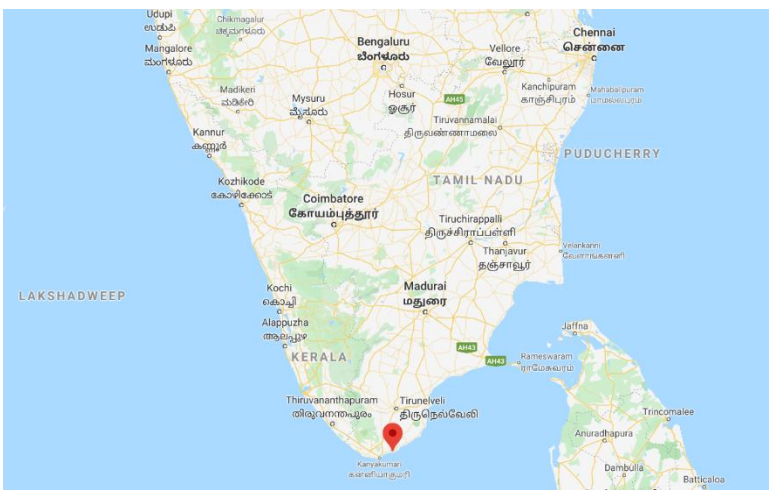


CASE STUDY REF: 028

## SPECIAL AIR CUSHION VALVE FOR NUCLEAR POWER PLANT UNIT 1 & UNIT 2, KUDANKULAM, TAMIL NADU, INDIA



### Location:

*Kudankulam Nuclear Power Plant is the largest nuclear power station in India, situated in Kudankulam, Tirunelveli-Kattabomman district in the southern Indian state of Tamil Nadu.*

### Purpose of Kudankulam Nuclear Power Plant project:

*As a developing nation, India needs energy to support its future industrial & domestic energy demand. Due to limited availability of the primary resources, it is necessary for India to tap all the resources in parallel, including Nuclear. The Kudankulam Nuclear Power Station is free from Green-House Gas, Fly Ash and Eco-Submergence and is a major supplier of large amount of electricity for the development of Tamil Nadu and its neighboring states in India. Its production life is of 60 years, which can be extended by another 20 years.*

### Challenge of cooling water pipeline of the Nuclear power plant:

*In this plant, sea water available in its vicinity is being used for cooling of the reactor. Since continuous cooling is critical, the cooling water pumps on their tripping are restarted within 30 seconds. This sudden tripping and restart of the pumps cause collision of water present in the cooling circuit with the new water supplied on restarting of pumps in short time. This collision gives rise to pressure surge, that may be detrimental for the pipe.*

### Application of Air Cushion Valves in Pipelines

*In Cross-country pipelines, Air Cushion Valves are being widely used for effectively controlling pressure surges arising due to tripping of pumps. It diminishes surges by its effective vacuum breaking and air management. By venting the air controlled manner, this valve cushions the collision of oscillating water columns during the surge event and restarting of pumps to feeble the pressure surge.*

*After careful engineering, Air Cushion Valves were put to trial in the project. Upon successful trials, the valves were found suitable for this special application. The valves were then modified according to the observations during the trials and requirement of this application.*

### Project Details

|                               |   |
|-------------------------------|---|
| <b>Project</b>                | Kudankulam Nuclear Power Plant UNIT 1 & 2   |
| <b>Owner</b>                  | Nuclear Power Corporation of India Limited (NPCIL)                                |
| <b>Engineering Contractor</b> | Built in collaboration with Atomstroyexport, the Russian state company and NPCIL. |
| <b>Reactor type</b>           | Pressurized water reactors (PWRs)   |
| <b>Units</b>                  | 2 × 1000 MW VVER  |

| Beneficiary States | Power (MW)      |
|--------------------|-----------------|
| Tamil Nadu         | 925 MW          |
| Karnataka          | 442 MW          |
| Kerala             | 266 MW          |
| Puducherry         | 67 MW           |
| unallotted         | 300 MW          |
| <b>Total</b>       | <b>2,000 MW</b> |



**Role of Jash make SURESEAL Air Cushion Valves at Kudankulam Nuclear Power Plant:**

The Jash make SURESEAL Air Cushion Valves are self-actuated. These valves have separate ports for air inlet and for its exhaust. On tripping of pumps, the large air inlet ports ensure high air inflow rate, and instantaneous vacuum braking.

Upon restarting of the pumps, (in less than 30 sec of tripping in this case) air sucked-in during vacuum breaking is now released in controlled manner through air outlet port. The air in pipeline during this time provides cushion to the colliding water columns, which otherwise give rise to pressure surge.

Due to its self-actuation feature and separate inlet and outlet ports, JASH Air Cushion valves operate immediately in response to the pressure change and facilitate effective air management.

| Air Cushion Valves (ACV) Details |   |
|----------------------------------|---|
| ACV Size                         | 150 NB                                      |
| Quantity                         | 8 nos (unit-1) & 10 nos ( Unit-2)           |
| Manufacturer                     | JASH Engineering Ltd.                       |
| Operation                        | Self-actuated                               |
| MOC                              | Duplex Stainless Steel (UNS 32205)          |
| Client name                      | Nuclear Power Corporation of India Limited. |

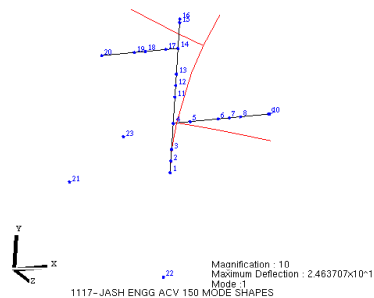
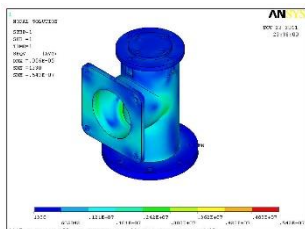
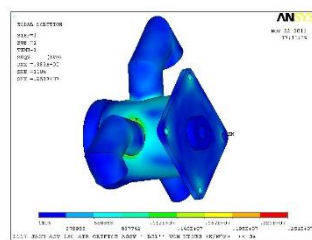
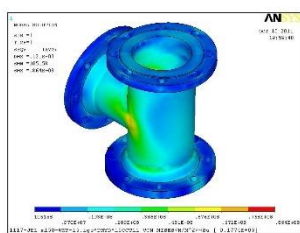
**Engineering changes made to the SURESEAL Air Cushion Valves to meet the challenge:**

The design of Air Cushion Valve is modified to suit the NPCIL requirements including the mandatory seismic requirements. Since the medium is sea water, these valves are made in Duplex stainless steel.

Necessary design upgradations are done for enhancing sensitivity, higher reliability, long working life and improving its characteristic of the valve.

Design is modified to make it spillage free. They are equipped with separate breather to allow effective air inlet and venting for the special operating conditions.

After supply of these SURESEAL Air Cushion Valves to Kudankulam Nuclear power plant in 2011. Such valves are then supplied to various other nuclear power plants of the country.



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