NORR SYSTEMS KOREA

- **Chemical Injection Package**
- **Wellhead Control Panel**
- **High Integrity Pressure Ptrotection System**
- **Deck Machineries, Winches and Derricks**
- **Emergency Fire Pump**
- **Emergency Generator Package**

Chemical Injection Package

> General

Chemical Injection Package for topsides and subsea are systems that are used to inject certain chemicals in to areas where they are required.

The Package can be for single injection output or militi chemical systems and the pumps used are accoding to API 674 / API 675 latest edition. They can be either diaphragm type or plunger pump with manual or automatic stroke control. These pumps can either be electrically operated or air operated. The pressure and flow rates can be customized according system design requirements Calibration pots or calibration gauges for the accurate setting of the pumps are provided and pulsation damper can be situated at along the discharge to remove any pulsation generated by the pumps.

The chemical storage tanks needed to stroe the chemicals can be made of SS316, SA36 or GRP and is usually mounted on a common skid with the pumps. the tanks shall cme with level gauges, level transmitters etc as part of the instruments.

If the complete package is placed in a hazardous environment, the electrical equipment and instruments shall come with the relevant ATEX certificates.

> Manufacturing Standards

- API 674 / API 675 latest edition
- ANSI / API 2000
- NR 10, 12, 13, 26
- IEC 529

> Class Standards

- ABS / BV / DNV

> Applications

- Asphaltines
- Emulsions
- Hydrates
- Defoaming
- Paraffin
- Scavengers
- Corrosion
- Demulsifiers

> Material Used and Design Cuts

- Positive displacement chemical pumps (Diaphragm Single / Double) / Material - PTFE
- Corrosion resistant steel, SS316
- Heavy duty structural steel skids, blasted, primed, finished Coated with two-part epoxy
- From carbon steel to specialty alloy
- Fully instrumented and controlled
- Scale

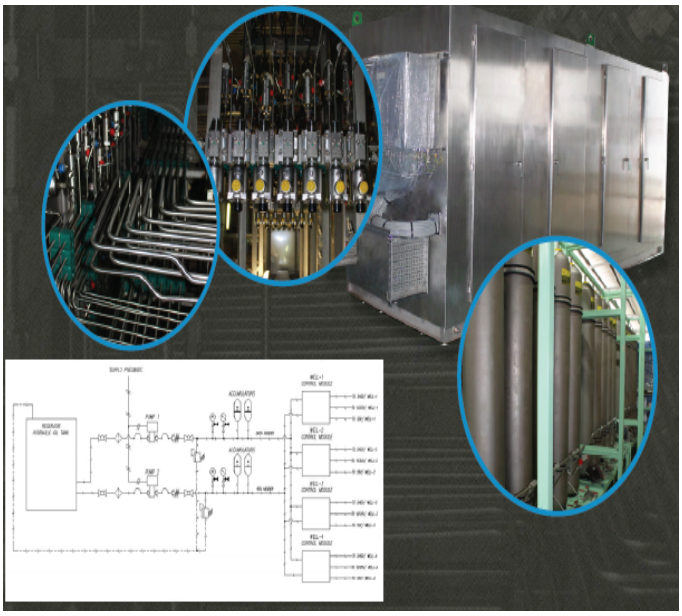
Wellhead Control Panel(WHCP)

> Generalal

Norr systems can provide complete design, supply, installation, commissioning and services for Wellhead process and Control Systems and Power Generation Units.
These include pneumatic, hydraulic and electronically automated control and safety shutdown systems for both manned and unmanned offshore installations.
Our long and proven track record in providing solutions to the offshore oil and gas markets has enabled us to come up with versatile and customized solutions which can withstand hazardous and contemporary environments.

The Well Control Panel is a pneumatic/hydraulic control unit designed to safely operate the three main safety valves(WV, SSV & SCSSV installed on a producing well. Not limited to this, it is also used to operate other actuators and valves. The unit can be sized in accordance to customer's requirements to control the number of wellheads.

Each well has individual manual and automatic contorl features to allow the well to be shutdown in sequence according to the pneumatic logic control or program logic control ((PLC).
To achieve this, the Wellhead Control Panel/Rack consists of various pressure switches, sensors and solenoid valves.



> Range of Application

- The equipment is used to actuate the subsea valves of the Christmas tree. These valves are actuated by single acting spring loaded actuator which required holding opened by Hydraulic Pressure under normal operation.

- This unit is designed as SSD (Safety Shutdown) system as per latest technical specifications and the catual working conditions. Apply to the effective control of SSV (Surface Safety Valve), SCSSV (Surface - Controlled Subsurface valve) and wing valve.

> Material Used and Design Cuts

- up to 20,000 PSI
- Hydraulic Water Glycol Pumps (High / Low pressure)
- SS316 - Tubing / Fittings
- SS316 - Accumulator - Carbon Steel
- SS316 - Instrumental Valves
- SS316 - Pressure Transmitter / Gauges / Switches
- SS316 - Solenoid Valves - ATEX / EEXD, EEXIA

> Manufacturing Standards

- API 16C
- NR13 / ASME Boiler and Pressure Vessel Code
- IEC 529
- AWS DII ANSI

> Class Standards

- ABS / BV / DNV

Hydraulic Power Units(HPUs)

Subsea Hydraulic Power Units (HPUs) are essentially used to supply hydraulic pressure to the valve actuators. In most cases, accumulators are often used as part of the system. Accumulators function as storage facilities and are sized in accordance to the number of cycles required to operate the required valves in the event of shutdown or system failure in the vessel without activating the pump stations in the system. The pump stations in return charge up the accumulators with respect to the pressure required and timing given.

Subsea suply, reservoir level, system pressures, control modules and pump status are all monitored and feedback to the internal controls of the Subsea Hydraulic Power Units((HPUs). This provides valuavle data and system data to the user which utilize common protocols used in vessel for total vessel control System management.

Hydraulic Power Units

>Generation and storage of hydraulic pressure using oil/water based fluids at pressures in excess of 1,000 barg
> For wellhead control or subsea distribution

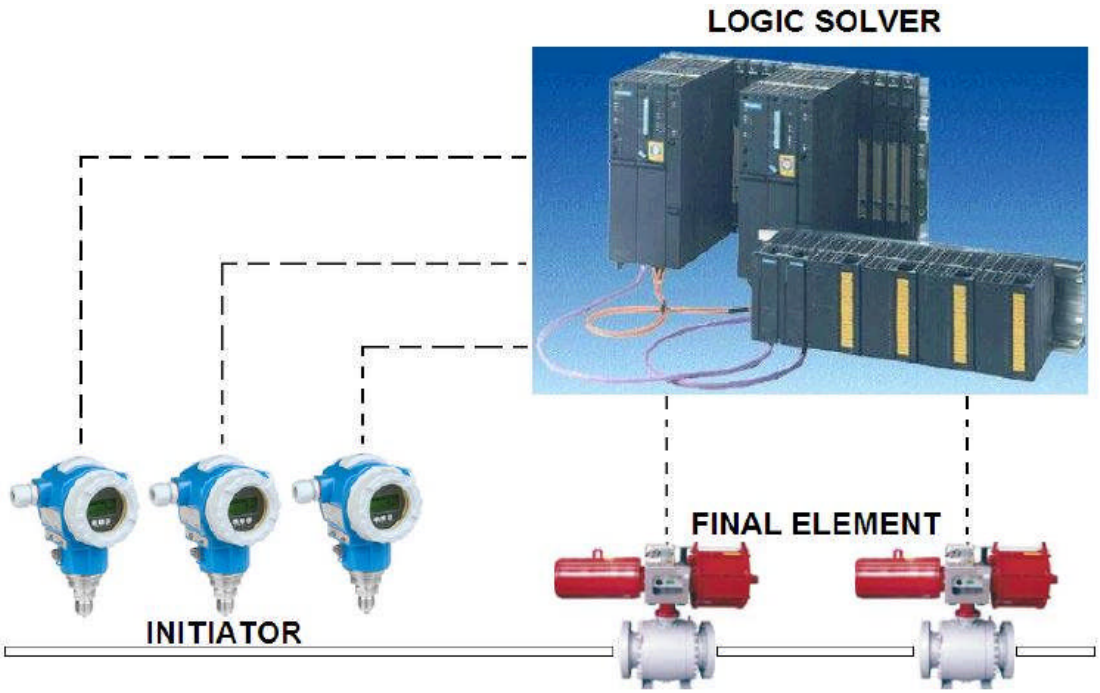
High Integrity Pressure Protection System

> General

Norr Sytems Korea'high integrity pressure protection system (HIPPS) is a type of safety instrumented system (SIS) designed to prevent over-pressurization of a plant, such as a chemical plant or oil refinery. The HIPPS will shut off the source of the high pressure before the design pressure of the system is exceeded, thus preventing loss of containment through rupture (explosion) of a line or vessel. Therefore, a HIPPS is considered as a barrier between a high-pressure and a low-pressure section of an installation.

> System Architecture

The main purpose of High Integrity Safety Pressure Protection System (HIPPS) is to execute shutdown action when over pressure happens. There are three (3) primary components that support the mechanism of HIPPS: Initiator, Logic Solver, and Final Element.



> Components

INITIATOR

Initiator consists of three (3) SMART electronic pressure transmitters with two wire circuit 4-20mA HART protocol and wired to logic solver. The function of initiator is simply to detect high pressure condition. In addition, initiator is able to execute self-diagnostic and to send output to certain failure state.

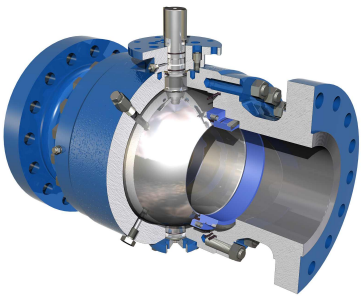
LOGIC SOLVER

Logic Solver retrieves and processes output signal from initiator and executes the result to final element. Logic solver uses 2oo3 voting logic and de-energizes solenoid valve in the final element when at least two (2) initiators send high pressure signal. Basically, Logic solver is a Programmable Logic Controller (PLC) with SIL 3 certified and fail-safe redundant I/O for safety related applications. The following figure depicts the arrangement of Logic Solver components with a fully redundant process.

FINAL ELEMENT

Final Element is a set of component which includes two (2) actuators and two (2) valves (trunnion-mounted double block and bleed ball) that uses 1oo2 voting logic. The actuator consists of Digital Valve Controller (DVC) and Local Control Panel (LCP).

The main purpose of DVC is to execute partial stroke test which ramps valve gradually during service and operation. Partial Stroke Test (PST) can be automatically scheduled and initiated by DVC or manually performed by using Local Control Panel (LCP). In the initial step, the valve will be moved to a predefined value and then to the original location. The default value for the movement of valve is configured to any value up to 30%



Local Control Panel (LCP) has built-in function called Partial Stroke Auto Test Interval which is used to setup the device to run partial stroke test automatically

on certain period. LCP has push button which sends commands to the DVC to open, close, or test Safety Shutdown valves. As indicators, there are three lights in LCP: Green for normal operating position, Red for tripped or fail-safe state, Amber for ready-to-reset status.

Deck Machineries, Winches and Derricks

> General

Norr Systems Korea, a producer of quality Deck Machinery, offers warranty and techniacl support on our Anchoring, Towing, and Mooring Systems anytime anywhere. As an integrated provider of various products and services, Norr Systems Korea strives to provied customers with Mooring and Towing System solutions that best meets their needs.

With our extensive network of facilities from Korea to South America, we are able to reach out to a global market both efficiently and effectively. Our areas f expertise includes engineering consultancy, designing and manufacturing of various deck top-side equipment such as winch, windlass, cranes, hull fittings, anchors, chains, ropes and other accessories. As such, we are able to assist customers in achieving their technical requirements within their budgets, while incorporating customization requests.

> Range of Deck Machinery

- Streamer Winch
- Hydraulic Mooring Winch
- Hydraulic Anchor Handling Towing Winch
- Hydraulic Tugger Winch
- Hydraulic Capstan
- Hydraulic Driven Rope Reel
- Shark Jaw
- Towing Bollard
- Hydraulic Anchor Windlass
- Offshore Crane

Emergency Fire Pump

> General

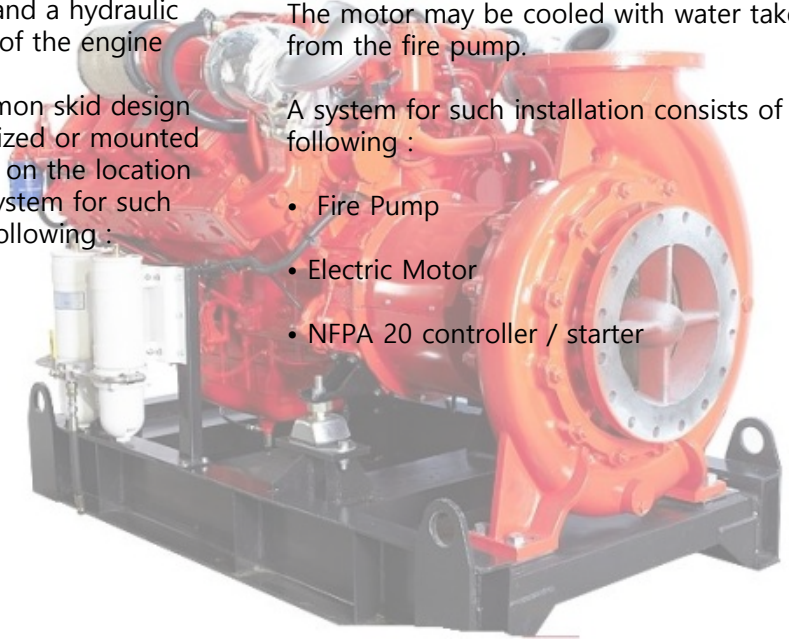
Nor Systems Korea is a designer and manufacturer of reliable and environment friendly solutions for offshore applications. Norr Systems Korea offers custom and pre-engineered packaged fire pump systems. Tese systems are factory assembled and tested. Its engineering team has extensive training and experience in supporting offshore and onshore sectors with environmentally friendly, innovative and integrated equipmnet solutions.

> Features

Diesel Driven Fire Pump

The diesel fire pump system usually consist a diesel engine which will be driving a fire pump which is centrifufal pump on one end of the engine output shaft and a hydraulic pump on the opposite end of the engine output shaft.
This configuration is a common skid design and can either be containerized or mounted on an open skid depending on the location where it is to be placed a system for such installation consists of the following :

- Diesel Engine
- Booster Pump
- Lift Pump
- Hydraulic System
- NFPA 20 controller
- Room Cooler



Electric Driven Fire Pump

Norr System Korea driven fire pump can be supplied both in vertical and horizontal configuration.
The motor may be cooled with water taken from the fire pump.

A system for such installation consists of the following :

- Fire Pump
- Electric Motor
- NFPA 20 controller / starter

Emergency Generator Package

> General

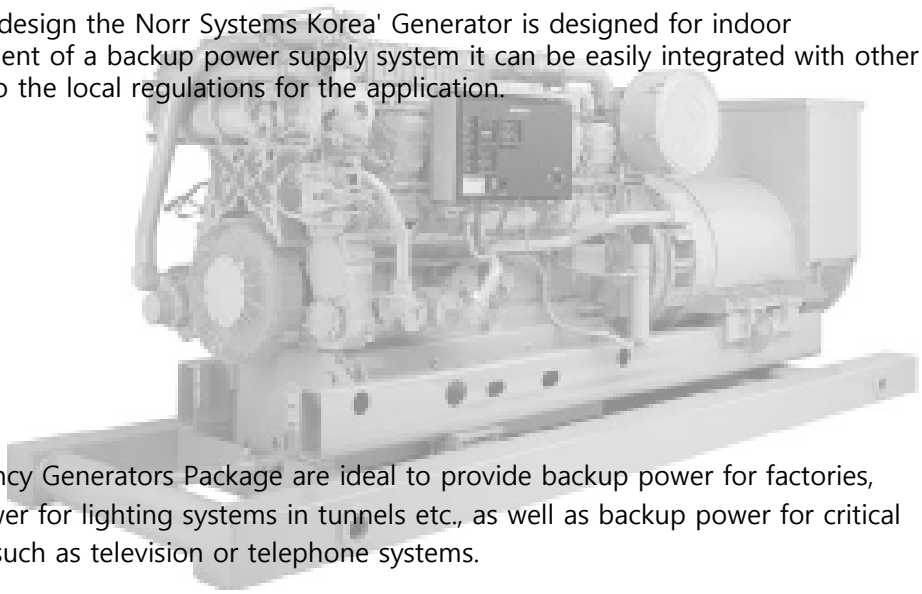
Norr Systems Korea' Emergency Generator Package operates using diesel fuel to generate electricity for applications where it is critical that there is a supply of power even if mains power has failed. With its high reliability diesel engine and fast start up, the Emergency Generator Package can be depended on to supply backup power as and when required.

Norr Systems Korea's Emergency Generator Package is available in 50Hz and 60Hz models with a range of voltage outputs to allow integration of the unit at high and low voltage points of the power supply system.

> Features

Emergency Generator Package operate using diesel to power a high reliability Norr Systems Korea diesel engine that drives a synchronous electrical generator. This electrical generator is a compact brushless design featuring automatic output voltage regulation to compensate for load and temperature variations.

With a compact open-frame design the Norr Systems Korea' Generator is designed for indoor installation, and as a component of a backup power supply system it can be easily integrated with other building systems according to the local regulations for the application.



> applications

Norr Systems Korea' Emergency Generators Package are ideal to provide backup power for factories, marine, offshore, backup power for lighting systems in tunnels etc., as well as backup power for critical communications equipment such as television or telephone systems.

NORR SYSTEMS KOREA Co.,Ltd.

Adress : 422-13, Songjung-dong, Haeundae-gu,
Busan, Korea
Tel : +82 07 7432 6952
Fax : +82 51 797 8350