

CONSIDERATIONS FOR THE USE OF SEA WATER IN FIREFIGHTING

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Introduction

- We have a serious water crisis at present ...
- Will it get better or worse?
- What do we as the *Fire Industry* to conserve water?
- What if we get to a stage where there is inadequate drinking water?



Risk Assessment

- The starting point for any fire protection design is a QRA (Quantitative Risk Assessment).
- The two components of the risk assessment being Probability and Severity. The risk can then be estimated and compared against certain acceptable criteria. Potential major hazardous events can be identified together with different types of fires that can be expected. For example: pool fires, pressure fires, flash fires, vapour cloud explosions, etc.

Risk Assessment



- **Quantitative Risk Assessment to determine:**
 - What is the greatest risk based on a credible scenario
 - What capacity of water is required to deal with the scenario e.g. 40 000 lpm of water
 - Will foam be needed – what type

This will guide the size of pumps and dimensions of mains to supply the water

Legal Obligations

What are we trying to protect?

Is it an **MHI (Major Hazardous Installation)** or a factory.

There are many factors that need consideration.

Is there a need for an AIA (Approved Inspection Authority) to carry out the QRA. What about insurance requirements that may need to be satisfied. There are applicable standards that need to be met for example SANS / NFPA / API.

Local Bylaws or Acts need to be complied with as well.



Legal Obligations



If you are going to use sea water, then there is a requirement for water licences. Environmental considerations as sea water can cause temporary damage to crops and or soil.

Where will your run off water from firefighting go to?

Is there a need for bunds or drains leading to a sump for treatment?

What type of treatment will you use ?

Legal Obligations

- Water Licences
- Environmental Controls
- MHI / OHS
- Insurance



PLANNING

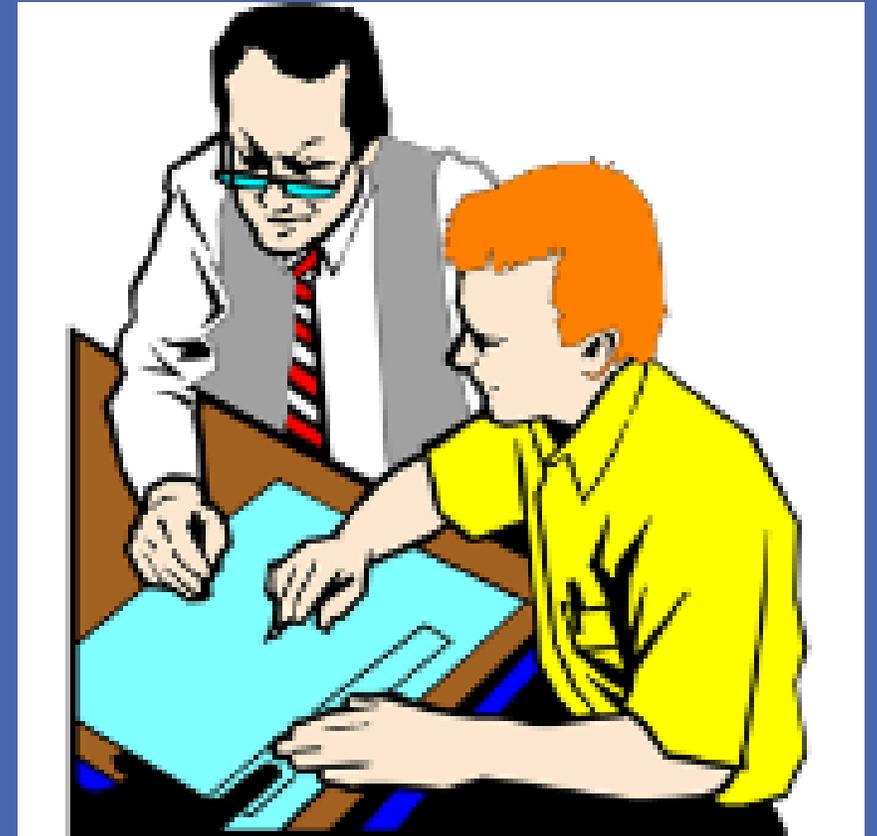


When you enter into a project that includes the installation of a fire pump, you must perform an analysis of the complete system requirements to ensure that you provide an approved and functional installation.

The main goal is to provide a well engineered, adequately sized, and reliable water supply necessary for fire protection for years to come.

PLANNING

- The risk assessment will guide the Fire Protection design and financial estimates are extremely important for the project to be sustainable.
- The Design of the fire fighting system must address the QRA.
- The design must consider the following:



Resistance to Corrosion: Bronze

Sea salt, due to the high salinity, generates corrosion in metals, such that damage to the machinery incurred would be irreversible. The Engen pumps have an internal epoxy coating to resist the corrosive nature of seawater.



Design

- Redundancy
- Manpower for manual start up
- Pipe work and Ring main
- Spacing of hydrants , size of hydrants , accessibility , testing against closed outlets (maintenance) , Cathodic protection



Pumps

Jockey Pump

An electrically driven jockey pump will be needed to ensure the design pressure is continuously maintained throughout the system.

- There should be 2 jockey pumps – one in use and one on standby.
- A backup diesel generator is needed in case of failure of the mains power supply.

Should the mains power supply fail, the jockey generator will start automatically and the transformer is replaced as the primary source of power.

When mains power returns - the transfer device will after a few seconds automatically transfer power back to the primary source, the transformer

Main Pumps

- The main pump is required to supply the required firefighting pressure and comes into operation once the jockey pump cuts off due to the inability to maintain the required pressure.
- Critical here is the need for redundancy - if the water requirement is 40 000 lpm and there are 2 pumps which can each supply 20 000 each, then there should be a third pump as a standby in the event one pump is out of commission.
- Pumps will need to have a stainless steel suction strainer at the inlet.
- Consider the terrain and distances (booster pumps)

Main Pumps

- Main Generators are needed as back up and the tank should have adequate diesel for 12 hours. The generator is designed to start up at a pre- determined pressure, for instance if the mains pressure drops below 5 bar, then the main generator will start up and when full speed is reached the associated pump starts and when the pump reaches operating speed, the pump control valve opens.
- After 60 seconds pass and the pressure of the mains does not reach 10 bars, the second combination of generator and pump starts and so forth.
- A pump station is needed to house the pumps and control panel.
- Jockey and main pumps may also be manually started.

Pipework

- The system should be ring mains having at least two points of supply so that, in the event of a break anywhere in the line, an alternative flow path is always available.
- Pipes used in the system could be 508mm external diameter mild steel pipes with a wall thickness of 6mm. Internally a 12,5mm thick spun cement lining can be provided and externally pipes can be protected against corrosion by two layers of bitumen-impregnated fibre glass.
- Pipes should be laid underground with sufficient cover to avoid damage by heavy axle loading.
- All piping should be pressure tested to 32 bars prior to acceptance.

Isolating valves

- The pipe reticulation should have butterfly valves in positions which enable any section of pipe between tee pieces to be isolated. Thus, in the event of a break or a leak in the line, the appropriate section can be isolated without the supply to any individual site being affected. Each supply point to a site must be *valved* separately.
- Each valve must be housed in a chamber and operated by a special key without the valve chamber being opened. The steel cover plate is provided with a screwed plug which is removed and a special key inserted. The key is turned clockwise, when viewed from above, to open the valve.



Hydrants

- Hydrants, mounted on top of the seawater mains, should be spaced at approximately (60 m) intervals (could be less depending on the risk) and must be accessible by road. Each hydrant should have at least 4 outlets, and all 4 must be either connected or blanked prior to opening the gate valve

Bleeding the Pipe Reticulation

- Due to its compressibility, it is desirable that as little air as possible be entrapped in the system. If, however, it is necessary to empty the pipeline, then re-filling should be carried out slowly with a number of hydrants, uniformly distributed over the reticulation, opened.
- Once water emerges, the hydrants should be closed and the pressure in the system brought to not more than 0,5 bars. At this stage the main pumps should be locked out by operating the STOP button of each main pump. With only the jockey pump operating, one hydrant in turn should be opened slowly until water, with no entrapped air, emerges and the valve should then be closed.
- Upon completion of the operation the RESET buttons for the main pumps should be operated.

Flushing

- Upon completion of construction the complete pipe reticulation needs to be thoroughly flushed. Fire equipment that is used during exercises or incidents must be thoroughly flushed with fresh water to prevent rusting.

Foam

2 options - CFI (Central Foam Injection) system or Foam Tankers

- A CFI system requires careful consideration of the siting of the Foam Storage Tanks in relation to the furthest point being protected.
- The disadvantages of the CFI system being the exorbitant associated costs and delays in reaching distant points. The system will require storage tanks, pumps, inductors and generators etc. similar to the set up of the main pump/s. A scour valve is needed and the scour valve must be opened to flush out the sea water before foam solution can be introduced into the foam equipment.
- Foam Tankers can be deployed to the emergency and foam can be introduced into the sea water system fairly quickly.

Drainage

- **With the large volumes of water available firefighting operations will result in large amounts of water run-off. Careful planning is needed to ensure there is no damage to the environment. There will be the danger of burning product reaching the sea. The runoff must be controlled and separated from the storm water drainage. Based on the quality of the water there may need to be treatment of the runoff water. Sampling points are therefore needed.**

Maintenance and Testing

- **Planned routine maintenance is essential for the efficiency and readiness of the sea water system. Annual pump curve tests are mandatory. Working against closed outlets can create extreme pressures and there will be a need for spill back valves that need to be opened to ensure that the test pressures do not cause damage to the pipework.**
- **The test and maintenance procedures must be clearly understood by persons that are responsible for the sea water system. It is an added advantage to have a DVD made for orientation purposes. Staff turnover is a normal occurrence and there needs to adequate persons competent to oversee the sea water system.**

Conclusion

The use of sea water for firefighting purposes works extremely well if the maintenance and upkeep of the system is strictly adhered to. The firefighting water will be readily available for the largest fire that may break out.

Remember: Plan – Consult – Verify – Implement – Train – Maintain

