GD

ENERGY SERVICES

Servicios y tecnología para la industria

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DINR - CN

Desmantelamiento de instalaciones nucleares y radioactivas

GDES
Servicios de Desmantelamiento

Centrales Nucleares

Al finalizar una instalación su vida útil, todos sus componentes contaminados radiológicamente se deben agrupar en un almacén especifico

SOLUCIÓN QUE APORTA

Aporta soluciones completas para un proceso completo de desmontaje de equipos y sistemas de una central nuclear, además garantiza una gestión adecuada de los materiales residuales.

ALGUNOS CASOS DE ÉXITO

DDesmantelamiento de parte activas y descontaminación de elementos singulares en CN Valdellós I, desmantelamiento de celdas calientes de Ciemet.

TECNOLOGÍA

Descontaminación química, con abrasivos y chorro de agua.

Técnicas de corte orbital, plasma, oxicorte, corte con sierras mecánicas.

DINR - RE

Desmantelamiento de instalaciones nucleares y radioactivas

GDES
Servicios de Desmantelamiento

Reactores experimentales

Cuando un reactor experimental queda en desuso, sus componentes contaminados se agrupan en almacenes para material radiactivo, mediante técnicas de desmantelamiento

PROBLEMA QUE SOLUCIONA

Desmantelamiento completo de un reactor experimental.
Gestión de los materiales residuales de una instalación radiactiva.

SOLUCIÓN QUE APORTA

Metodología completa de desmantelamiento de un reactor experimental.

ALGUNOS CASOS DE ÉXITO

Desmantelamiento reactor Arbi.

TECNOLOGÍA

Métodos de desmontaje: troceado y desensamblado de componentes.
Medidas radiológicas para segregación y desclasificación de materiales.

DINR - CG/CC

Desmantelamiento de instalaciones nucleares y radioactivas

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Servicios de Desmantelamiento

Cajas de guantes y celdas calientes

Durante la operación de una instalación, se manipulan componentes con altos niveles de contaminación y/o tasas de dosis. Es necesario extremar la precaución desmantelando estos equipos.

PROBLEMA QUE SOLUCIONA

Manejo de contaminación alfa.
Desmontajes de recintos pequeños con muchos equipos con elevada contaminación.
Gestión de los materiales residuales de una instalación radiactiva.

SOLUCIÓN QUE APORTA

Segregación de materiales contaminados con radionucleidos alfa sin dispersión de la contaminación.
Extracción de depósitos con líquidos de media y alta actividad.

ALGUNOS CASOS DE ÉXITO

Desmantelamiento de la planta M-1 del Ciemat.

TECNOLOGÍA

Métodos de desmontaje: troceado y desensamblado de componentes sin dispersión de la contaminación alfa.
SAS especiales para el confinamiento de la contaminación alfa.
Aspiración de polvo con emisores alfa.
Corte de hormigón con hilo de diamante/sierra circular.
Medidas radiológicas para segregación y desclasificación de materiales.

DINR - CHD

Desmantelamiento de instalaciones nucleares y radioactivas

GDES
Servicios de Desmantelamiento

Equipos e Instalaciones Radiactivas

Es necesario segmentar algunos componentes de una instalación hasta alcanzar dimensiones que permitan su manipulación, transporte y almacenaje

PROBLEMA QUE SOLUCIONA

Permite trocear grandes componentes de acero en instalaciones donde no se pueda emplear el corte térmico. Los grandes componentes se pueden trocear in situ, ya que la herramientas es muy ligera y fácilmente desplazable de un lugar a otro. No se producen gases de combustión, por lo que los cortes se pueden practicar en recintos cerrados o locales poco ventilados. Permite cortar piezas de cualquier dimensión.

SOLUCIÓN QUE APORTA

Cortes mecánicos en ambientes donde no se pueda emplear el corte térmico o el mecánico que desprenda chispas y/o contaminación ambiental. Técnica totalmente mecanizada; no exige esfuerzo humano.

En piezas que presenten altas tasas de dosis, permite practicar el corte manteniendo una distancia o interponer un blindaje biológico entre la pieza y los mandos de control del equipo. Minimiza el volumen de residuos secundarios al no ser necesario disponer de elementos filtrantes para confinar la contaminación ambiental como ocurriría en el caso del corte térmico.

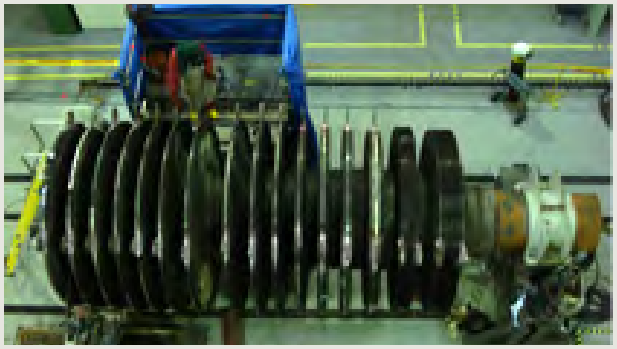
Permite segregar piezas de un componente mayor sin transmitir vibraciones ni calor al conjunto, condicionante que es muy importante en determinadas condiciones, p.ej. Cuando parte de los componentes de un equipo son combustibles o inflamables o su estabilidad está condicionada por la presencia de componentes frágiles.

ALGUNOS CASOS DE ÉXITO

- Troceado de rotores de turbina en CN Cofrentes (imagen inferior).
- Corte de grandes componentes durante el desmantelamiento de CN Vandellós I.

TECNOLOGÍA

Corte por hilo diamantado guiado mediante poleas y refrigerado por agua.



DESINI

Desmantelamiento de instalaciones industriales

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Servicios de Desmantelamiento

Las instalaciones industriales que hayan almacenado productos tóxicos y/o peligrosos, especialmente petrolíferos líquidos, requieren legalmente una limpieza y desgasificación (por empresa autorizada) previa al desmantelamiento

PROBLEMA QUE SOLUCIONA

Eliminación del producto contaminante, gestión/valoración del residuo, certificación homologada de instalación fuera de servicio y restauración de la zona.

SOLUCIÓN QUE APORTA

Acondicionar la instalación para su puesta fuera de servicio.

SECTORES DE APLICACIÓN

Industria petroquímica, eléctrica y en general todas aquellas que conlleven almacenamiento de productos tóxicos y/o peligrosos.

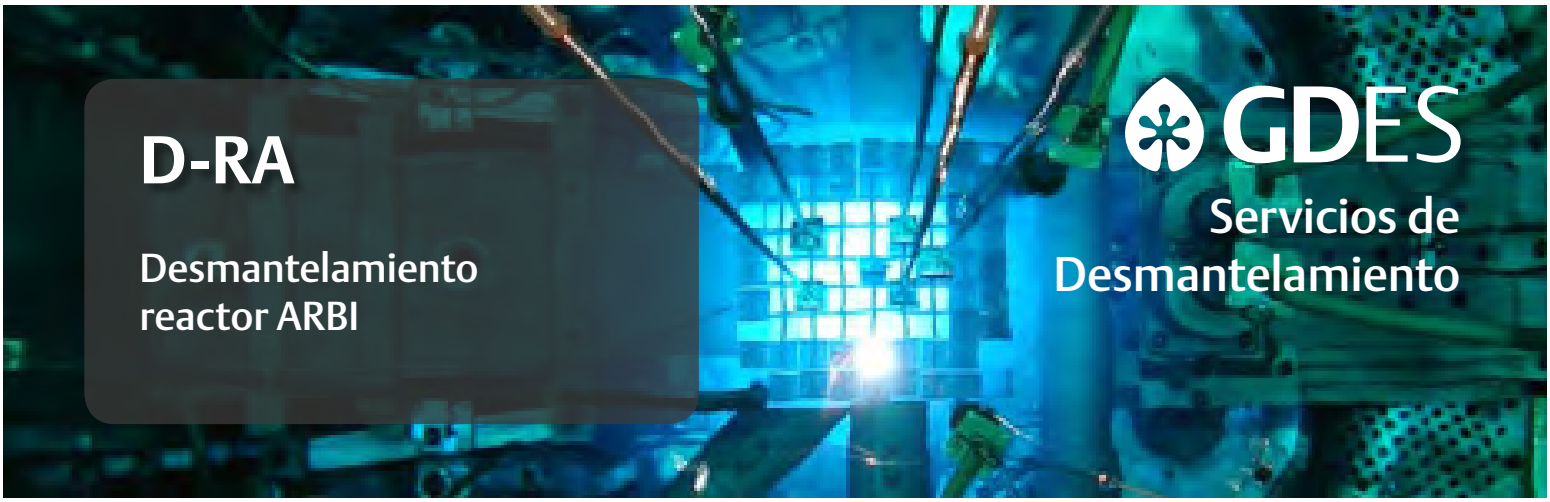
ALGUNOS CASOS DE ÉXITO

- FUA
- CIEMAT
- Vandellós I
- CNJC Almacén III
- C.T. Castellón I y II
- C.T. Escombreras IV y V
- Azucarera Ebro, Ciudad Real
- Azucarera Ebro, Peñafiel

TECNOLOGÍA

Descontaminación de equipos, útiles, herramientas, instalaciones y edificios.

Desmantelamiento



D-RA

Desmantelamiento reactor ARBI

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Servicios de Desmantelamiento

Desmantelamiento completo de reactor nuclear de investigación (10 Mw). Período Agosto-Diciembre 2004.

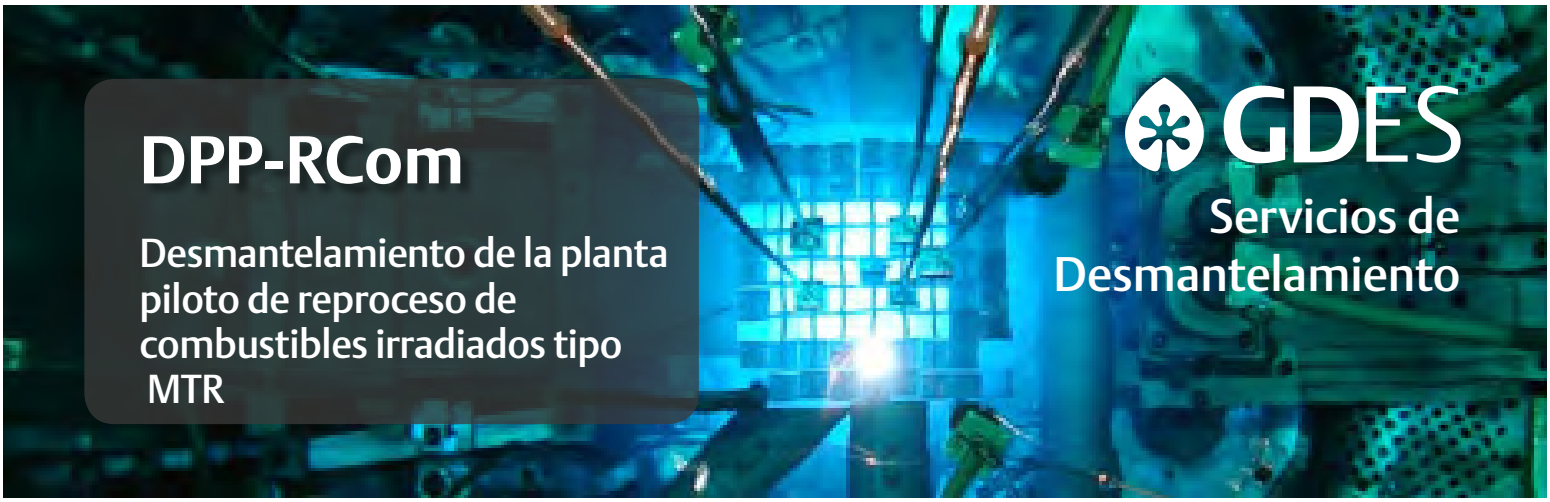
EJECUCIÓN.

- 4.062 horas-Hombre.
- 400 componentes metálicos.
- 618 bloques de hormigón.
- 411 bloques de grafito.

Monitorización de materiales para su desclasificación: 98.000 medidas de tasa de dosis y contaminación.

GESTIÓN DE RESIDUOS:

- Residuos sólidos inertes y reciclables: bloques de hormigón y metales. Evacuación por empresa gestora.
- Residuos peligrosos (grafito, Cd, parafina).
- Residuos de cableado y componentes electrónicos. Gestión de residuos radiactivos.



DPP-RCom

Desmantelamiento de la planta piloto de reproceso de combustibles irradiados tipo MTR

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Servicios de Desmantelamiento

Ed.18, zona Este del Ciemat – Madrid.

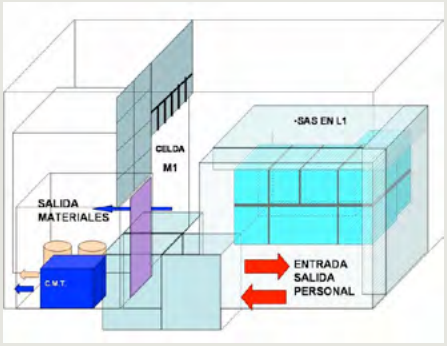
Planta diseñada para el tratamiento de elementos de combustible tipo placa del JEN1. Desarrollo de procesos de reprocesado de combustible.

ACTIVIDADES:

- Instalación de SAS.
- Estudio ALARA previo.
- Inventario físico y radiológico del interior.
- Sistemas auxiliares: aspirado de partículas, descontaminación, recogida de líquidos, plastificado y embolsado, blindaje, manipulación mecánica de cargas, suministro de aire respirable.

MÉTODOS DE TRABAJO:

- Aspirado inicial. Cañas de aspiración adaptables a la geometría del entorno de trabajo. Vigilancia periódica de los filtros del sistema de recogida de polvo.
- Corte y desmontaje de tubos. Cizalla hidráulica que permite un corte rápido y limpio. Corta tanto acero al carbono como inoxidable.
- Desembridado de tanques, componentes y blindajes. Corta tuercas y llaves manuales de desapriete de carraca.
- Retirada de tubos. Doble embolsado y a CMT.
- Retirada de tanques. Manual o con polipasto en función del peso. Retirada previa de líquido del interior.
- Corte de bancadas y soportes. Corte con cizalla hidráulica.



CN Vandellós I

Desmantelamiento de partes activas y descontaminación de elementos singulares

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PREVENCIÓN CONTAMINACIÓN:

- Uso de pinturas pelables para confinar la contaminación.
- Mantenimiento de la estanqueidad de la Celda mediante los sistemas de ventilación existentes y otros auxiliares.
- Montaje de SAS de acceso de personas, con módulo de duchas, zonas de cambio y ayuda al desvestido del personal que salía de la Celda.
- Montaje de SAS de transferencia de materiales, con objeto de evacuar rápidamente los objetos altamente contaminados, evitando cruzarse con el movimiento del personal de intervención.
- Uso de los trajes Mar-95 cuya característica diferencial respecto a otros trajes con respiración asistida es que el aire es conducido en el interior del traje a través de una máscara con filtro.

REDUCCIÓN DE EXPOSICIÓN A RADIACIÓN:

- El uso de telemanipuladores existentes en la Celda para retirar los materiales más activos, a través del SAS superior.
- El uso de filtros prehormigonados y HEPA para aspirar el polvo de la Celda.

ASPECTOS CRÍTICOS DEL DESMONTAJE:

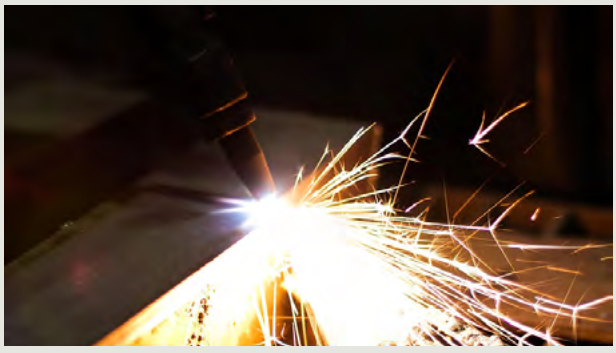
- Asesoramiento técnico del personal que trabajó en su mantenimiento durante la vida útil del equipo, facilitando el establecimiento de la secuencia de desmontaje.
- Una aspecto importante ha sido el poder disponer de los útiles específicos de desmontaje y maniobras de la máquina empleados durante su mantenimiento.
- Utilización del poste de mantenimiento como soporte para la instalación de recintos de confinamiento, con objeto de tratar los materiales en función de sus niveles de radiación y contaminación.
- Uso de blindajes durante la fase de desmantelamiento, como medio de reducción significativa de dosis.
- Eliminación del polvo de grafito y alambres activados, que presentaban muy altos niveles de radiación, como actividad previa al despiece del recinto inferior.

TÉCNICAS DE DESCONTAMINACIÓN:

- Descontaminantes químicos específicos.
- Abrasivos.
- Chorro de vapor.

TÉCNICAS DE CORTE Y SEGMENTACIÓN: (EN FUNCIÓN DEL MATERIAL Y DE LOS RIEGOS RADIOLÓGICOS).

- Torno orbital.
- Oxicorte.
- Amoladora.
- Sierra de sable.
- Sierra de cinta.
- Sierra de vaivén.



Decommissioning Case Studies

CIEMAT

(Center for Energy, Environmental and Technological Research)

GDES

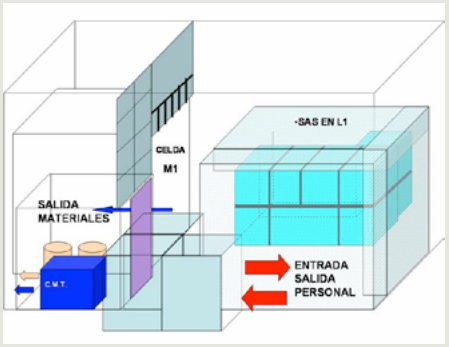
GDES Decommissioning Experience

PROJECT DESCRIPTION

The project consisted of the dismantling of all the nuclear and radioactive facilities in the so called East Part of a Nuclear Research Centre (CIEMAT) in Spain.

The main facilities involved in this project were:

- Radioactive Liquid Waste Conditioning Building.
- Fuel Assembly Reprocessing Plant M-1.
- Radioactive Liquid Waste Storage Facility.



SERVICES PROVIDED

- Pre-conditioning of working areas.
- Designing and construction of specific auxiliary facilities for decommissioning.
- Characterization of radiological areas.
- Dismantling works.
- Implementation of ALARA Programme.
- Management of solid and liquid radioactive waste.

ADDED VALUE

Unique work in Spain in a effective and efficient way, optimizing resources, equipment, wastes and doses according to the ALARA principle.

Know-How:

- Paintings and cleaning inside in order to avoid the spread of contamination.
- Collected dust in shielded filters.
- Cutting and desassembling pipes Hydraulic shears.
- Removal of piping - Double bagging.

RESULTS

- 4427 men x hours.
- 62 Tn treated materials.
- Neither external nor internal contamination detected.
- Collective Dose:
  - M1 Hot Cell: 6 manxmSv.
  - F-1 Hot Cell: 10 manxmSv.

Decommissioning

VANDELLOS I NPP

GDES Decommissioning Experience

PROJECT DESCRIPTION

It was a 508 MWe carbon dioxide gas cooled reactor modeled. It was shut down on July 31, 1990, following a fire in one of its two turbogenerators in October 1989.

Decommissioning description:

- Decommissioning of active parts (Thermal and mechanical cutting).
- Dismantling and demolition of building reactor and pools.
- Equipment, walls and singular elements “in situ” decontamination.
- Building the weather protection of the reactor and preparing the insfrasture for latency period.

SERVICES PROVIDED

- Selection of different cutting techniques according to the radiological and physical conditions.
- Selection of different decontamination techniques according to the radiological and physical conditions.
- Segregation and conditioning of waste.
- Characterization of materials.
- New weather protection calculations.

ADDED VALUE

- Detailed study before the beginning of the works.
- Split the project into a measurable packages.
- Waste routes available all the time.
- Use of experienced and specialized personnel.
- Personnel with previous experience in decontamination.
- Use down times to do the specific works without inteferfences.
- Use of expansive foam before the pipe cutting.
- Use of specificic filtration system (pre-concrete filters).
- Type of materiales used:
  - Crane.
  - Pyramid bottle gas.

RESULTS

Materials removed:

- Aluminium – 10 Tn
- Copper – 44 Tn
- Carbon steal– 14300 Tn
- Stainless steal – 149 Tn
- Lead – 41 Tn
- Wirings – 141 Tn
- Concrete – 7900 Tn
- Thermal coatings – 108 Tn
- Shieldings – 588 Tn
- Other – 100 Tn

ARBI RESEARCH REACTOR

GDES

GDES Decommissioning Experience

PROJECT DESCRIPTION

Decommissioning and waste management of the research reactor ARBI (Argonaut Type) 10 kW in Bilbao (Spain).

SERVICES PROVIDED

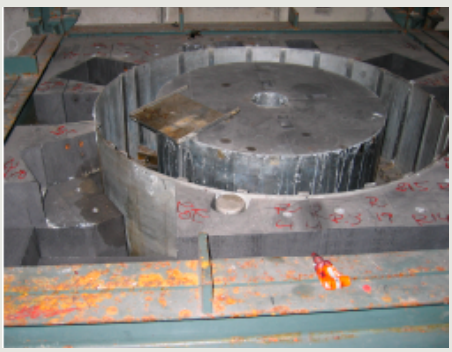
- Design decommissioning document packages.
- Planning and scheduling.
- Implementation works.
  - Pre-decommissioning activities.
  - Disassembly of equipment and systems.
  - Decontamination.
  - Sampling and smear tests.
  - Characterization of radioactive waste.
  - Routes for disposal.
  - Packaging and shipment of radioactive waste.
  - Monitoring of radiological areas, personal and area dosimetry.
- Waste Management.

ADDED VALUE

- In-time delivery of the entire nuclear decommissioning activity,
- Quality aspects of dismantling and radiological protection independently monitored by labein and inspected by CSN with fully satisfactory results.

RESULTS

- 100 % of the program implemented on time:
  - 4.062 men-hour.
  - 400 metallic components.
  - 618 concrete blocks.
  - 411 graphite blocks.
- Materials monitoring: 98.000 measures between dose rate and contamination.
- Site de-licensing achieved without any accident.



CISAM RESEARCH REACTOR

GDES

GDES Decommissioning Experience

PROJECT DESCRIPTION

Removal of the pool water nuclear reactor RTS-1 “G. Galilei” and storage tanks, and conditioning of radioactive material inside.

- Define a discharge formula for the reactor water.
- Treat the reactor pool water and other deposits.
- Discharge the water in the Canale dei Navicelli without any radiological restriction.
- Decommission the components existing inside the reactor pool and other places of the installation.
- Manage the waste according to their waste routes.
- Radiological characterization of the waste.

SERVICES PROVIDED

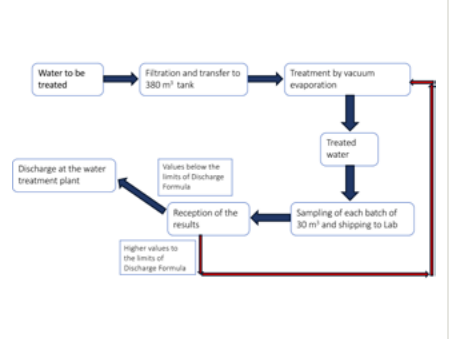
- Design decommissioning document packages.
- Definition of the discharge formula of liquid effluents and gaseous nuclear reactor.
- Treatment of the pool water and the storage tanks.
- Decommissioning of the mobile and fixed, activated and/or contaminated material in the pool of the reactor and in other locals of the Centre.
- Decontamination.
- Waste Separation and classification and characterization.
- Design and Control of radiological protection measurements. Radiation Monitoring of radioactive waste.
- Organization and implementation of ALARA.

ADDED VALUE

- Whole project adapted to the legal and technical requirements of the country Italy.
- Design of the shielded containment for a ***Ra-Be Source.***
- Use of tweezers and pneumatic tools designed to rescue objects from the pool floor.
- Re-use of the liquid waste from the evaporator for the concrete of CC500 drums.
- Necessary to study different scenarios to make the discharge in safety conditions, taking into account the dose limits legislated for the workers and the population, in order to obtain a discharge formula.

RESULTS

- Achievement of the objectives of the project with a schedule reduction.
- Approximately 700 m3 of treated water discharged
- The discharge radionuclides concentration were lower than calculated.
- 24.268 Kg of materials were introduced inside the 80 drums of type CC500 and filled with concrete.
- The total amount of personnel hours for the development of the project were 23.026 men-hour:
  - Water Treatment Team: 5.986 men-hour.
  - Decommissioning Team: 9.336 men-hour.
  - RP Team: 7.704 men-hour.
- Non work accidents.
- Non internal/external contamination.



TRINO NPP

GDES Decommissioning Experience

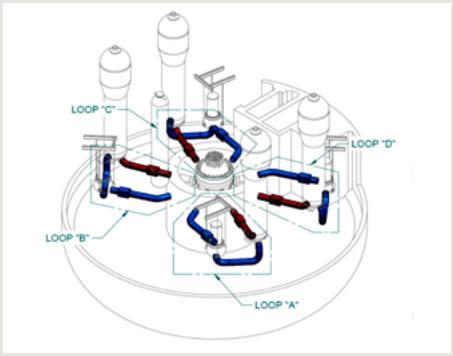
PROJECT DESCRIPTION

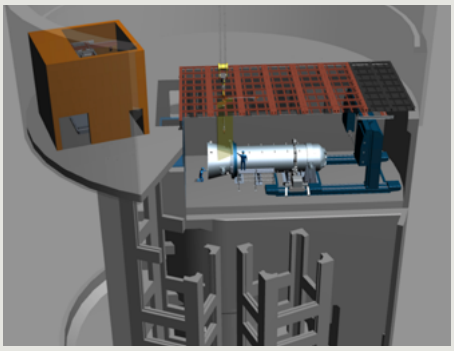
Decommissioning of Big Components: Steam Generators, Pressurizer, Pumps, Primary Circuit, Auxiliary Systems...

Remote decommissioning of big components by means of Big band saw and robotised arms in a specific confinement.

SERVICES PROVIDED

- Design decommissioning document packages.
- Planning and scheduling.
- Designing and construction of specific auxiliary facilities for decommissioning.
- Manual decommissioning.
- Remote decommissioning.
- Segregation and classification of waste.





JOSE CABRERA NPP

[Internals and vessel reactor cutting project]

GDES

GDES Decommissioning Experience

PROJECT DESCRIPTION

- The Project consisted of the support to **segmentation of the reactor vessel and internals** in José Cabrera NPP (Spain).

SERVICES PROVIDED

- Cutting and removal of concrete walls between the Spent Fuel Pool and reactor cavity.
- Removal of the fuel racks from the SFP.
- Removal of upper and lower internals and Vessel.
- Cleaning and filtering of the SFP and reactor cavity.
- Decontamination of cutting tools.
- Removal concrete and steel parts from reactor cavity walls and floor.
- Construction of new concrete floor in reactor cavity.
- Cutting and segmentation reactor vessel head tubes.
- Large components underwater dose rate measurements.

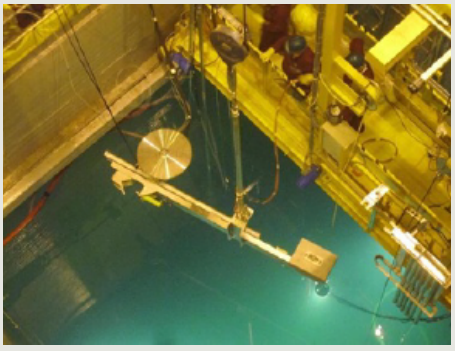
ADDED VALUE

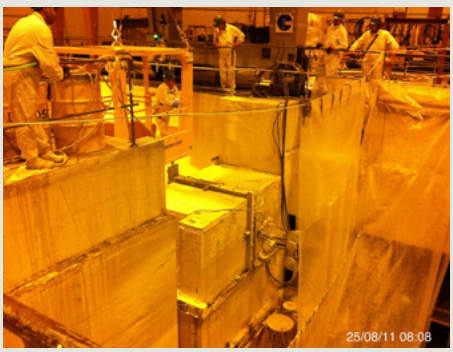
- Water recycling system based on a close circuit during diamond wire cutting.
- SFP Liner repair with divers and remote techniques.
- Thimble conduits cutting – resin injection.
- Design of lifting tool for the removal of fuel racks.
- Trails and mock-ups before the execution of the works.
- Design of a water distributor to avoid the environmental contamination during the drainage of pools.

RESULTS

See videos and photos:

- Wall diamond wire cutting.
- SFP Internals segmentation & packaging.
- SFP Liner Repair.
- Vessel movement.





JOSE CABRERA NPP

[Cutting Workshop]

GDES

GDES Decommissioning Experience

PROJECT DESCRIPTION

The Project consisted of the cutting of metals and decontamination of concrete blocks in a special enclosure.

The main activities were:

- Transport of the materials to be cut or decontaminated from the present storehouse to the enclosure.
- Cutting of metallic elements as: Racks, Old Pulley of Omega Crane, vessel top, Steam Generator model, biological shields.
- Decontamination of big pieces of concrete: concrete blocks from the cavity walls.

SERVICES PROVIDED

- Classification and segregation of the waste.
- Radiation and contamination control of materials and people.
- Execution of dismantling techniques as: mechanical and thermal cutting, diamond saw cutting, plasma cutting.
- Decontamination: mechanical decontamination.
- Transport the decontaminated concrete blocks to the specified location.
- ALARA studies.

ADDED VALUE

- Install a specific enclosure with curtains inside the main enclosure to avoid the spread of contamination
- Filtration system in recirculation with self-cleaning filters
- Cutting expert to know the best technique to do the cut: plasma, oxy-propane...
- Elaboration of specific document to calculate the LDCA according to the contamination and type of cutting machine

RESULTS

- 100 % decontamination of concrete blocks
- More than 100 Tn of metallic elements
- Non internal/external contamination

JOSE CABRERA NPP

[Decontamination Workshop]

GDES

GDES Decommissioning Experience

PROJECT DESCRIPTION

Construction and operation of a decontamination workshop.

Propose the methodology to decontaminate and the technical solutions to carry out the main objective.

Design of the decontamination workshop, including the supply, mounting, tests and the start-up.

The decontamination workshop consist of:

- Chemical baths.
- Metal blasting cabin.
- Manual decontamination.
- Characterization area.
- Waste segregation area.

SERVICES PROVIDED

Chemical baths

- Metal blasting cabin.
- Manual decontamination.
- Characterization area.
- Waste segregation area.

During Operation

- Classification and segregation of waste.
- Operation of the metal blasting cabin and chemical baths, and manual descontamination.
- Maintenance of the decontamination workshop.
- RP measures.

ADDED VALUE

- Test in laboratory to identify the best techniques and amount of H2SO4 decontamination.
- Reduction of the volume of medium and low activity materials, so it implies an economic save on waste management.
- Selection criteria on the kind of decontamination for different materials it's done with previous experience and tests in laboratory.

RESULTS

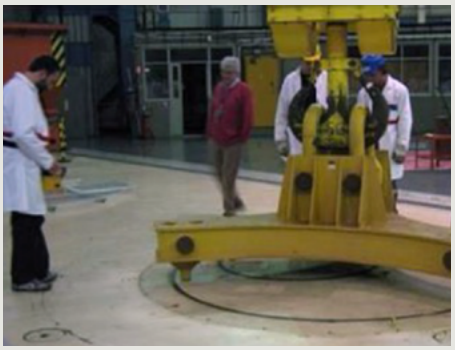
- Treatment of 100 Tn of medium and low activity materials, reducing to a very low activity materials.

JRC ISPRA RESEARCH CENTRE – RP

GDES Decommissioning Experience

PROJECT DESCRIPTION

4 years as nominated subcontractor for Iberdrola Ingeniería y Construcción S.A.
This project was awarded for 4 more years (2010-2014) with a bigger scope than the first one.
The project consists of providing Radiation Protection Assistance services in support to JRC-ISPRA's Radiation Protection Sector for its activities (mainly in support of the Nuclear Decommissioning and Waste Management Programme).



SERVICES PROVIDED

- Dose and contamination measurements.
- Maintaining shutdown nuclear installations in a state of safe conservation.
- Management of radioactive waste: Segregation and classification of waste.
- Preparation of RP technical documentation (measurement reports, technical notes, etc.).
- Maintaining radiometric instruments used for Radiation Protection purposes in good operational conditions.
- Specific laboratory activities, related to external and internal dosimetry.
- ALARA organization and implementation of the ALARA approach.

ADDED VALUE

- Support with experienced personnel and GDES know-how accumulated during 30 years in Nuclear Power Plants in Spain.
- Ability to develop all kind of RP tasks.
- Personnel with multidisciplinary abilities, languages and high level of education (University degree).
- Availability of qualified personnel in a short period of time.

RESULTS

In the frame of the D&WM Programme, the goal of this project was the decommissioning of the RCHL up to the so-called "brown field" status without any radiological constraints:

- Physical and radiological characterization.
- Dismantling activities.
- Waste management activities.
- Final radiological survey.
- Final official release of the facility.

JRC ISPRA RESEARCH CENTRE – A52

GDES Decommissioning Experience

PROJECT DESCRIPTION

Design an aerial transfer system for the transfer of 42 m3 in the Ispra Joint Research Centre (JRC) in Italy.

The transfer system must ensure no uncontrolled spillage occurs in the event of the bursting of the pipe.

Decontamination of the tank interior to minimum levels of 0.4 Bq/cm2 for alpha and 4 Bq/cm2 for B and minimising liquid and solid waste.

SERVICES PROVIDED

Design phase:

- A prior visit to the location and record of data.
- Design a technical solution and its structural calculation.
- Calculation of the estimated man-dose.

Execution stage:

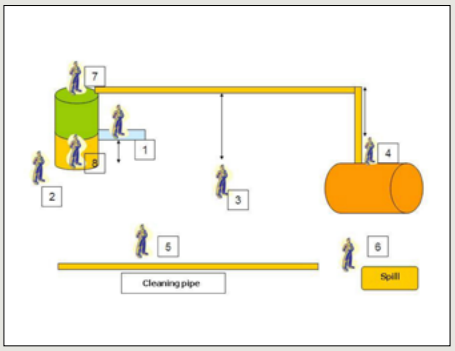
- System assembly: Enclosures and Transfer System.
- Sludge transfer through a double containment pipe.
- Decontamination of the tank using CO2.

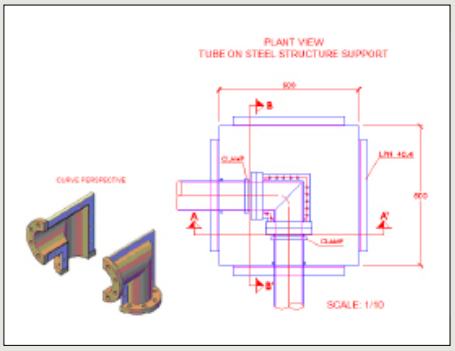
ADDED VALUE

- Decontamination by means of CO2 pellets (No secondary waste generated).
- Aerial transfer system designed to avoid interferences.
- Double containment pipe to ensure that no uncontrolled spillage occurs.
- Leak detectors inside the double pipe, at the beginning and the end of the pipe.

RESULTS

- Sludge transfer was done in 4 days (6 h working day) by means of a peristaltic pump.
- Decontamination process with CO2 took 2 days, using 600 kg of CO2 aprox.
- Final liquid waste was 200 l. It was expected 500 l.
- Final solid waste was 90 kg. It was expected 100 kg.
- All the smear tests done to the tank to measure the removable contamination were below the established limits.





COFRENTES NPP

GDES

GDES Decommissioning Experience

PROJECT DESCRIPTION

- Cutting of 10 racks and waste management.
- Decontamination, dismantling and cutting of 2 turbine rotors, 72 diaphragms and 24 MSR's and waste management.

SERVICES PROVIDED

- Thermal cutting:
  - Plasma cutting.
  - Thermal torch.
  - Oxy-cutting.
- Diamond wire cutting.
- Decontamination:
  - Metal blasting.
  - Chemical decontamination.
- Radiological control of materials for free release and waste management.

ADDED VALUE

- Turbine rotors and MSR's to a radiological measurable elements.
- More than 95% of decontaminated material to free release.
- Water recycling system based on a close circuit during diamond wire cutting.
- Different decontamination techniques according to the element: turbine rotors or MSR's tubes.

RESULTS

Materials removed:

- MSR's – 123 Tn
- Diaphragms – 320 Tn
- Turbine rotors – 350 Tn
- Racks's – 140 Tn

Decontaminated material for free release: 800 Tn