TANK SAFETY & PROTECTION DEVICES

www.ikspc.com

Korea Steel Power Corp.

KOREA

Ministry of SMEs and Startups | KBIZ Korea Federation of SMEs

أديبك ADIPEC | Host أدنوك ADNOC

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COMPANY **OVERVIEW**

Since its foundation in 1991 at Republic of Korea, KSPC has been developing industrial valves. Appointed as the Domestic-Product Development Enterprise for Tank Safety Valve, KSPC produces safety devices for flammable and nonflammable storage tanks by focusing on industrial valves.

Since then, KSPC's own Research Institute of Technology was established and its FMRC factory was approved in 1996, which serves as a momentum for KSPC to gain recognition on its product reliability and competitiveness. Supplying high-quality systems optimized for various fields such as petrochemical refinery, chemical treatment plant and natural gas supply line, KSPC also guarantees the maintenance of systems after delivery.

Through continuous research and development, KSPC has won many domestic and overseas certifications and parents, such as ATEX certification, ISO9001, ISO 14001, KFI, achieving recognition on the performance of its products. Having established quality goals that meets the requirements of ISO, KSPC concentrates on the improvement of its effectiveness and efficiency, standardizes process quality control, employees experts and enhances company-wide quality education for achieving systematic quality control.

K.S.P.C **VISION & MOTTO**

VISION 1 Safety is the first and most important. 2 Think about Environment

MOTTO

- Truly think and consider customers.
- Truly make eco-friendly products.
- Truly think safe world

QUICK ACCESS TO ITEM **CATALOGS IN QR CODES**

- PRESSURE VACUUM RELIEF VALVE
- FLAME ARRESTER
- EMERGENCY RELIEF VALVE
- GAUGE HATCH COVER
- NITROGEN BLANKETING VALVE
- Quick access to KSPC website in QR code
  www.ikspc.com
- Quick access to valve operating video in QR code

Contents

PRESSURE VACUUM RELIEF VALVE

KSBB/BS type

Pressure Vacuum Relief Valve is designed to protect low pressure storage tanks from excessive pressure or vacuum created by thermal expansion (and contraction) and product movement into(out of) the tank and at the same time minimizing costly product evaporation/loss.

SETTING PRESSURE	WEIGHT LOADED MODEL	±20 mmW.C ~ +700/-430 mmW.C
	SPRING LOADED MODEL	+700/-430 mmW.C~ ±9,000 mmW.C
SIZE RANGE	DN 50 ~ DN 350 with ASME 150# flanges (different connections available on request)	
BODY MATERIAL	Aluminum, Carbon Steel, 304 Stainless Steel and 316 Stainless Steel with various trims (different materials available on request)	
RULES & CERT.	API 2000, ATEX	

VALVE OPERATION & SIZING CALCULATION

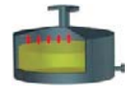
A. VALVE OPERATION

According to API 2000 code, the **Pressure vacuum relief valve** are designed, manufactured and tested. The Pressure Vacuum Relief Valves are used on liquid storage Tanks which designed by API 520/API 650 and Others process vessels or systems to prevent structural damage due to excess internal pressure or vacuum.

This valve has functions to intake the air under constant pressure during unloading and rising Temperature, and to discharge the overpressure generated during pouring the liquid and falling Temperature on storage tank. This is the safe valve to control the deflation(vacuum) and inflation(pressure) of several storage tanks.

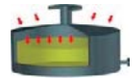
The function of prevention of natural evaporation of fluids

THE EFFECT OF ENERGY REDUCTION In case of gasoline, to minimize the natural evaporation of stores saves 98m³ per year. (Based on the tank diameter: 30.4m x tank capacity 8690m)



The function of protection of over-pressure

THE EFFECT OF PREVENTION OF EXPLORATION With the exception of influx and efflux of stores, it is Kept always closed to prevent the diffusion of exploration into tank.



The function of protection of under pressure

THE EFFECT OF PREVENTION OF CORROSION (The effect of extension of life). To keep the stabilization of constant gas pressure generated pressure generated inside tank, prevents inside of the tank from corrosion by the temperature of gas.

WHEN TANK IS UNLOADING PHENOMENA AND THE PRESSURE is above the setting(operational fixing pressure), the Pressure Vacuum Relief Valves operates automatically to protect the storage tank from the deflation or malformation.

The weight loaded type models are designed to provide tank protections for both pressure and/or vacuum of set point to max 75/-43 mbarg.

Over 75/-43 mbarg set point till 900/-900 mbarg, consider to be installed spring loaded type. Safety relief valve is not used in controlling the extra setting of pressure and consider Emergency vent for External fire and Rupture case.

The set point of Pressure vacuum relief valve is fixed by the customer's order or Project's Specification. but it is designed to adjust the pressure / vacuum setting in case. The way of change adds additional counter weight for Weight loaded type. The way of change for spring loaded as follow,

To increase the setting pressure turns the press. adjusting screw clockwise. To decrease the setting pressure turns the press. adjusting screw counter-clockwise. Before change set point of disc A'ssy, should be consulting the factory or our local representative.

Loading condition

Unloading condition

B. VALVE SIZING CALCULATION

◎ Required Inbreathing and Out-breathing capacity for your applications should be determined by using API2000 standard.

B-1 Total Out-breathing caused by liquid movement and vaporization

- Liquid movement (section 3.3.2.2.1 in API 2000 7th)

$$\dot{V}_{op} = \dot{V}_{pf}$$

$\dot{V}_{op}$: Out-breathing volumetric flow rate (Nm³/h of air) at the actual pressure and temperature conditions of the tank vapor space with a vapour pressure equal to or less than 5.0 kPa.

$\dot{V}_{pf}$: Maximum volumetric filling rate (Nm³/h) of nonvolatile liquids.

$$\dot{V}_{op} = 2.0 \cdot \dot{V}_{pf}$$

$\dot{V}_{op}$: Out-breathing volumetric flow rate (Nm³/h of air) at the actual pressure and temperature conditions of the tank vapor space with a vapour pressure greater than 5.0 kPa.

$\dot{V}_{pf}$: Maximum volumetric filling rate (Nm³/h) of volatile liquids.

- Thermal effect (section 3.3.2.3.2 in API 2000 7th)

$$V_{OT} = Y \cdot V_{tk}^{0.9} \cdot R_i$$

Y : is a factor for the latitude.
(search for the number in the table. Refer API2000 3.3.2.3.2)

Latitude	Y-factor
Below 42°	0.32
Between 42° and 58°	0.25
Above 58°	0.2

V_{tk} : is the tank volume. (m³)
R_i : is the reduction factor for insulation.

$$R_{inp} = \frac{A_{inp}}{A_{tts}} \cdot R_{in} + \left(1 - \frac{A_{inp}}{A_{tts}}\right) \qquad R_{in} \frac{1}{1 + \frac{h \cdot l_{in}}{\lambda_{in}}}$$

There are three cases in getting R_i.
No. insulation : R_i=1
Fully insulated :
- h : The inside heat-transfer coefficient (W/m²·K)
- l_{in} : the wall thickness of the insulation (m)
- λ_{in} : The thermal conductivity of the insulation (W/m·K)

3) Partially insulated
- A_{tts} : The total tank surface area (shell and roof) (m²)
- A_{inp} : The insulated surface area of the tank (m²)

B-2 Total In-breathing caused by liquid movement and vaporization

- Liquid movement (section 3.3.2.2.1 in API 2000 7th)

$$V_{ip} = V_{pe}$$

V_{pe} : Out-breathing volumetric flow rate (Nm³/h of air) at the actual pressure and temperature conditions of the tank vapor space with a vapour pressure equal to or less than 5.0 kPa.

V_{ip} : Maximum volumetric filling rate (Nm³/h) of nonvolatile liquids.

- Thermal effect (section 3.3.2.3.2 in API 2000 7th)

$$\dot{V}_{it} = C \cdot V_{tk}^{0.7} \cdot R_i$$

C : is a factor that depends on vapour pressure, average storage temperature and latitude.

Latitude	C-factor for various conditions			
	Vapour pressure			
	Average storage temperature, °C			
	Hexane or similar		Higher than hexane, or unknown	
	<25	≥25	<25	≥25
Below 42°	4	6.5	6.5	6.5
Between 42° and 58°	3	5	5	5
Above 58°	2.5	4	4	4

V_{tk} : is the tank volume. (m³)
R_i : is the reduction factor for insulation. The way to calculate 'R_i' is equivalent to the method which is in the upper part of this page.

◎ The size of the valve shall be selected by comparing our certified flow / pressure drop diagrams with calculated inbreathing and out breathing.

- Check point

1) Set pressure : The adjusted pressure or vacuum which valve start to open.
2) Over pressure : Pressure increase at the valve inlet above the set pressure or vacuum.
3) Over pressure calculation
- Example.1
  · Valve set pressure = 50mm.W.C
  · Tank Design pressure = 80mmW.C
  · Max. allowable over pressure = 60% (80mmW.C = 1.6times of 50mmW.C)
- Example.2
  · Valve set vacuum = -50mm.W.C
  · Tank Design vacuum = -100mmW.C
  · Max. allowable over pressure = 100% (-100mmW.C = 2times of -50mmW.C)

4) Size select comparing flow/pressure drop diagram with calculated inbreathing and out breathing
- Example (Check figure 01 & 02)
  · Calculated Out breathing = 500m³/hr
  · Valve set pressure = 80mmW.C
  · Calculated Max. allowable over pressure = 60%

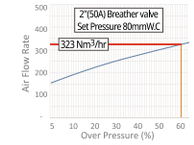


Figure 01
2" Valve flow capacity not enough to meet calculated Out breathing 500Nm³/hr

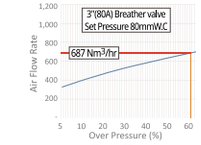


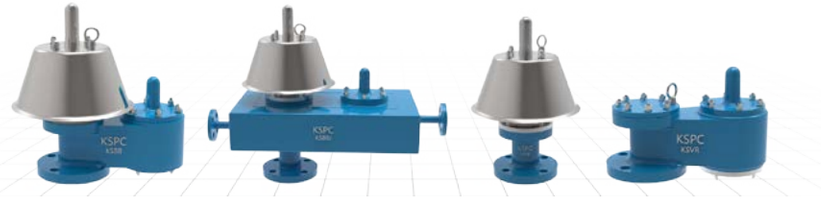
Figure 02
3" Valve flow capacity enough to meet calculated Out breathing 500Nm³/hr

5) According to API2000, The maximum overpressure shall be 2times of adjusted set pressure or vacuum. If the fully open position of the valve disc is not achieve at two times the adjusted valve set pressure, one step above size or additional measuring point(=additional valve) are required until the fully open position is reached to calculated in/out breathing.
* Note : Direct-acting vent valve are typically available in size from 50mm to 350mm.

VENT TO ATMOSPHERE PRESSURE VACUUM RELIEF VALVE

- Vent to ATM pressure vacuum relief valves are an advanced design for vent to atmosphere applications.

Designed manufactured and tested according to the API2000 code. It is a safety device made in response to the pressure and vacuum in the storage tank. Opening at accurate settings, it protects the tank from damages due to explosion and vacuum, minimizes the loss of product by prevention leakage of the tank and protects environment from poisonous gases.

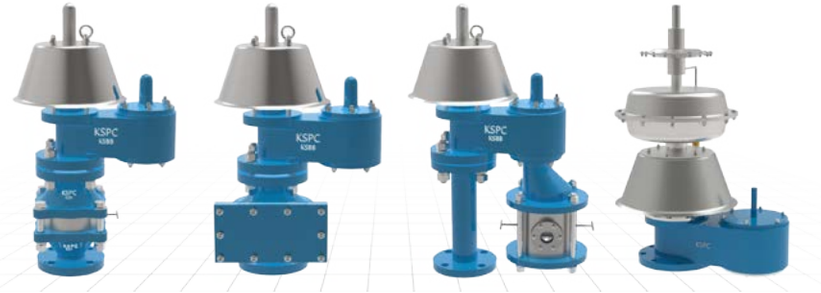


KSBB/BS type
Pressure / vacuum relief

KSBBJ type
Pressure vacuum relief w / steam jacket

KSPR/PS type
Pressure relief

KSVR/VS type
Vacuum relief



KSBBFI type
Pressure / vacuum relief w / flame arrester

KSBBFH type
Pressure / vacuum relief w / flame arrester

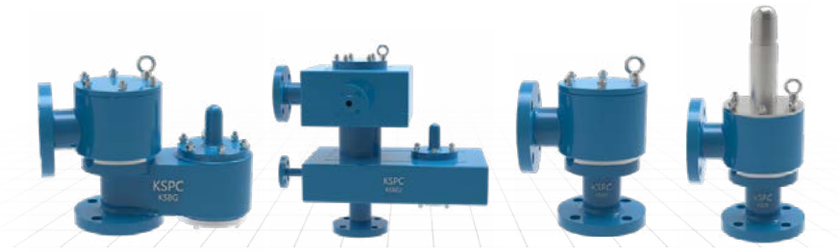
KSBBFY type
Pressure / vacuum relief w / dehumidifier

KS120 type
Pilot operate valve

PIPE AWAY PRESSURE VACUUM RELIEF VALVE

- Pipe away pressure vacuum relief valves are an advanced design for pipe away application.

Designed manufactured and tested according to the API2000 code. It is a safety device made in response to the pressure and vacuum in the storage tank. Opening at accurate settings, it protects the tank from damages due to explosion and vacuum, minimizes the loss of product by preventiog leakage of the tank and protects environment from poisonous gases.

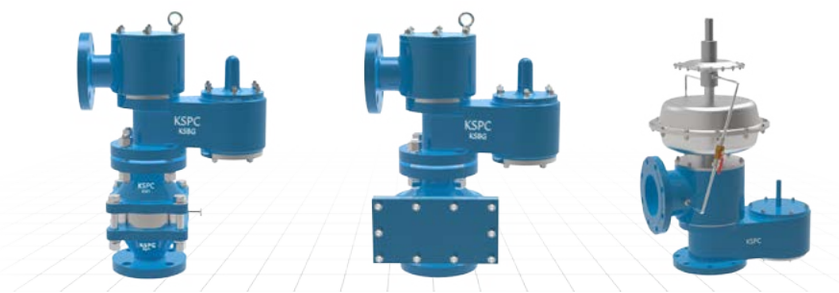


KSBG/GS type
Pressure / vacuum relief

KSBGJ type
Pressure vacuum relief w/Steam jacket

KSBD type
Pressure relief
Vacuum relief

KSDS type
Pressure relief
Vacuum relief
(Spring loaded type)



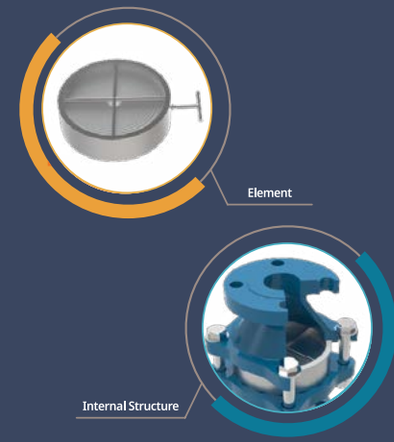
KSBGFI type
Pressure / vacuum relief w / flame arrester

KSBGFH type
Pressure / vacuum relief w / flame arrester

KS110 type
Pilot operate valve

FLAME ARRESTER

KSFD-A type



Flame Arrester is used for preventing flame transmission when an explosion is occurred inside of the piping which full of explosive mixed gas

OPERATING TEMPERATURE @ PRESSURE	+60 °C @ 0.11 Mpa
SIZE RANGE	DN 50 ~ DN 1000 with ASME 150# flanges (different connections available on request)
BODY MATERIAL	Aluminum, Carbon Steel, 304 Stainless Steel and 316 Stainless Steel with various trims (different materials available on request)
RULES & CERT.	ISO 16852, ATEX

FLAME ARRESTER OPERATION & SELECTION

Flame arresters are passive devices with no moving parts. Flame arresters prevent the propagation of flame from the exposed side of the unit to the protected side by the use of wound crimped metal ribbon type flame cell element(Figure 03). This construction produces a matrix of uniform openings that are carefully constructed to quench the flame by absorbing the heat of the flame. This provides an extinguishing barrier to the ignited vapour mixture. Under normal operating conditions the flame

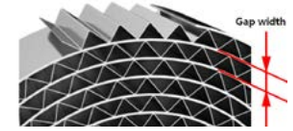


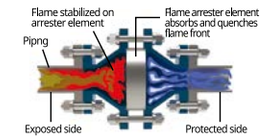
Figure 03

arrester permits a relatively free flow of gas or vapour through the piping system. If the mixture is ignited and the flame begins to travel back through the piping, the arrester will prohibit the flame from moving back to the gas source.

Flame arrester operation

When the combusted gas pass through the heat exchange lattace net of the element bank of the flame arrester in inline Flame arrester type, the combusted gas ignified by the quenching is completely extinguished by lowering the temperature under below the natural ignition point. Thus, this item is designed to extinguish the fire automatically, and the heat is absorbed by the element bank of flame arrester and the fire cannot be spread.

MESG (Maximum Experimental Safe Gap)



Measurement of the maximum gap between two equatorial flanges on a metal sphere that will prevent a flame from being transmitted from the sphere to the surrounding flammable mixture. MESG is dependent on gas composition,
The stoichiometric mixture is used to determine the minimum MESG value for a given gas.

Range of application (marking)		Requirments for test mixture			
Explosion group	MESG of mixture mm	Gas type	Gas purity by volume %	Gas in air by volume[2] %	Safe gap of gas-air mixture mm
IIA1	≥1,14	Methane	≥98	8,4 ± 0,2	1,16 ± 0,02
IIA[3]	>0,90	Propane	≥95	4,2 ± 0,2	0,94 ± 0,02
IIB1[3]	≥0,85	Ethylene	≥98	5,2 ± 0,2	0,83 ± 0,02
IIB2[3]	≥0,75			5,7 ± 0,2	0,73 ± 0,02
IIB3[3]	≥0,65			6,6 ± 0,3	0,67 ± 0,02
IIB1[3]	≥0,50	Hydrogen	≥99	45,0 ± 0,6	1,16 ± 0,02
IIC	<0,50	Hydrogen	≥99	28,5 ± 2,0	1,16 ± 0,02

Flame arrester selection

Flame propagation poses significant dangers to systems and personnel in industries worldwide. Careful consideration must be taken to determine whether to use a Flame Arrester or a Detonation Flame Arrester. There are two basic determinations when evaluating the intended application:
Q. The location of the ignition source from the flame arrester, and;
Q. What needs to be protected.
First, determine the location of all potential ignition sources (i.e. flare, vacuum pump, blower, burner, lightning strike, static discharge, etc).
Second, evaluate the system to determine exactly what should be protected (i.e., the gas source, process component, personnel, upstream process facility, tank, etc.).
When you have determined the ignition source(s) and what is to be protected, the following parameters should be evaluated in order to determine the appropriate flame arrestment protective device:
1. Length and configuration of pipe and pipe between ignition source and arrester.
2. System gas grouping.
3. Initial operating pressure.
4. Flame stabilisation on element.

All of these variables affect the performance of the arrester and can also affect the dynamics of flame propagation

Inline and End of Line Applications

The inline flame arrester and the end of line (free vent) arrester are used to stop flame propagation of confined and unconfined low pressure deflagrations. They are typically used for limited piping applications when the system operating pressure is near atmospheric levels.

Detonation application

The detonation flame arrester is an advanced technology flame arrester. They are used to stop the high pressures and velocities associated with detonation. They stop confined and unconfined low and high pressure deflagrations, stable and overdriven detonations. Application parameters for the detonation flame arresters far exceed those of flame arresters for pipe lengths, configurations, system operating pressures, and flame stabilization. Our flame arresters are designed, manufactured and tested according to BS7244. BSEN12874 and ISO16852 test standards and codes.

System gas grouping

The type of gas in the system and it's corresponding gas group determines the design of the arrester element. The SS316L element must be designed to accommodate the specific gas group that could possibly ignite and propagate in the system. The available designs consist of International Electric Code (IEC) group gases into IIB,IIA and IIC, the National Electric Code (NEC) groups gases into A, B, C and D categories depending on the MESG value of the gas.

GAS GROUP CHART

Group A
Acetlyene

Group B(IIC)
Butadiene
Ethylene oxide
Hydrogen
Manufactured gases containing more than 30% Hydrogen (by volume)
Propylene oxide
Propyl nitrate

Group C (IIB3)
Acetaldhyde
Cyclopropane
Diethyl ether
Dimethylhydrazine
Ethylene
Hydrogen sulfide
*Methanol (methyl alcohol)
Methyl mercoptan
Unisymmetrical dimethyl hydrazine UDMN)

Group D (IIA)
Acelone
Acrylonitrile
Ammonia
Benzene
Butylene
1-Butanol (butyl alcoholl
2-Butand (secondary butyl dcohol
Cyclohexane
N Butyle ocetate
sobutyl gcetate
Ethone.echoll
Ethanol (ethyl alcohol)
Ethyl acetate.
Ethyl acrylate
Ethylene dichloride
Gasoline
Heptanes
Hexanes
soprene
Methane (natural gas)
Methyl acrylate
Methylamine
Methyl ethyl ketone
Methyl mercoptan

Group D (IIA)continued)
3-Methyl-1-butanol isoamyl alcobhol)
Methyl isobutylketone
2-Methyl-1 propanol isobutyl clcohol)
Methyl-2-propanol
tertiary butyl alcohol
Naphtha (petroleum)
N Propyl acetate
Octanes
Pentanes
1-Pentanol (amyl aloohol)
Propane
1-Propanol (propyl alcohol
2-Propanol (isopropylalcohol
Propylene
Styrene
Toluene
Turpentine
Vinylacetafe
Vinyl chloride
Xylenes

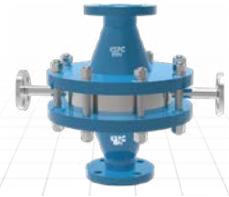
DEFLAGRATION FLAME ARRESTERS

- Deflagation flame arresters provide positive protection against flame propagatin to the protected side in case of deflagration of explosive vapor/air or gas/air mixtures.

  They are designed to protect against continuous burning against the 316LSS flame cell elements for a specific period.

KSFI / KSFI-A TYPE

Inline flame arrester
Possible to install vertically and horizontally



KSFIJ type

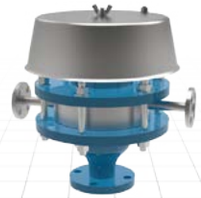
Flame arrester w /
steam jacket

KSFH type

Inline flame arrester
Possible to install vertically and horizontally

KSFE / KSFE-A type

End line flame arrester
Should be installed vertically

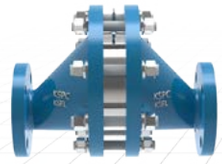


KSFE-J type

Flame arrester
w/ steam jacket

KSFE-S type

End line flame arrester,
Should be installed vertically



KSFL type

Inline flame arrester
Should be installed horizontally

KSFT type

Inline flame trap

KSFF type

Deflagration proof end-line
flame arrester

DETONATION FLAME ARRESTERS

- Detonation flame arresters provide positive protection against flame propagation in piping systems that are manifolded or have long runs.

  The arresters are designed to stop and ignited flammable vapour mixture travelling at subsonic or supersonic velocities.

  They are also designed to protect against continuous burning against the 316LSS flame cell elements for a specific period

KSFD-A type

Inline detonation flame arrester,
Possible to install vertically
and horizontally

KFD type

Inline flame arrester
Possible to install vertically
and horizontally

KSFLD type

Inline flame arrester
Should be installed horizontally

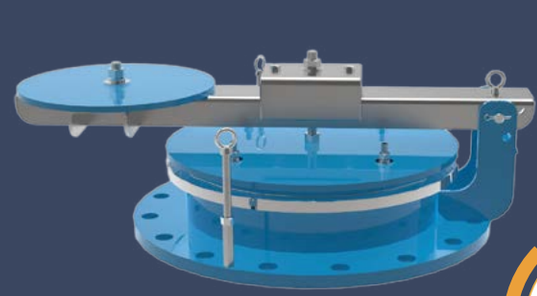
KSFM type

Inline flame arrester
Should be installed right angle pipe line

KSFD type

Inline flame arrester
Should be installed horizontally

EMERGENCY RELIEF VALVE



KSEPK type

Emergency relief valve open to greatly increase the venting capacity of petroleum storage tanks when the internal pressure rises above the set point. it remains closed tightly when internal pressure below the settings.

SETTING PRESSURE	WEIGHT LOADED MODEL	+50 /-25 mmW.C ~ ±700 mmW.C
	SPRING LOADED MODEL	+700/-20 mmW.C ~ ±9,500/-700 mmW.C
SIZE RANGE	DN 400 ~ DN 750 with ASME 150# or API 650 flanges (different connections available on request)	
BODY MATERIAL	Aluminum, Carbon Steel, 304 Stainless Steel and 316 Stainless Steel with various trims (different materials available on request)	
RULES & CERT.	API 2000, ATEX	

VALVE OPERATION & SIZING CALCULATION

A. Valve operation

Emergency relief valve is the safety valve to protect the storage tank from the inflation(pressure) with the function to discharge rapidly the overpressure developed during external fire around the storage tank or the Excessive fluid intake more than the capacity of pump planned.

Emergency relief valve is designed to be Cushioned air seating, Teflon (PTFE/FEP-2 Layer) seating diaphragm are Standard. It minimize sticking caused by resinous vapors and atmospheric moisture. The Seat tightness is 75% of set point by API 2000. It is designed to be self closing under normal operation by Internal Guide & external Hinge and the restraining cable to Connect the Cover assembly and Flanges also serve a grounding cable.

The Emergency relief valve provides pressure / or vacuum relief when the tank is loading phenomena and external fire or Rupture cases also the pressure is above the setting (Operational Fixing pressure), the Emergency relief valve operate automatically to protect the storage tank from inflation.

The weight loaded type model max. set point is 70/-43mbarg and spring loaded type is till 900/-900 mbarg.

B. Valve Sizing

Where the fluid properties are similar to those of hexane, the required venting capacity can be determined as table 03.
If the height of the tank exceeds 9.14 meters, use the same number to the tank which is higher than 9.14 meters for calculation. If wetted surface area is wider than 260 m², there are two cases. Refer to the following table 01.

Wetted surface area A_{TWS} m²	Design pressure kPa (gauge)	Required Venting Calculation Nm³/h of air
<260	≤103.4	See table 03
≥260	≤7	19910
≥260	>7 and ≤103.4	$q = 2032 \cdot F \cdot A_{wet}^{0.82}$

Table 01

$$A_{TWS} = \pi \cdot D \cdot L \qquad A_{TWS} = \pi \cdot D \cdot L \cdot 9.14$$

(In case of L<9.14 meters) (In case of L>9.14 meters)

Where the fluid properties are other than hexane, the required venting capacity can be calculated given by below equation.

$$q = 906.6 \cdot \frac{Q \cdot F}{L} \cdot \left(\frac{T}{M}\right)^{0.5}$$

Q is the heat input from fire exposure as given by Table 02, expressed in watts.
F is the environmental factor from table 09(API2000 Clause 3.3.3.3.2).
L is the latent heat of vaporization of the stored liquid at the relieving pressure and temperature, expressed in joules per kilogram.
T is the absolute temperature of the relieving vapor, expressed in kelvins
M is the relative molecular mass of the vapor

Wetted surface area A_{TWS} m²	Design pressure kPa (gauge)	Heat Input,Q W
<18.6	≤103.4	$63{,}150 A_{TWS}$
≥18.6 and <93	≤103.4	$224{,}200 \times (A_{TWS}^{0.566})$
≥93 and <260	≤103.4	$630{,}400 \times (A_{TWS}^{0.388})$
≥260	>7 and ≤103.4	$43{,}200 \times (A_{TWS}^{0.82})$
≥260	≤7	4,129,700

Table 02

Wetted area[a] (Square meters)	Venting Requirment (Nm³/h)	Wetted area[a] (Square meters)	Venting Requirement (Nm³/h)
2	608	35	8086
3	913	40	8721
4	1,217	45	9322
5	1,521	50	9895
6	1,825	60	10,971
7	2,130	70	11,971
8	2,434	80	12,911
9	2,738	90	13,801
11	3,347	110	15,461
13	3,955	130	15,751
15	4,563	150	16,532
17	5,172	175	17,416
19	5,780	200	18,220
22	6,217	230	19,102
25	6,684	260	19,910
30	7,411	>260[b]	-

Table 03

The size of the valve shall be selected by comparing our certified flow / pressure drop diagrams with calculated inbreathing and out breathing.

Check point.

1) Set pressure : The adjusted pressure or vacuum which valve start to open.
2) Over pressure : Pressure increase at the valve inlet above the set pressure or vacuum.
3) Overpressure calculation

Example

- Valve set pressure = 100mm.W.C(90% or same as tank design pressure)
- Tank Design pressure = 100mmW.C
  · Max. allowable over pressure = 10%(Emergency relief valve set pressure is usually 90% or same as Tank design pressure hence max. allowable design pressure is 10% generally) Size select comparing flow/pressure drop diagram with calculated emergency out breathing.

Example (Check figure 01 & 02)

· Calculated Out breathing = 19,910m³/hr
· Valve set pressure = 100mmW.C
· Calculated Max. allowable over pressure = 10%

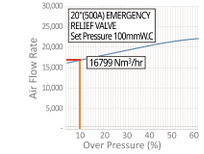


Figure 01

20" Valve flow capacity not enough to meet calculated Out breathing 19,910Nm³/hr

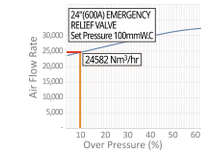
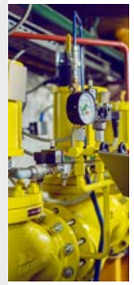
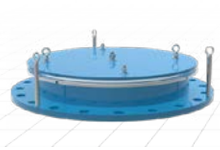


Figure 02

24" Valve flow capacity enough to meet calculated Out breathing 19,910Nm³/hr

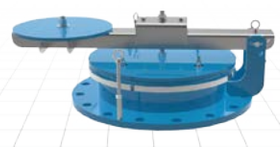


WEIGHT LOADED TYPE



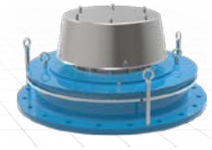
KSEP type

Pressure relief



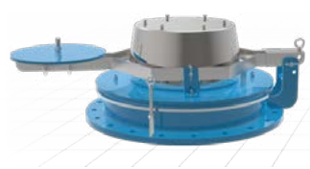
KSEPK type

Pressure relief
Hinged type
- closed automatically



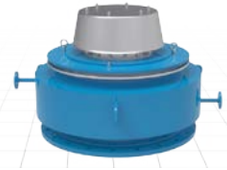
KSEV type

Pressure / vacuum relief



KSEVK type

Pressure / vacuum relief
Hinged type
- closed automatically



KSEVJ type

Pressure /
vacuum relief w /
steam jacket

KSEPW type

Pressure relief
Water seal type
- zero leakage at set point

SPRING LOADED TYPE

KSES type

Pressure relief

KSESV type

Pressure / vacuum relief

NITROGEN BLANKETING VALVE

DST100/200 type

INSTALLATION

Nitrogen Blanketing Valve helps gas pressure to maintain In cons-tant state in the vapour space of storage tanks.

When liquid run out from storage tanks or vacuum state take place because of temperature dripping, N2 blanketing Valve has a ability of control desired pressure within the fixed limits.

Besides about subjects, prevents air and humidity from entering into storage tank, so it can preserve product, and also protect from a fire.

It protects the tank from explosion by restriction spark. It prevents the outflow of fluid by evaporation.

DIMENSION TABLE

SIZE	DST-100			DST-200	
	½"	¾"	1"	1½"	2"
N.D	15	20	25	40	50
A	290	290	290	340	340
Approx. H	355	355	355	415	415

NOTE Standard Connection(ANSI 150LB flange) and JIS or different types are available upon request.

GENERAL SPECIFICATION

MODEL	DST-100	DST-200
SIZE	½" ~ 1"	1"~ 2"
SET PRESSURE	30 ~ 5000mmW.C	
CONNECTION	FNPT / ANSI 150# & 300#, Etc	
MATERIAL	SS304, SS316, Etc.	
USED GAS	N2 (Nitrogen)	
SENSING PORT	NPT½"	

TECHNICAL SPECIFICATION

SET PRESSURE		MINIMUM INLET PRESSURE	TEMP.
1.2 ~ 1.4" W.C	1.3 ~ 3.1 psi	22 psi (1.5 kg/cm^{2}G)	-20 to +149 °C
3.5 ~ 10" W.C	2.3 ~ 3.5 psi		
8 ~ 18" W.C	3.0 ~ 6.0 psi		

GAUGE HATCH COVER & SLOT DIPPING DEVICES

KSGE type

Operating pressure
- 0.01 kg/㎠

KSGH type

Operating pressure
- 0.03 kg/㎠

KSPC's Sampling and Gauging Hatch Cover is designed to provide quick access for product gauging, temperature measurement or sampling.

KSSD-A type

KSSD type

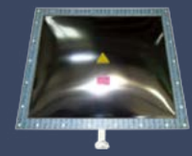
T-2000-TSS-01 type

KSSD Series Sampling Device is designed for gauging the height of liquid levels, measuring the depth of water bottoms, and taking sample of liquids held in storage tank, without relieving pressure within the tank.

RUPTURE DISC

Rupture Disc holder and disc assembly

Rupture Disc



Explosion Panel

A Rupture Disc is a non-mechanical safety device to relief when it is occurred that excessive pressure is over the critical pressure in a pressure system

When is it required a Rupture Disc?

- In case of a rapid rise in pressure as a result of runaway reaction and so on
- In case that there is any concern that fixtures cause other safety device malfunction
- In case that any leakage is not permitted
- In case that it contains strong corrosive fluid
- In case that it requires large relieving capacity in an instant by polymerization and so on
- Severe conditions such as high or low temperature

Features

- Special material and structure (It is easy to select material and is economical) And there is no size limit
- Constant rupture performance and release all of fluid
- Instantaneous release of maximum capacity
- Extensive service environment (strong corrosive fluid, temperature, liquid, gas, powder, etc.)
- Zero Leakage
- Extension of safety valve life
- Possible to check the Piping of outlet during operating
- Extension of overhaul period
- Easy to handle and cost reduction

Applicable Code

- ASME Sec. Ⅷ Div.1
- ISO 6718
- ISO 4126-2~6
- API RP520
- KOSHA Safety Certification

When is it required a Rupture Disc?

- Stainless Steel (304SS, 316SS, 317SS, etc)
- Carbon Steel
- Duplex
- Aluminum
- Nickel, Inconel, Monel, Hastelloy, Titanium, Tantalium
- Graphite
- Teflon
- Maximum usable Temperature

Teflon	200 ℃	Monel	483 ℃
Aluminum	120 ℃	Inconel	592 ℃
Stainless Steel	483 ℃	Hastelloy	483 ℃
Nickel	403 ℃	Graphite	371 ℃

Application of Rupture Disc

1) Primary Case

2) Secondary Case

3) Combination Case

4) External Fire Case

VACUUM BREAKER & AIR RELEASE VALVE

KSVBBJ type

Air release valve is designed to release accumulated air pockets from the system, while pressured pipelines.
Air pockets increase energy consumption because pumping operation will be at higher water heads to overcome pressured air.
Air release valves are have function to protect high shock and surge pressure, water hammer and liquid overflow from fresh or sea water pipelines.

Application

Operation Principle

LIQUID OVERFLOW PROTECION

PRESSURE / VACUUM RELIEF

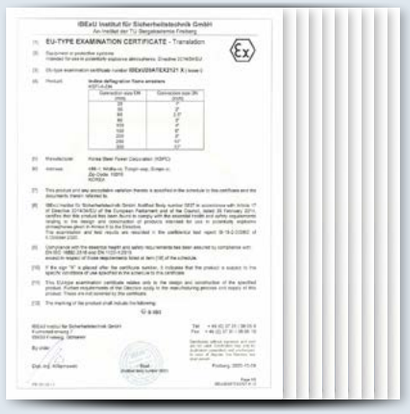
Quality & Environment Certification

ISO 9001

ISO 14001

Type Approval Certification

KFI



ATEX

www.ikspc.com

Tank Protection Devices

- Flame Arrester
- Breather Valves
- Air Release Valve
- Vacuum Breaker
- Pilot Operating Pressure / Vacuum Valves
- Emergency Relief Valve
- Gauge Hatches
- Sampling Dipping Devices
- Flame Trap Assembly
- Floating Suction
- Roof Drain System
- Oil Skimmer
- N2 Blanketing
- Rupture Disc

Application Fields

- Offshore & Ocean Gas Plants
- Marine Tank Ships
- Cryogenic Gas Facilities
- Sea & Fresh Water Plant
- Tank Terminals
- Refinery Tank Farm
- Gas Plants
- Oil & Chemical Storage Tanks

Korea Steel Power Corp.

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E-mail. ikspc@ikspc.com **Website.** www.ikspc.com

COMPANY PROFILE

SAFETY & PROTECTION

FULL-TIME GUARANTEE

KSPC

Korea Steel Power Corporation


“ That's a safety issue. There is no question about that. ”
Ken McEldowney
safety is my NAME
protection is my GAME
KSPC
SAFETY & PROTECTION
FULL-TIME GUARANTEE
KSPC

Table of Contents

1 Company Information

KSPC at a Glance

Company History

Organization

KSPC at a Glance

Established

1991.3.1

Capital

$ 200,000

Sales in 2019

$10,000,000

Employees

30

World-wide Networks

31 countries

Factory & Head Office

Busan, Kimhae, Gimpo

Plant / Factory Area

7,500 / 3,400 m²

Brach Offices

Kimhae, Ulsan, Yeochon

Company History

1900

1991 Established KSPC at Hanam City, Kyoung-Ki Province
1994 Moved HQ & built new factory at Kimhae City, Kyoung-Nam Province
1996 Established a Research Institute of Technology
1998 Obtained ISO9001 Certificate
1999 Awarded The first Kyoung-Nam Best Trader by Kyoung-Nam Province

2000

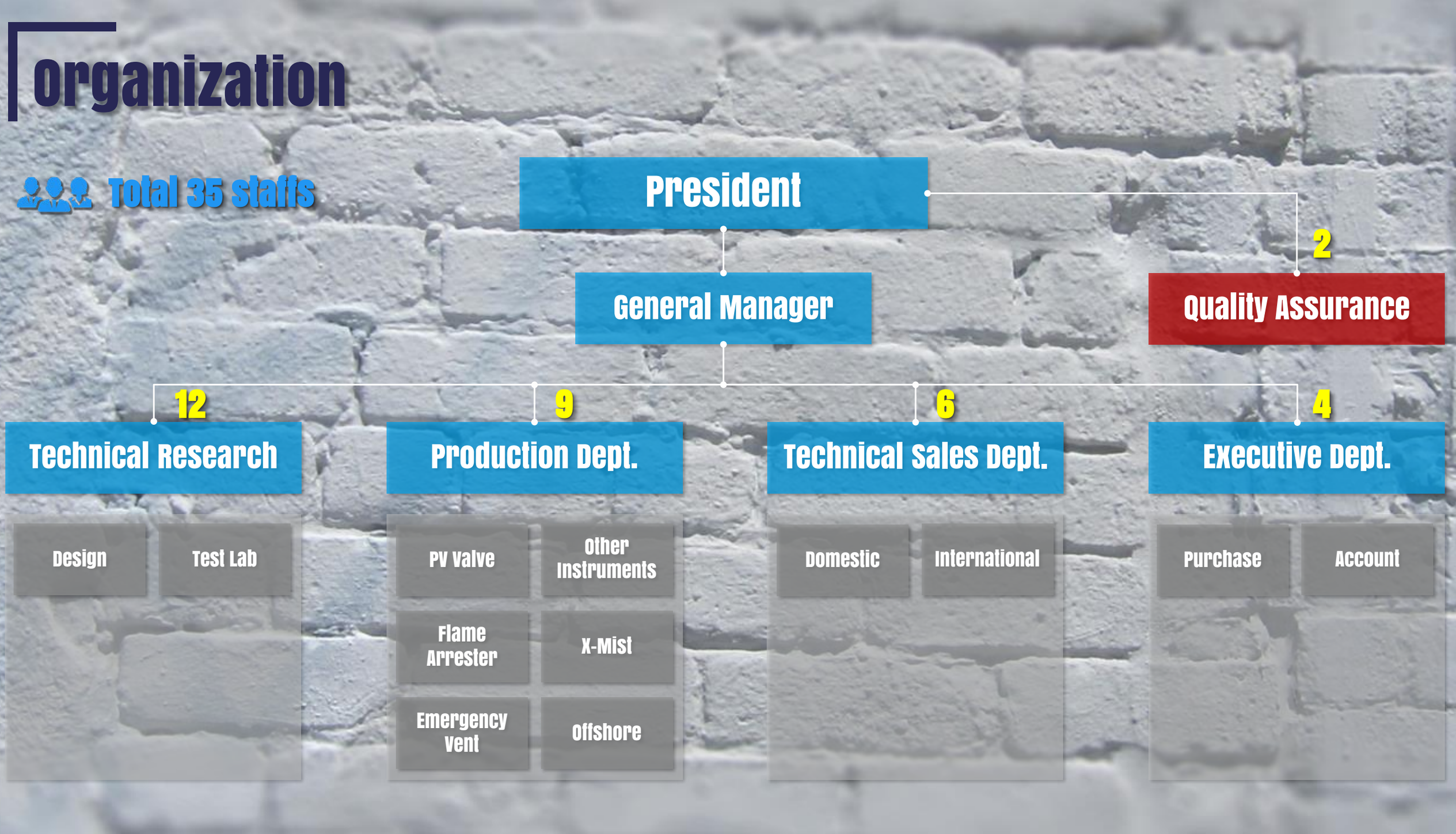
2000 Established company name to TANKTECH CO LTD
2001 Obtained USCG Certification for NEW-ISO-HV SERIES
2002 Won Official Commendation from Minister of Ministry of Commerce
2003 Developed Water Mist Firefighting System (X-MIST) & Tank Cleaning Machine (PM-80)

2010

2010 Moved office & built new factory at Gimpo City named to Korea Steel Power Corp.

Organization

Total 35 staffs



2 Main Products

Safety & Protection System

Automatic Tank Cleaning System

Fire Fighting System

Safety & Protection System

- Pressure Vacuum Relief Valve
- Flame Arrester
- Emergency Vent Cover
- Gauge Hatch, N2 blanketing System, R/Disc

Pressure Vacuum Relief Valve

KSPC Pressure Vacuum Relief Valves are designed manufactured and tested according to the API 2000 code, these valves utilize the latest technologies to provide protection against positive or vacuum over pressure and prevent air intake, evaporative losses of product and help to contain odorous and potentially explosive vapor.

P/V Valve Types

KSBB/BS

KSVR/VS

KSBG/GS

KSBBFI/BSFI

KSBBFH/BSFH

KSPO

KSBBJ/BBJS

KSPR

KSPS

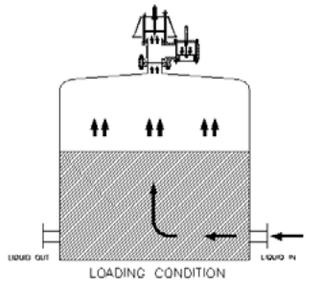
KSBD/DS

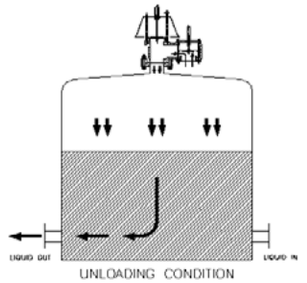
KSBGFI/GSFI

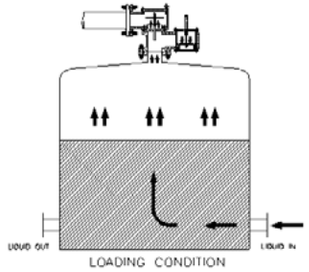
KSBGFH/GSFH

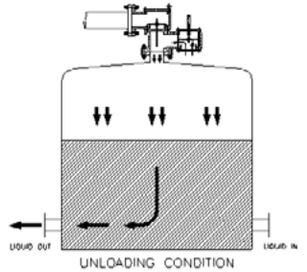
KSBBFY

Operation







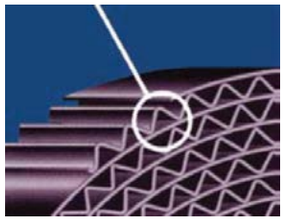


Flame Arrester

BURNING TEST

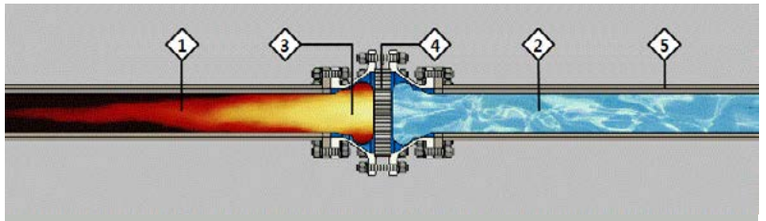
FLASH BACK TEST

KSPC Flame Arrester of the model KSFI/FH is designed, manufactured, and tested according to ISO 16852 / EN12874 code. Installed in the top nozzle of the several kinds of the flammable low pressure storage tank (the ignition point below 65℃), it is the explosion proof and deflagration proof which blocks the influx of flame ignified externally into the tank.



Flame Arrester Types

Operation



1 Exposed Side
2 Protected Side
3 Flame Stabilized on arrester element
4 Flame arrester element absorbs
5 Piping

Emergency Vent Cover

KSPC Emergency Vent Covers provide the capacity to meet API standard 2000 for emergency venting due to fire exposure when properly sized. These covers also provide quick easy access for tank inspection and maintenance.
The KSEP/EPK emergency pressure relief vent provides pressure relief only.
Vacuum relief must be supplied by normal venting devices, or use our KSEV emergency pressure and vacuum relief vent covers.
When excessive pressure builds within the storage tank the KSEP series emergency pressure relief vent begin to open at a predetermined set pressure relieving excessive pressure. And when the overpressure has dissipated the cover reseat onto the base.

Emergency Vent Cover Types

KSEP

KSEPK

KSES

KSEV

KSEVK

KSESV

Gauge Hatch, N2 Blanking, R/Disc

GH SD N2

Gauge Hatch Cover with Sampling System

KSGH

KSGE

KSSD

T2000-TSS-01

N2 Blanking System

Rupture Disc

Explosion Panel

Gauge Hatch with Tank Measuring

Portable Oil/Water Interface Detector, T2000 series offer total solution for management of cargo in tanks. This device can detect and measure the Ullage, Oil/Water Interface and Temperature Gauging of cargo at the same time.

- Measurement of tank liquid storage level, Water bound and Ullage
- Measurement of tank liquid temperature
- Inert Gas Sampling
- Liquid Sampling
- Inert Gas Pressure measurement
- Dryness check (hand Dipping)

Portable Measuring Devices

T2000-TFC-01
Oil/Water/Ullage

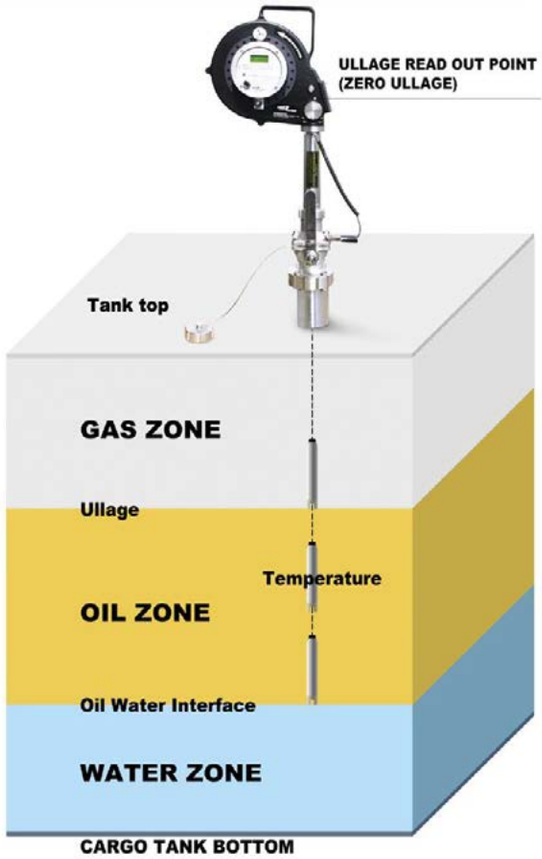
T2000-TSS-01
Liquid Sampling

T2000-TOS-01
Inert Gas Sampling

T2000-TPG-01
Inert Gas Pressure

T2000-TLS-01
Dryness Check

Tank Measuring on Gauge Hatch Cover



Air Release Valve

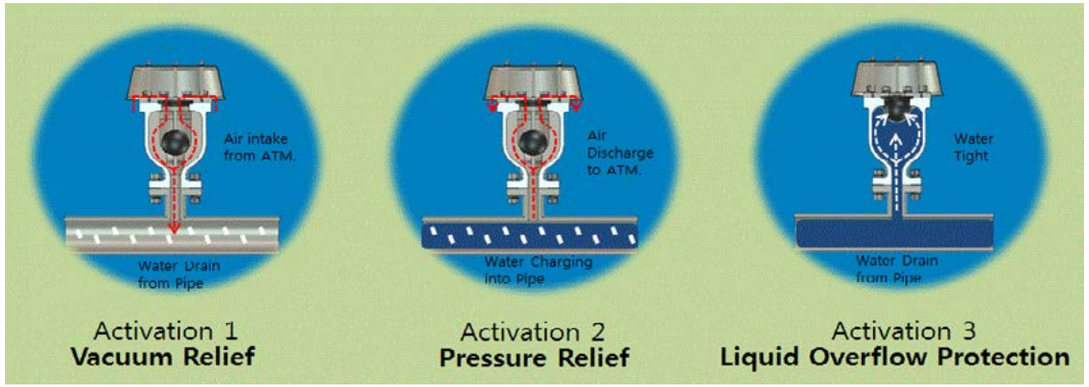
KSPC Air release valves are designed to release accumulated air pockets from the system, while pressured pipelines. Air pockets increase energy consumption because pumping operation will be at higher water heads to overcome pressured air.
Air release valves are have function to protect high shock and surge pressure, water hammer and liquid overflow from fresh or sea water pipelines.

KSBJ air release valve can provide low cast insurance to protect expensive maintenance cost of pipelines and pump systems.

Air Release Valve Function

- Anti-Surge & Anti-Shocks
- Surge and Water-hammer Protection
- Liquid Overflow Protection
- Release air pocket from pipeline
- Increasing of pump efficiency
- Less system energy
- Maintenance free

Operation



Automatic Tank Cleaning System

- Automatic Tank Cleaning Machine
- Floating-Roof Tank Cleaning System
- Cone-Roof Tank Cleaning System

Automatic Tank Cleaning Machine

Automatic Tank Cleaning System is using fresh crude oil or cleaning chemical as cleaning agent. And the cleaning pump supplies the fresh crude oil to the tank cleaning machine through the flexible hoses.

Application Procedure

1. Measuring of sludge profile
2. Installation plan
3. Automatic tank cleaning
4. Extraction of sludge-oil mixture
5. Measuring of sludge profile
6. Repeat step 3 ~ 5 until cleaning completed

Easy Installation & Mobilization

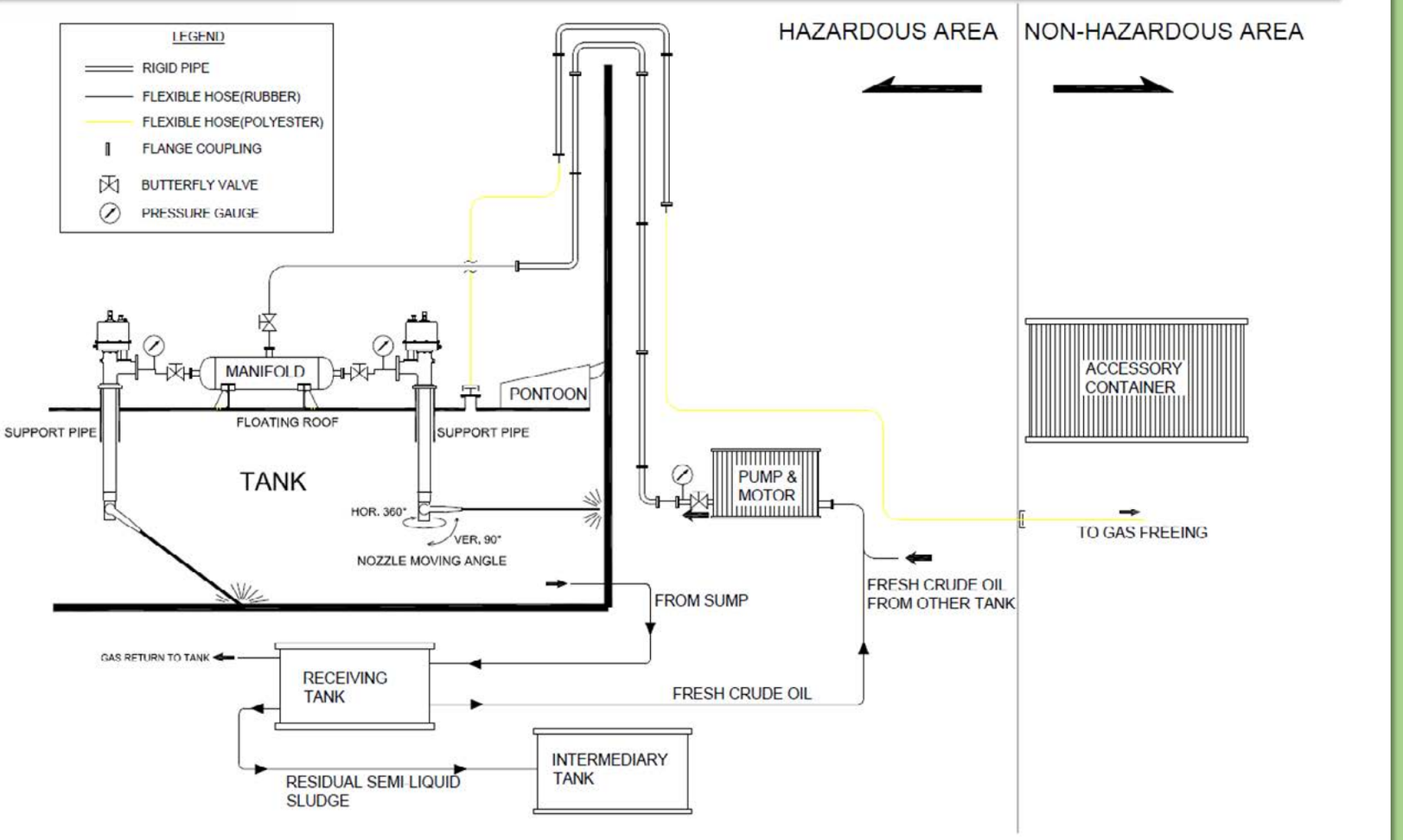
Container Module

Project		Customer	Oil Field / Operator	Qty
Offshore	Floating Production Unit	TOTAL	Moho Bilondo field, Congo	10 sets
		IOOC	Bahregan field, Persian Gulf, Iran	101 sets
	Floating Storage and Offloading Unit	misc	Abu Cluster field, Malaysia	55 sets
			Bunga Orkid field, Malaysia	46 sets
		PETRO VIETNAM	Bach Ho field, Vietnam	57 sets
	Floating Production Storage and Offloading Unit	Petrofac	Cendor Phaze II field, Malaysia	48 sets
Onshore	External Floating Roof Tank		North Refineries, Iraq	44 sets
			Al Ghaith, Qatar	1 full system
			Akita Oil Storage, Japan	10 sets

Floating-Roof Tank Cleaning System

Operation Concept

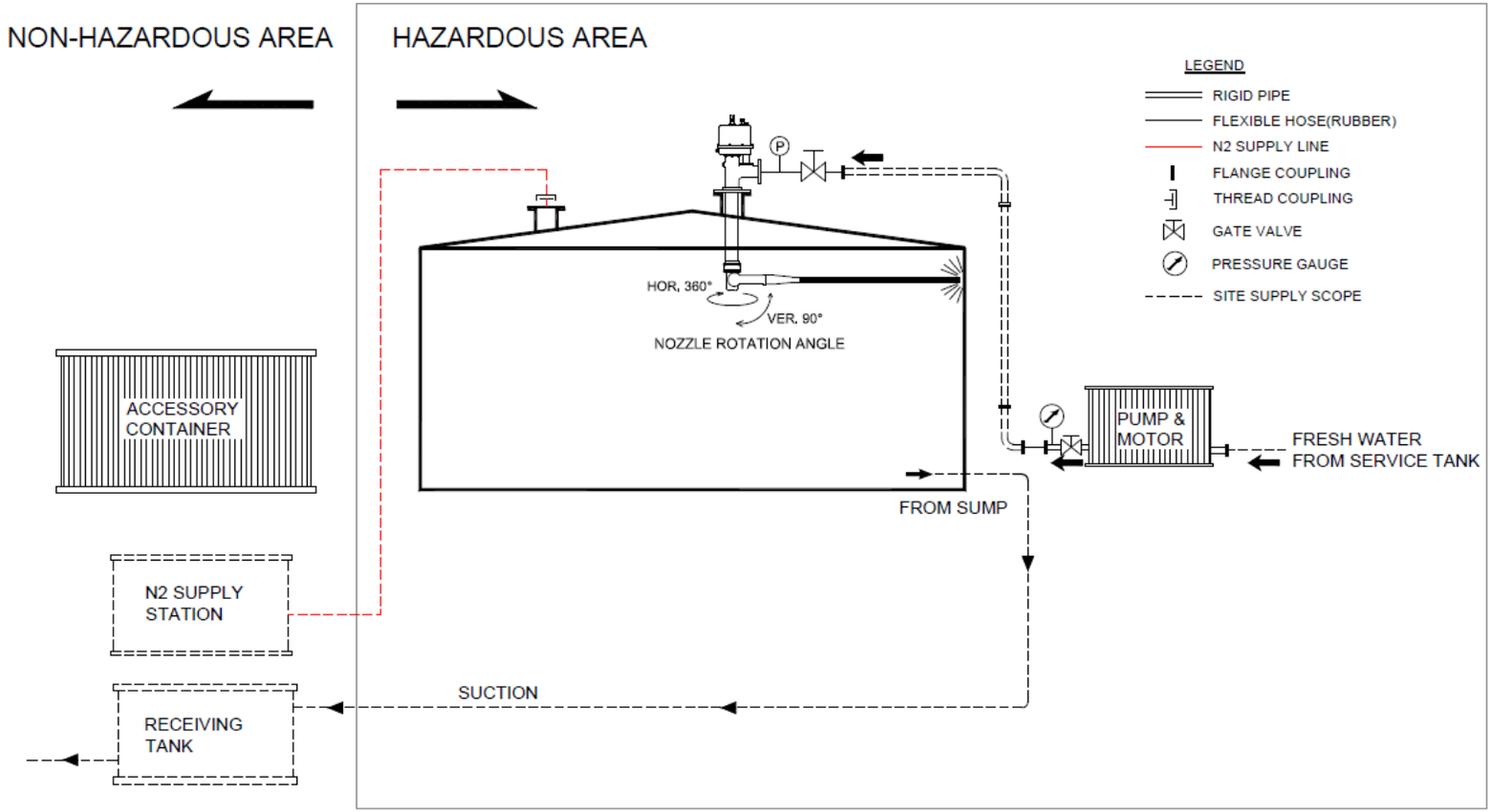
Schematic Drawing



Cone-Roof Tank Cleaning System

Operation Concept

Schematic Drawing



Fire Fighting System

- Water-mist Fire Fighting System
- Deluge Fire Fighting System

Water-Mist Fire Fighting System

X-MIST® SYSTEM is the next generation of fire fighting solutions and this system extinguishes fires by water vapor(water-mist). The exceptional cooling effect of water mist is a result of the division of water into very fine droplets, which increase the total surface area available to absorb heat and maximizes the evaporation rate of the water. All fire types, ie.A, B, C type, can be covered by this new fire fighting system.

System Component

Pump Unit (MOV type)

Supply water to each protected area.
Composed of pump/motor, MOV valve, motor starter panel.

Benefits

- Motor operation valve with manual override
- No leakage while pump's running
- Easy maintenance

Main Control Panel

Receive fire signal from alarm control panel.
Operate pump/motor and section valve.
Check an error of system.

Local Control Panel

The panel is installed at each section.
Manual release of water mist.

Smoke / Flame Detector

Addressable type

Alarm Control Panel

Receive fire data from detector consisted loop.

Fire Monitor (Repeat Panel)

Receive fire data from main control panel.
Display the state of fire at each section.

Major Component

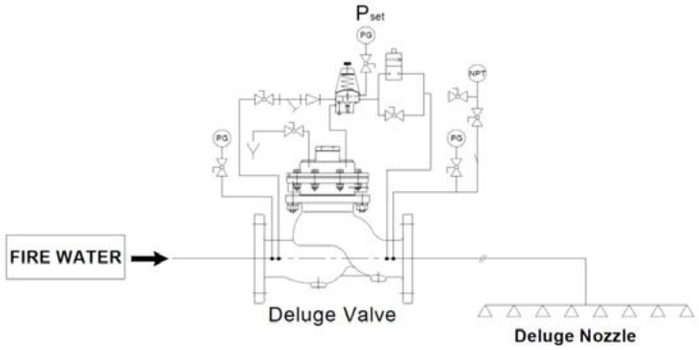
Water-Mist Nozzles for Local Area Application

Water-Mist Nozzles for Total Flooding Application

Deluge Fire Fighting System

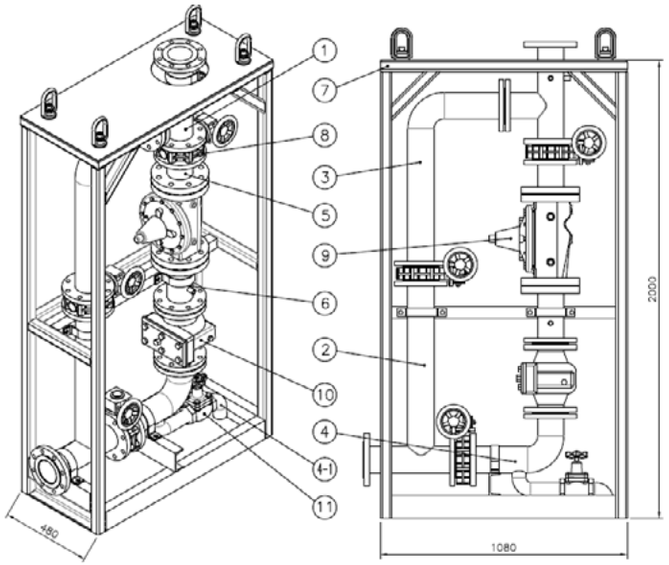
Deluge system is keeping closing state. When fire breaks out or in other emergency situation, the system is opened by electric actuating or manual and supply the fire water or foam to each deluge nozzle of the fire water line. And this system has the pressure regulating function which can preset the outlet pressure and supply the fire water as the preset pressure when the valve is opened.

Schematic Drawing & Major Component



System Design Capacity

- **Deluge Full Package : Valve + Nozzle + Control + Foam + Skid**



3 Quality Management

Quality Management System

ERP Management System

Quality Management System

QUALITY CERTIFICATION

Certificate
of Registration

This is to certify that :

Korea Steel Power Corporation

#488-1, Wolhwa-ro, Tongjin-eup, Gimpo-si, Gyeonggi-do, Korea

Has been assessed by International Certification Registrar Ltd., in respect of their Quality Management Systems and found to comply with

ISO 9001:2008

Approval is hereby granted for registration providing the rules and conditions relating to certification are observed at all times.

Certification Scope

Development, Manufacture, Sales of
Industry Machinery Valve

Certificate Issue Date :30th December 2013 Certificate No. : Q557310
Expiration Date :29th December 2016

The Seal of ICR Limited was here to affixed in the presence of :

President

International Certification ICR ISO 9001 REGISTERED FIRM Registrar Ltd.

IAF ANAB

Certificate
of Registration

This is to certify that :

Korea Steel Power Corporation

#488-1, Wolhwa-ro, Tongjin-eup, Gimpo-si, Gyeonggi-do, Korea

Has been assessed by International Certification Registrar Ltd., in respect of their Environmental Management Systems and found to comply with

ISO 14001:2004

Approval is hereby granted for registration providing the rules and conditions relating to certification are observed at all times.

Certification Scope

Development, Manufacture, Sales of
Industry Machinery Valve

Certificate Issue Date :30th December 2013 Certificate No. : E268810
Expiration Date :29th December 2016

The Seal of ICR Limited was here to affixed in the presence of :

President

International Certification ICR ISO 14001 REGISTERED FIRM Registrar Ltd.

IAF ANAB

CLASS CERTIFICATION

DNV

FM Approvals

Lloyd's Register

KR KOREAN REGISTER

Ex

BUREAU VERITAS

UNITED STATES COAST GUARD 1790

ClassNK

GL

ABS

ERP Management System

ERP SYSTEM INTEGRATION

ERP SYSTEM APPLICATION

4 Major customers

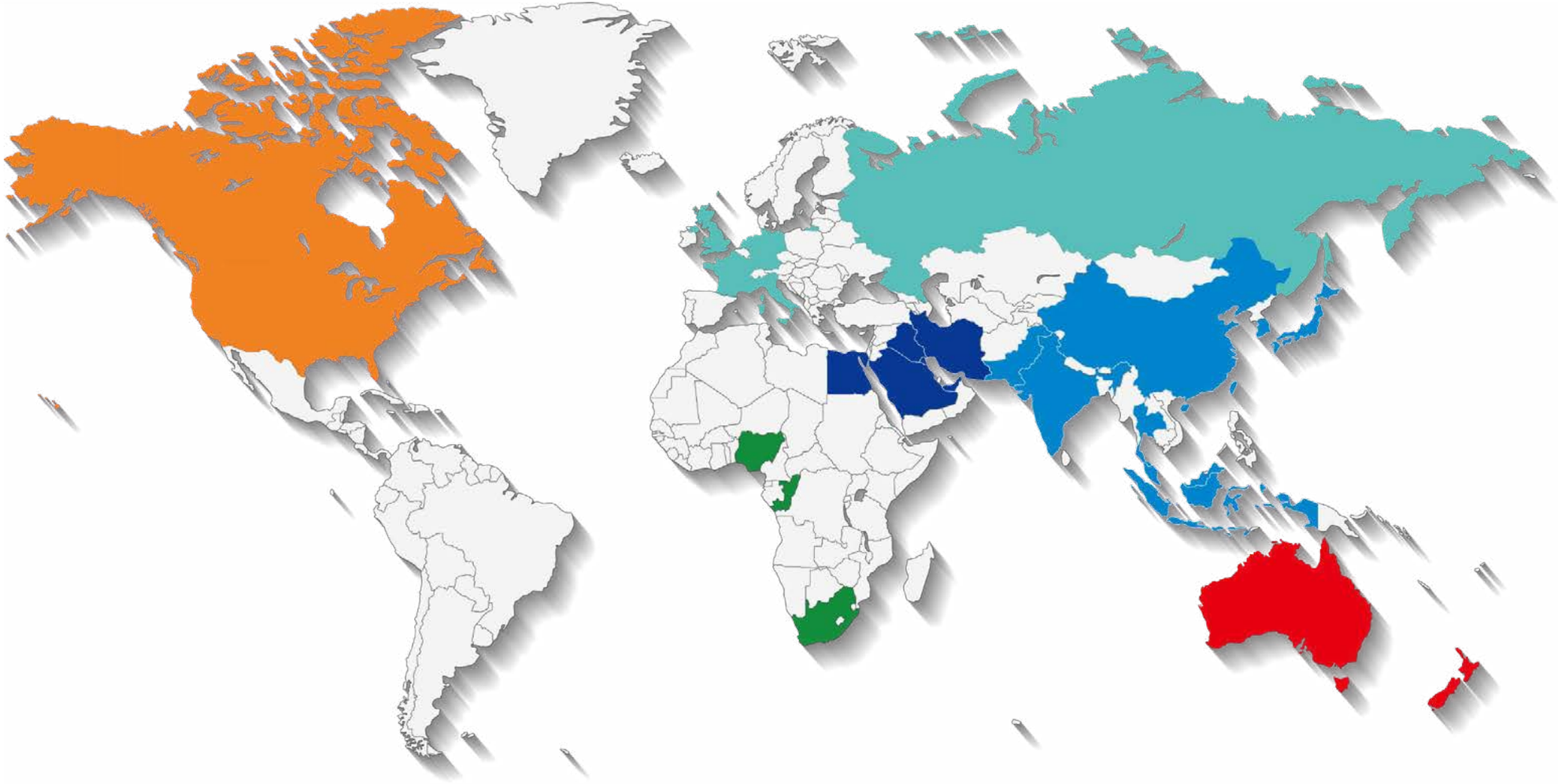
Customer List

Major customers

5 World-wide Networks

KSPC Networks Map

KSPC Networks Map



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When was the last time
you got **really good**
safety protection ?
SAFETY & PROTECTION
FULL-TIME GUARANTEE
KSPC