ZOOK®

Rupture Disk Applications








Safety **through** knowledge **and** performance.

ADHESIVE & PAINT MANUFACTURERS

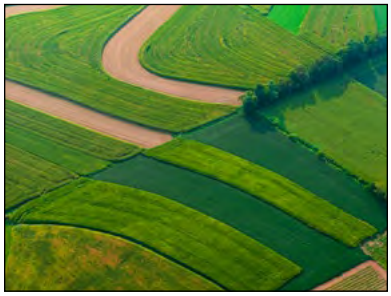
Mixers, batch reactors, storage filling and SRV isolation, (RA & EFV)

(Pumping Sweepcleen) Some applications may need heat tracing.

AEROSPACE

Special Custom Welded Assemblies for many aerospace applications that include jet propulsion, vacuum protection, vessel over-pressurisation protection and event managed systems such as parachute deployment. Assemblies made to the very highest standards of QA and designed with weight saving as a crucial element of functionality. Extreme low levels of leakage are normally a basic requirement for these designs.

AGRICULTURE



Protecting silos and tanks from methane build-up, (Z-POS, ARD), (Z-VAC) against vacuum collapse during emptying of tanks. Grain Elevators

AGROCHEMICAL MANUFACTURING

A large amount of applications wherever pressure is present. (ARD, Graphite), (Z-VAC & Z-POS) in storage vessels, exp panels for transporters ducts and bag filling machines.

AUTO

Air bag activators, pneumatic and hydraulic production machinery. Tyre curing moulds uses TA, UT.

AVIATION

Protecting personnel from over filling tyres. Has also some effect of preventing tyres to explode at hard landing. Protection of fuel tanks.

BREWERIES,WINERIES & SOFT DRINK MANUFACTURES

Fermentation and storage vessels (same as used in Agriculture) CO2 storage and filling machines (high & medium pressure disks, any suitable type)

CHEMICAL

Acetal Resins:
Special resins, eg, Delrin, made in limited quantities. Batch reactors use disks.

Acetic Acid/Anhydride:
Produced by reaction of carbon monoxide and methanol in a continuous process. Highly corrosive. Process vessels protected by safety valves. Valves isolated by tantalum disks or C276. Typical disk use 10 to 20 per plant.

Acrylic Acid, Acrylates:
Used as monomers for producing acrylate resins. Toxic, and may self-polymerise. Disks used to protect safety valves on storage tanks and reactors. May be used to protect pumps.

Acrylic Resins:
Polymers produced by batch polymerisation of acrylates, e.g. Poly Methyl Methacrylate - PMMA - Perspex. Other acrylates widely used in paints

Disks used to isolate safety valves and as secondary relief on batch reactors. Pumps can be protected with disks. Typical disk use 20 to 50 per plant.

Acrylonitrile:
Produced by reaction of oxygen, ammonia, propylene. Large low pressure DVs used to protect reactor. Storage systems may use disks to isolate safety valves. Acrylonitrile is toxic and may self-polymerise.

Acrylonitrile Butadiene Styrene Resins - ABS:
Widely used polymers produced in batch reactors. Great scope for disk usage on feed stock storage tanks, feedstock pumps, reactors, product pumps. Typical disk use up to 100 per plant.

Air Separation Units - ASU:
Used to produce oxygen, nitrogen and argon from air. Shell and tube heat exchangers protected by disks. May have liquifier attached to produce liquid nitrogen or oxygen. Safety valves isolated with disks. Turbine expander also protected by disks.

Ammonia:
Mass produced chemical. Starting point for fertilisers and intermediates, eg amines.

Disks used on ammonia production plants to protect heat exchangers. Large plants may have several exchangers.

Ammonia storage and transport tanks may offer opportunity for safety valve isolation. Up to 20 disks per plant.

Ammonia Liquid:
Road and rail tank cars fitted with relief valves - usually isolated with disk. TD, TCP, ICP.

Ammonium Nitrate:
Fertiliser produced by reaction of ammonia and nitric acid in ‘contactor’. Contactor protected by safety valves. Disks have been used to isolate safety valves to prevent solids blockage.

Aniline:
Widely used chemical - toxic. Disks used to isolate safety valves on process and storage.

Butadiene:
Gas usually stored as liquid. Feedstock for synthetic (butadiene) rubber, latex and resin production. Produced on large chemical plants operating steam crackers for ethylene.

Will self-polymerise. Disks used to isolate storage vessel safety valves.

Butadiene (Poly Butadiene) Rubber Latex:
Produced by batch polymerisation of butadiene. Reaction vessels safety valves isolated by disks. Disks possibly also as secondary relief. Disk use up to 100 per plant.

Butyl Rubber:
Also known as isobutylene - isoprene rubber IIR. May be produced in presence of chlorine or bromine to produce halogenated rubber, e.g. neoprene. Safety valves isolated with disks. If high levels of chlorine or bromine, tantalum must be used.

Caprolactam:
Used as feedstock for nylon production. Disks used to protect safety valves on reactors and vessels. Heat exchangers protected by disks.

Carbon Black:
Carbon powder produced by partial combustion of hydrocarbons, soot is collected and refined. Small disks used on receivers. Storage silos can use panels.

Carbon Disulphide:
Produced by reacting methane and sulphur over catalyst. Reactors protected by disks. Liquid toxic and slightly corrosive. Tanks protected by disks or safety valves plus disks.

CHEMICAL

Cellulose Acetate:
Used to produce cellulose fibres, cellophane film. Produced by reacting wood cellulose with acetic acid. Disks used to protect reactors. Liquid acetate injected through spinneret heads into liquid baths. Heads protected by disks.

CFCs, HCFCs 'Freons':
Production and use of nearly all types of Freon has been banned.

Was widely used as refrigerants, aerosol propellants. Produced by reacting ethylene with fluorine and chlorine. Expensive and impact upon environment. Disks used to isolate safety valves on production plant reactors and storage. Any safety valves on storage or refrigeration systems should be isolated. Small refrigeration units may use disks alone. Typical plants may use up to 200 disks.

Chlorinated Rubber:
See Butyl Rubber. (See page 3)

Chlorinated Solvents, eg Trichlorethylene:
Made by reaction of EDC. Processes have same problems as EDC production and same disk applications.

Chlorine:
Widely produced chemical from electrolysis of brine. No disks used in manufacture, but disks used as primary relief on liquid chlorine storage vessels.

Chloroethylene:
See ethylene dichloride.

Citric Acid:
Produced by fermentation of molasses. Disks used on fermenters and molasses pumps. Molasses tanks protected by disks. Powder - dryers, silos and dust handling plant requires explosion panels.

Epoxy Resins:
Produced in batch reactors. Disks used to isolate safety valves and as primary relief. Product pumps protected by disks.

Ethanolamines:
Monoethanolamine (MEA), Diethanolamine (DEA), Triethanolamine (TEA).

Produced using ethylene oxide and ammonia. Disks used to isolate safety valves and as secondary relief. See amine, ethylene oxide. Typical disk use up to 20 per plant.

Ethylene:
Widely used basic petro-chemical produced by steam cracking hydrocarbons such as ethane, propane etc. Start of process is pyrolysis furnace. Furnace tubes protected by double disks or disk/safety valves. Plants also have heat exchangers protected by disks.

CFC/HCFC - now banned - refrigeration units used to liquefy ethylene (for storage/ transport) should have safety valves isolated.

Storage tanks increasingly have isolated safety valves to reduce product loss.

Ethylene Propylene Rubber EPR:
Made by polymerisation of ethylene and propylene. Disks used to isolate safety valves and as secondary relief.

Ethylene Dichloride EDC:
Widely used solvent made by reacting ethylene, chlorine and oxygen. Process can be highly corrosive if hydrogen chloride forms. Disks used to isolate safety valves on reactors and vessels.

Up to 40 positions per plant.

Ethylene Oxide:
Widely used for production of glycol, amines, polyoils and surfactants. Very toxic and will self polymerise. Auto-explosive.

Used in batch reactors with safety valve as primary relief. Forward acting disks with vacuum supports have problem of product build-up.

Knife blade-type disks have been known to cause explosions. Scored reverse acting disks should be used. Reactors, storage tanks and transport vessels must use disks. May use 100 or more disks per plant.

CHEMICAL

Fatty Acids:
Stearic and palmitic acids made by hydrogenation of vegetable oil. Reactors may have safety valves isolated by disks. Product storage and pumps may use disks.

Formaldehyde:
Produced by oxidation of methanol. Reactor protected by large composite disk - up to 30" diameter, depending on plant capacity. Disks also used to protect columns and stills.

Higher Olefins:
Partially polymerised hydrocarbons - viscous liquids. Used as plasticisers and lubricants. Safety valves on reactors protected by disks. Pumps protected by Sweepcleen.

Hydrofluoric Acid:
Aggressive acid formed by reaction of sulphuric acid and calcium fluoride. Safety valves isolated with disks - Monel or C276. Transported in IMO containers - relief valves protected by disks. Stainless steel rapidly corrodes in hydrofluoric acid, carbon steel does not.

Hydrogen Peroxide:
Normally produced by oxidation reaction of hydrocarbons. Safety valves isolated with disks to prevent product loss and under certain conditions product build up. Up to 30 disks per plant.

Transported in tanks, railcars, but can decompose explosively, tanks protected by large (250+mm) low pressure bursting disks.

Ink:
Made from resins - usually acrylic. Disks used to protect solvent/resin mixing vessels and solvent storage tanks. May have 50 disks per plant.

Iso Cyanates:
Two types, toluene dilsocyanate and methyl diisocyanate (TDI and MDI).

Produced by reaction of phosgene with other chemicals. Disks used on reactors, phosgene storage and product storage. Can use up to 40 disks.

Maleic Anhydride:
Produced by catalytic oxidation of hydrocarbons. Reactors protected by large bursting disks.

Melamine:
Produced by catalytic decomposition of urea. Reactors may use disks as sole relief or to isolate safety valves.

Mercaptans:
Compounds of sulphur with very unpleasant smell. Plant producing mercaptans must have all safety valves isolated. All transportation vessels must have any safety valves isolated.

Main use of mercaptans is to make domestic natural gas smell - odourising. Odourising plants at gas terminals, distribution centres etc must have valves isolated with disks.

Metal Powder:
Some powders, highly explosive – e.g. aluminium, bronze, magnesium. Production and handling plants use explosion panels.

Monochloroacetic Acid:
Produced by reaction of chlorine and acetic acid. Very corrosive. Safety valves protected by tantalum disks.

Phthallic Anhydride:
Produced by catalytic oxidation of certain hydrocarbons. Reactors protected by disks usually 250 mm and above. Up to 10 disks per plant.

Poly Fluorothanes PTFE, PFA etc:
Produced by polymerisation of CFCs and HFCs in batch reactors. Similar to PVC. Vessels protected by disks.

Poly Vinyl Acetate PVA:
Can be (but not normally) used as a polymer on its own. Usually a co-polymer. Produced from vinyl acetate in batch reactors. Reactors use safety valves which can be isolated with disks.

Poly Vinyl Chloride PVC:
Batch process to produce PVC from vinyl monomer. Several process routes all of which use bursting disks. On reaction vessels disks are used to isolate safety valves and as secondary relief. Disks may have to be large diameter and reverse type because of cycling. Knife blades cause problems because of product build-up.

In emergency, a reaction stopper may have to be injected into vessels. Some process types, e.g. EVC, Elf Atochem use reverse disks to protect stopper line from blocking.

CHEMICAL

On EVC process VCM for the process is heated in an exchanger by hot PVC slurry from reactor vessel. Disks are used to protect the heat exchanger. PVC slurry pumps may be protected by disks. Safety valves on VCM storage vessels isolate with disks. Plants may have up to 40 positions.

Polyamides - Nylon:
Various types - Nylon 66, Nylon 6, Nylon 11. Nylon 6 has main disk use, but Nylon 66 also uses disks to protect reactors.

Polycarbonates:
Clear strong plastics - Lexan (brownish-colour), Makralon (bluish-colour) - produced by reaction of phosgene and bisphenol A. Because phosgene used, safety valves isolated with disks. Reactors protected by disks.

Polyethylene:
Three types - LDPE, HDPE and LLDPE - all made by different process routes.

(a) Low density polyethylene (LDPE). Made by compressing ethylene to very high pressure. Disks widely used on reactors, separation vessels, exchanger, gas treaters. Two main process types ICI and BASF. Latter can have up to 80 disk positions.

(b) High density polyethylene (HDPE). Made by several process routes - gas phase or liquid slurry.

Disks used to isolate safety valves. Up to 30 positions.

(c) Linear low density polyethylene (LLDPE). Replacing LDPE. Main process designed by BP uses disks to isolate safety valves. One company has installed GFN disks to protect main reactor. Up to 30 positions.

All types of plant use disks to protect product extruders and panels on solids handling plant.

Polyethylene Terephthalate PET:
Polymer used for bottles, films etc. Can be produced in continuous or batch plants. Disks used to protect reactors and isolate valves. Process designed by Zimmer (Germany) uses large number of disks on Dowtherm heating/cooling systems. Up to 40 disks per plant.

Polypropylene:
Made by polymerisation of propylene by 2 routes - gas process using catalyst, slurry route using suspension in liquid. Both methods use disks for relief isolation. Extruder assemblies used to protect molten polypropylene systems and explosion panels used to protect polymer chip, sieving and storage. Up to 20 disks per plant.

Propylene Oxide:
Similar properties to ethylene oxide, but less dangerous. Replacing ethylene oxide in some applications. Disk requirements same as ethylene oxide.

Pure Terephlthalic Acid PTA:
Feedstock widely used for polyester manufacture. Wide use of disks especially for processing finished product with acid. Highly corrosive acids, disks in tantalum required for some positions.

Pyrolysis:
See Ethylene.(See page 4)

Silicones:
Available in various forms - liquids, gels, resins, emulsions. Made by production of chlorsilane followed by hydrolysis. Process involves highly corrosive products and gases and likelihood of polymerisation in valves. Large disk use in 316, C276 and tantalum.

Sodium Hydrosulphite:
Reaction of sodium salts with sulphur dioxide. Reaction vessels protected with disks. Drier units also protected by disks.

Styrene:
Produced by dehydrogenation of ethylbenzene. Reactors protected by large low pressure disks. Can self polymerise in valves etc. Pump can be protected by Sweepcleen disks.

Styrene Acrylonitrile Resin SAN
See Acrylonitrile, Butadiene, Styrene (ABS) resins.

Styrene Butadiene Rubber SBR:
Produced in batch reactors. Same requirements as ABS.

CHEMICAL

Titanium Dioxide:
Pigment used to make paper and paint white. Two process routes - sulphate (obsolete) and chloride. Natural oxides of titanium are reacted (chlorinated) to produce titanium tetrachloride (very toxic), titanium tetrachloride reacted with oxygen to produce titanium dioxide.

Disks widely used on chloride route on chlorine systems, chlorinators and to isolate safety valves in titanium tetrachloride service, protect processing vessels for final processing product. Reverse disks widely used. Up to 50 disks per plant

Vinyl Chloride Monomer VCM:
Feedstock for PVC manufacture. Highly toxic.

Produced by reaction of oxygen, chlorine and ethylene in oxychlorinator. Reaction vessel protected by large disks up to 600 mm in diameter. Because of danger of corrosion products, C276 or even tantalum may have to be used for disks. Safety valves normally isolated on process and for VCM storage.

VCM plants can be large users - up to 200 positions.

CRYOGENIC

Special welded disk assemblies in storage and transportation vessels TA units.

DUST COLLECTORS & FILTERS

Vent panels and large bore flat seat rupture disks are used in these applications where normally large volumes are collected and filtered. Dust applications such as flour and cement production plants use many vent panels.

ELECTRICAL & ENERGY

Switchgear and transformer over pressurisation protection of equipment casing. Either graphite or metal rupture disks used on SF6 gas and oil impregnated paper insulated systems.

Process Equipment (ZOOK Canada) rupture disks designed for use on CANDU nuclear reactors many that are still in use today.

ENGINEERING

FIRE EXTINGUISHERS

Small nominal bore rupture disks used on potable water, powder and gas fire extinguishers used in most building worldwide. Fuel tank farms use rupture discs on the foam release systems that include top pourers.

FIRE PROTECTION

FOOD

Vegetable oils can oxidize or absorb water. Stored in tanks with Nitrogen blanket, usually low pressure but need disks (ARD, Z-POS & Z-VAC)

Sugar, highly explosive dust, storage vessels fillers, transport ducts EXP a must. Flour, highly explosive dust, storage vessels fillers, transport ducts EXP a must

HEATING & VENTILATION

For pressure dispensing. Valves may be used for pressure relief. Disks have high pressure

LITHIUM BATTERY HOUSINGPROTECTION

Lithium batteries are becoming ever more prevalent, often they will be enclosed in a housing which needs to be protected in the event of overheat or gassing. Typically the customer is looking for a small cheap robust easy to install disk – the burst rating does not need to be highly accurate and the operating conditions are not demanding.

Since non-fragmentation is not necessarily critical to these applications a graphite disk may be an option. This opens the way to simple and inexpensive fitting by adhesive – a pilot order has been supplied to one customer using this installation method. This means all the customer needs for the disk installation is a flat surface, a hole and suitable adhesive.

METALS

OFF-SHORE

Gas can be found alone or associated with oil or condensate. Few disks are used to process the oil, but disks are used if the gas is processed on the platform. Main applications are as follows:

De-aerator

Used to remove dissolved oxygen from process water by injecting nitrogen.

Flares

Waste gases are flared off. Flow to the flare is controlled by a large butterfly valve.

Since the butterfly may stick closed, reverse acting open bursting disks are widely used as a by pass. Large sizes - up to 36”, 1 to 8 barg.

Fuel Tanks

Helicopter fuel tanks blanked by nitrogen have bursting disks fitted.

Gas Turbines

Widely used to generate power. Heat from exhaust gases used to raise steam in waste heat boilers. If gas is allowed to build up in the exhaust, and the turbine is started, there could be an explosion. Insulated explosion panels are used to protect the exhaust ducts.

Heat Exchangers

After separation the gasmay need to be heated for processing or more usually cooled after compression. Heat exchangers consist of a steel shell with a design pressure of 25 barg. The gas passes through tubes in the exchanger normally at 100 barg. Water at 5 barg passes through the shell. In the event of a tube burst the shell is rapidly over pressurised. Safety valves cannot operate fast enough to release pressure so bursting disks have to be used. In the past, forward acting double assemblies have been used. Since 1987 the industry has adopted reverse acting liquid service disks.

Pig Launcher

Pigs are used to clear gas lines and are sent into the line from a launcher which has to be pressurised to above line pressure. Pig launchers have used pilot safety valves in the past but because of cost and mechanical problems RDs have been used.

PHARMACEUTICAL

Amines:
Expensive chemical with ability to absorb water. Used as drying agent in gas industry, feedstock in plastics and pharmaceuticals.

Disks used in amine producing plants to isolate safety valves Amine drying and desulphurising units in gas plants use disks to isolate safety valves.

To prevent water absorption during storage, tanks are blanketed by nitrogen. Disks used to prevent tanks from over pressure.

Batch Reaction:
Generic term for process which is taken to completion in single vessel. Process cycle consists of vacuum, reaction, discharge. Pressure usually rises quickly in reaction phase. Batch reactors widely used in chemicals, fine chemicals and pharmaceuticals. Batch reactors usually fitted with safety valve and also disk as secondary relief.

Batch reactions regarded as high risk include polymerisation, sulphonation, nitration and hydrolysis, and require disks.

Biotechnology:
Relies on fermenters.
Disks used to stop build-up and contamination in safety valves.

Bromine:
Usually produced from seawater. Used for chemicals and pharmaceuticals production. Highly corrosive if wet. Stored under nitrogen. Tanks protected by disks. Inconel holders, tantalum disks used.

Centrifuges:
Used to mechanically separate solids from liquids. Sometimes centrifuge is inerted with nitrogen. Centrifuge is now a pressure vessel and needs bursting disks.

Fatty Alcohols:
Three main routes.
Hydrogenation of fatty acids.

1. Hydrogenation of fatty acids.

2. Reaction of ethylene and aluminium followed by oxidation with air.

3. Oxidation of high olefins.

Reactors use disks for safety valve isolation or as secondary relief. Pumps may be protected by disks. Fatty alcohols reacted with ethylene oxide to produce detergents. Reactors protected by disks and isolated safety valves. See Ethylene Oxide.

Fermenters:
Widely used to produce drugs, antibiotics. Fermenting takes place at low pressure or atmospheric. After each batch, vessel steam cleaned at approximately 2 barg.

Fermenters fitted with pressure relief, usually safety valves. Valves protected by disks to prevent build-up of micro organisms, SD, RAUS, RLPS. Disks with Teflon or vacuum supports should be avoided.

Hydrogen Cyanide:
Toxic gas. Safety valves must be isolated.

Hydrogenation:
Used to harden fats and oils by reaction with hydrogen in presence of a catalyst. Reactors and separation vessels protected by disks.

Industrial Pressure Cookers:
Used to cook food or sterilise pharmaceuticals. Consist of inner vessel pressurised by steam and outer jacket heated by steam. Inner vessel and jacket protected by safety valves, but because of incidents valves have been replaced by rupture disks.

Integral Bulk Containers IBCs:
Small vessels for carrying liquids or powders.

Depending on product, may have nitrogen atmosphere or use nitrogen been used, especially for powders.

Phosgene:
Very toxic, but widely used chemical. Any safety valve used in phosgene service must be isolated. Tanks and reactors protected.

PHARMACEUTICAL

Pressure Filter:
Used to separate solids from liquids. Consists of vessel with filter membranes in base. Vessel is filled with liquid and nitrogen is used to squeeze liquid through filter. Because system classed as pressure vessel disks should be used. Reverse disks allow higher operating pressure and faster throughput.

Pumping:
Most industries pump fluids. These can be thin fluids such as water or thick fluids such as adhesives or slurries. Pumps are of two types, centrifugal or positive displacement.

Centrifugal pumps rely on a rotating impeller to give energy to the fluid to cause it to enter and leave the pump.

If the discharge is closed the impeller will just slip which in itself does not cause problems. However, as the pump slips it generates heat which may - and does - cause the fluid to boil. This causes the pump casing to be over pressurised leading to it bursting. A disk on the discharge line will overcome this problem. Since centrifugal pumps have no cycling forward acting disks, SFAZ can be used, but operating pressure, vibration and available relief area must be considered.

Screw type pumps are usually used where very high pressure is required, e.g. hydraulic systems, injection & extrusion systems (TA, EB).

Positive displacement (PD) pumps, e.g. gear, piston, lobe, helical, screw types, move a specific quantity of fluid per cycle or stroke. If the discharge is closed pressure will build causing drive shaft to fail or casing to burst. PD pumps should always have some form of pressure relief - relief valves or disks. Relief valves will leak and since this type of pump is used for viscous fluids the dangers are obvious. Disks can be used alone or with valves. The pulsation from this type of pump requires that reverse, liquid service disks are used.

Soap, Detergents & Cosmetics:
Positive displacement pumps used to pump soap, washing-up liquid, shampoo, toothpaste. RA, Sweepcleen used to protect pumps.

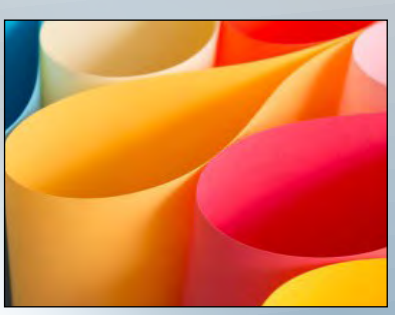
Spray dryers used for powders - protected by explosion panels.

Storage:
Some products stored under nitrogen atmosphere. Tank now a pressure vessel so must have relief. Vent valves can be used, but leak nitrogen. Disks must provide pressure relief with minimal leakage.

Sulphur Dioxide:
Gas stored as a liquid with wide range of uses. Storage usually protected by bursting disk.

Synthetic Blood Plasma:
Produced by fermentation. Disks used to protect valves and storage vessels.

PAPER & PULP



Fibres separated by strong caustic lye, or TMP (Thermo Mechanical Process).Large grinding wheels assisted by steam. Ideal for clogging up PSV's with the fibres.

Pulp usually bleached by Chlorine or Sulphate.

The main uses of disks To protect steam cabinets and drums on paper dryers.
Pulp is processed in a deflaker/ refiner - a large vessel with central rotating shaft and static and rotating arms. If paper stock flow fails, heat generated will create steam causing vessel to burst, vessel protected by disks.

Fine papers are "filled" with kaolin (china clay). This is pumped as a slurry that can solidify if process is stopped. Pump protected by RA disks.

PSV ISOLATION

Disks in combination with PSV

This is a classic application but not all plant / process designers and engineers are aware of it. In short the benefits of both valve and disk are realised by installing a disk upstream of the safety valve.

Benefits

Elimination of leakage fugitive / emissions

- Valve is isolated from corrosion

  So can be constructed from standard materials – reduced first cost

  And will be in perfect condition when required to operate - enhanced reliability
- Valve servicing and calibration costs can be much reduced
- Depending on application details the disk can be engineered to allow in-situ testing of the valve
- Major savings are available in plant running costs, for example costly steam leaks can be eliminated

A second (typically low pressure) disk can be installed on the vent side of the safety valve to isolate the valve from corrosion / other environmental conditions, the disk can be fitted with a detector which will provide an indication of valve operation or leakage.

REFINERIES

An almost infinite range of applications. Will often require disk assemblies to cope with downstream back pressure from common header / flare stack discharge side pipework – often this will require a double disk assembly. In this case careful consideration needs to be given to eliminating vent side leak paths.

Detection may be challenging – Z-Alert and BA may cover this. Material specifications may be very tight including special qualifications for the mill supplying raw material for holder components.

The holder components may need to be forged specifically for the project in hand, PMI, NACE, ITP are typically required and there may be finishing requirements (painting and packaging).

Meeting the demanding specifications can mean price becomes secondary – because of the enormous cost of down time – especially for off shore equipment – it is key to these customers to have reliable and easily serviced equipment. Any extra engineering from the supplier which will promote this will be well received by the project engineers.

REFRIGERATION

Typically small (up to 2” disks) at medium / high pressures (10 barg+) used to protect refrigeration circuits, the applications may also call for burst detection and pipe end protection (PG).The disk is used in series with a safety valve to prevent leakage of refrigerant. Some custom installations, there also exists mass market application, for example Henty Tech disks – a small medium to high pressure non fragmenting disk in a threaded enclosure again to be put in series with a safety valve – sometimes also supplied built up into a complete assembly with disk, relief valve, pressure transmitter, pressure gauge. No current ZOOK solution for this particular application. Interestingly the UK Institution of Refrigeration recommends a 5 yearly test / changeout of rupture disks (was previously 2 years).

SHIPPING

Applications include rupture disks on the desalination plant, pumping systems, fuel storage over pressure, heating and ventilation.

TEXTILE

Dyeing making plants use rupture disks on the process systems.

TRANSPORTATION

Generally graphite and metal rupture disks are used on a variety of applications. These include over the road intermodal tankers and railcar tankers. A variety of materials are available for these applications.

WATER

Reverse Osmosis Desalination plants drive water under pressure through filters and medium pressure bursting disks are frequently used for protection. Both graphite and metal disks are used. Water storage / transport tanks which will require protection. Antique UK water mains are vulnerable to damage when recommissioned after repair disks may be used by the utility company for protection in that application.

In general the ZOOK FS series is a good option for contact with potable water, for example to protect road tanks used for temporary water supply in the case of water outage, events etc – buyer here would be the tank constructor.

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ZOOK®

SERVING AMERICA, CENTRAL & SOUTH AMERICA

16809 Park Circle Drive
Chagrin Falls, Ohio 44022
United States

Toll Free: +1 800 543 1043
Phone: +1 440 543 1010
Fax: +1 440 543 4930
E-mail: sales@zookdisk.com
Website: www.zookdisk.com

SERVING EUROPE, MIDDLE EAST & AFRICA

Navigation House, Bridge Street
Killamarsh, Sheffield, S21 1AL
United Kingdom

Phone: +44 (0) 1909 560999
Fax: +44 (0) 1909 560860
E-mail: sales.europe@zookdisk.com
Website: www.zookdisk.com

SERVING CANADA

4400 South Service Road
Burlington, Ontario, L7L 5R8
Canada

Toll Free: +1 800 370 6057
Phone: +1 905 681 2885
Fax: +1 905 681 8838
E-mail: sales.canada@zookdisk.com
Website: www.zookdisk.com

SERVING ASIA PACIFIC

Unit No. 23A-05, Menara Landmark
No.12, Jalan Ngee Heng
80000 Johor Bahru, Johor,
Malaysia

Phone: +60 (7) 2910099
Fax: +60 (7) 2910096
E-mail: sales.asia@zookdisk.com
Website: www.zookdisk.com

ALL OTHER INTERNATIONAL INQUIRES

E-mail: sales@zookdisk.com