standard for nuclear containment thermal insulation.

Call: 913-928-2800 | www.PCIESG.com

A LOOK INSIDE THE NUKON INSULATION BLANKET



CHECK OUT THESE NUKON® SYSTEM FEATURES AND BENEFITS!

NUKON® SYSTEM FEATURES

- Fits tightly without gaps or annular spaces, giving excellent thermal performance
- Removes/reinstalls quickly and without the use of any tools
- Durable materials and design
- Fully tested and analyzed to meet a large number of nuclear safety requirements
- Capable of being designed, fabricated, and supplied prior to the refueling outage, and of being installed during a two to three week outage

NUKON® SYSTEM BENEFITS

- Reduced containment air temperatures and cooling loads
- Improved plant performance
- Increased life of electrical components
- Lower personnel radiation exposure
- Keeps insulation work off the critical path during outages
- Will last the lifetime of the plant under normal usage
- Reduced life-cycle costs for the plant
- Less time & expense in qualifying the NUKON® system for use in a particular plant
- Assurance for the safe shutdown of the plant in the event of an accident
- Less impact on today's short refueling outages
- Improved outage planning
- Replacement of existing NUKON® components available on emergency basis

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NUKON® BLANKETS & METAL JACKETING COMPONENTS ARE DESIGNED & FABRICATED TO FIT VARIOUS TYPES OF SERVICES

NUKON® BLANKETS

As shown in the cutaway photograph on the left page, all NUKON® blankets are fabricated from five nonmetallic materials:

- NUKON® base wool — the insulation material
- NUKON® reinforcing scrim (NUKON® blankets are the only ones made in the insulation industry that use this material)
- NUKON® fabric — a strong, industrial strength outer encasing cloth
- NUKON® hook-and-loop or Velcro attachment material
- NUKON® sewing thread

Together, this combination of materials – results in extremely durable insulation blankets – all specified and purchased through the NUPIC audited and accepted Nuclear Quality Assurance Program of Performance Contracting, Inc. (PCI).

NUKON® METAL JACKETING & PIPING

The standard NUKON® stainless steel jacketing is formed so that it custom-fits the NUKON® blankets it covers. The lap joints are all hemmed and fitted to give a smooth, tight fit. Attachments are made with special long-reach latches and strikes that make it quick and easy to draw the latches and strikes together during jacket installation.

NUKON® BLANKETS WITH MSJ ON PIPING AND EQUIPMENT:

These are used on horizontal piping and equipment where thermal insulation is subjected to repeated abuse from workers stepping on the pipes. To address this abuse and protect the NUKON® system from damage, PCI developed the patented NUKON® with MSJ System. This system is designed to withstand continuous loads, such as from workers stepping on the insulation. It is designed to with stand up to 450lbs. (2,000 Newtons) of force, thereby preventing compression of the NUKON® blankets beneath the NUKON® jacketing. In addition, the NUKON® with MSJ jacketing is reinforced to prevent deformation of its surface. NUKON® with MSJ can be installed anywhere that NUKON® systems can be installed on pipes, valves, pumps, pressurizer top heads, steam generator trunnions, pipe hangers, etc. It's the "silver bullet" solution to the problem of thermal insulation being damaged by foot traffic and other forms of abuse.

NUKON® SUPPORT RINGS AND METAL JACKETING ON VESSELS

On steam generators and pressurizers, PCI has developed a unique system which consists of frictional support rings with radial studs, NUKON® blankets, 22-gauge metal jacketing, and hitch pin attachments. As with NUKON® pipe insulation, jacketing sections and blankets can be removed individually without disturbing adjacent panels and without the use of tools. In over 1,000 NUKON® vessel support rings installed worldwide spanning 13 years of time, ring slippage has never occurred.

NUCLEAR SAFETY

The NUKON® blankets on the bottom of head of this pressurizer can easily be removed for future inspection and reinstalled quickly without tools.

To determine its installed performance, PCI has performed a number of tests and engineering analyses on the NUKON® system. These have demonstrated that the NUKON® system will not prevent the safe shutdown of a plant following a nuclear accident. The table on the next page summarizes the typical performance requirements, the test procedures followed and the NUKON® system's performance.

TESTING AND ENGINEERING ANALYSES TO DETERMINE IN-PLACE PERFORMANCE OF THE NUKON SYSTEM

PERFORMANCE REQUIREMENTS	TEST PROCEDURES	NUKON® SYSTEM PERFORMANCES
Heat flux not to exceed 65 Btu/hr-ft OF (205 w/m')	ASTM CI77, C335 and C680	2-inch (51 mm) thickness required for a 550°F (288°C) surface in a 135°F (57°C) environment on a 3- inch NPS pipe
Blankets to meet the requirements of USNRC Reg. Guide 1.36 (on fluorides and chlorides)	USNRC Reg. Guide 1.36	NUKON® blankets meet both the chemical and stress corrosion requirements
Blankets to have a Class A flame spread rating	ASTM E84	NUKON® blankets are Class A
Blankets to be noncombustible	USCG 164.009	NUKON® blankets are noncombustible
Blankets to have a compressibility, after high temperature exposure, greater than 100 lbs/ft^2(4.8 kPa) when subjected to 50% thickness compression	ASTM C165 and ASTM C411	The NUKON® system's compressibility is 110 lbs/ft^2 (5.3 kPa)
NUKON® blankets to have an effective radioactive half-life of less than 18 hours when subjected to 10^{15} NVT	Procedure of the Ford Nuclear Reactor for exposure of thermal insulation blankets	Effective NUKON® system half-life is about 15 hours
In a slurry of NUKON® Fibers, the fibers shall minimally adhere to a 2,200°F (I,200°C), 1/4 inch (6 mm) diameter by 24-inch (600 mm) long stainless steel rod	The heated rod is plunged into a 3,000 ml slurry of 5 gms/l of insulation fibers and kept hot for 3 hours, then examined for fiber adherence	The thickness of the adhered NUKON® fibers is about 1 mm
A slurry or NUKON® fibers shall not clog a 1/4-inch (6 mm) diameter spray nozzle with a flow of at least 10 gpm (0.63 l/s) with at least 28 psi (193 kPa) pressure	Using a water - fiber slurry with at least 0.35 lbs./gallon (42 gms/l) through the nozzle, the nozzle shall not clog after 5 hours or operation	NUKON® fibers did not clog the spray nozzle
NUKON® blankets shall withstand water jet pressures of at least 20 psig (138 kPa)without fabric failure	Procedure used by Alden Research Laboratory in USNRC NUREG/CR-3170	Of 13 tests performed, in both 90° and 45° orientations, the lowest fabric tear pressure was 20 psig.
Shredded NUKON® fibers shall have a transport velocity or at least 0.15 ft/s (0.046 m/s) in 170°F (77°C), pH = 9 water	Procedures used by Alden Research Laboratory in USNRC NUREG/CR-2982	The NUKON® fibers' transport velocity was found to be about 0.17 ft/s (0.052 m/s)
Fibrous debris to have a head loss behavior within 25% of that given by Equ. B-32a or b in USNRC NUREG/CR-6224, App. 8 (1995)	Procedure used by Alden Research Laboratory in USNRC/CR-6224	The NUKON® system met or exceeded the requirements in these tests
Fibrous debris head loss to increase at no more than 50% per 24-hour period when tested in 170°F (76°C) pH = 9.4 water	Alden Research Laboratory test procedure for head loss across fibrous debris	Head loss increased at less than 50% per day
All NUKON® systems to be able to meet a seismic criterion of at least 5 g's, horizontal and vertical applied simultaneously	Structural Analysis by static equivalent and by Finite Element Analysis	The NUKON® system exceeds this criterion without failure

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SOME ANSWERS TO KEY QUESTIONS TYPICALLY ASKED ABOUT THE NUKON SYSTEM

Where is the NUKON® insulation installed?

NUKON® insulation systems are installed in over 100 nuclear containments in the U.S., Mexico, Korea, Belgium, Sweden, Switzerland, Spain, Netherlands, and several other countries. This includes over 20 units where the NUKON® system was installed during plant construction and includes both BWR and PWR plants.

Who installs the NUKON® insulation?

NUKON® insulation can be installed by PCI or by any other qualified insulation contractor. PCI encourages the nuclear utility to make use of a PCI Technical Specialist when installing a new NUKON® system scope.

How can my plant get the NUKON®system ordered designed, fabricated and delivered in time for my next refueling outage?

Depending on the scope involved, a new scope of NUKON® system should be ordered at least 30 days prior to the time the utility requires it to be shipped. However, the NUKON® system is frequently y ordered and delivered with less than 30 days' lead time. PCI 's estimators can work with you to determine how to meet your needs.

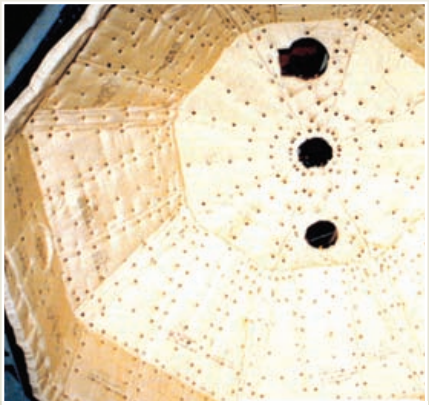
How can my plant purchase the NUKON® system? The NUKON® system is available directly from PCI in the U.S., and through a network of distributors and licensees world wide

How am I assured that the NUKON® system will fit?

Using plant engineering drawings, PCI's Design Department will custom-design all NUKON® blankets and metal jacketing components so that they fit where intended to be installed. NUKON® system assembly drawings are typically included with the purchase of any new scope of NUKON® insulation.

How does my utility get PCI approved and added to our Approved Vendors List?

PCI has been audited and accepted under the NUPIC Team Audit system on several occasions. In addition, PCI welcomes Quality Assurance audits or surveys by individual nuclear utilities or general contractors requiring nuclear safety-related work.



NUKON® blankets on the underside of a BWR RPV top bend "dog house."

This shows the installation of NUKON® with MSG on a pressurized top bead.

NUKON® pipe insulation installed inside the drywall of a BWR

PCI ENGINEERED SYSTEMS GROUP

When the Engineered Systems Group (ESG) was formed as a branch within Performance Contracting, Inc. in the 1970's, we were guided by a set of goals that remains true today—develop superior products, deliver our goods and services as specified and on time; and solve our client's problems as though they are our own.

More than 40 years later, these goals have allowed us to establish and grow a loyal customer base not only in the Nuclear Market worldwide; but also in the Metal Fabrication Industry.

With PCI's strong financial position and national branch resources, ESG is capable of providing a superior range of services, purchasing power, experience, and knowledge to give you fast, reliable and comprehensive service for all your needs under our nuclear accepted QA program.

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