

## INTERNAL FLOATING ROOFS (IFR'S) FOR STORAGE TANKS, PONTOON TYPE

*To reduce the emissions of Volatile Organic Compounds (VOC's) from atmospheric storage tanks internal floating roofs (IFR's) are an effective instrument eliminating emissions at their source. Skin and pontoon IFR's are using a light weight floating structure combined with a closed skin. By saturating the vapour space under the IFR combined with an effective seal the typical emission reduction is in excess of 98%. For this reason IFR's are categorised as BACT (Best Available Control Technique).*

### Aluminium IFR's, standards and safety

CTS' Aluminium IFR's are designed and constructed according all relevant international standards such as API 650 and/or EN14015. Local or user requirements are of course also reviewed and covered.

Also safety standards such as a.o. ATEX and NFPA and all emission requirements such as a.o. EPA (USA) and IPPC BREF (Europe) are fully covered from CTS as your supply partner.

### Features

- Reducing emissions of VOC's by more than 98%, and classified as BAT – Best Available Technique and BACT – Best Available Control technique on that basis by EPA (USA) and under the BREF (Best Reference Guide) Storage tanks (EU – IPPC, 2006)
- Maintenance free
- Compatible with all products stored, including 100% aromatics
- Light weight structure manufactured from aluminium or stainless steel
- Can be fitted in tanks with diameters between 6 and 120 meters
- Service life expectation in excess of 30 years
- Designed for each specific tank
- Easy installation, full installation manuals and project support available
- Compliant with all international (environmental) standards such as API, EN, BREF IPPC, EPA and specific requirements such as EEMUA, PGS 29 and VLAREM etc.
- Successfully used by all reputed major oil and tank storage companies
- Suitable for high filling and emptying rates as well as Nitrogen pigging and mixing operations
- Can be equipped with several different seal designs in an extensive range of materials able to withstand 100% aromatics

## INTERNAL FLOATING ROOFS (IFR'S)

### Seal arrangements

There are several different seal arrangements available for internal floating roofs. Each seal has its own specific areas of service. Seal materials have to be reviewed and are subject to change depending on the product stored.

### The most common seals are:

- Single wiper seal (economic choice)
- Double wiper seal (economic choice)
- Liquid mounted mechanical shoe plate seal (often combined with an independent rim mounted secondary seal)
- Foam seal

### Engineering aspects

Each IFR will be designed for the tank it has to be fitted in. CTS has developed sheets with all relevant engineering information. This includes amongst others the tank diameter, stored product, cleaning routines, pumping rates and pigging requirements. All IFR materials will fit through a 24" manhole.

### Proven efficiency

Our IFR's are extensively tested and monitored. Overall emission reductions will typically exceed 98%.

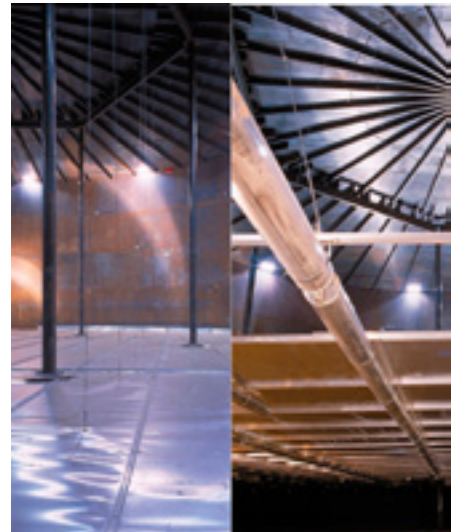
Upon request details of these emission measurements can be made available.

### Replacing corroded external floating roofs

Besides being used in fixed roof tanks an internal floating roof is an excellent alternative for replacing heavily corroded external floating roofs, when combined with an aluminium dome roof. This combination will eliminate rain water ingress, drain lines and extensive repairs such as blasting and painting, for a converted tank generating very low emissions compared to a steel external floating roof tank. This means that the gains go well beyond reducing only maintenance costs and out of service time!

### Detailed product information

Obviously this leaflet could not address all details of our internal floating roofs. Full engineering information including material specifications, engineering drawings and other relevant information is available upon request. Please do feel free to ask for your copy.



Cable suspended IFR, no legs, top and bottom view.



IFR's and domes make a great alternative for replacing a corroded steel roof.



Skin and pontoon IFR under construction, 70m diameter.



Liquid mounted shoe plate seal on skin and pontoon IFR.



Cable suspended skin and pontoon IFR, bottom view.

*All our product information and specifications are drafted with extreme care but can be subject to change. We reserve the right to change product specifications.*

Your Distributor:

**CTS Netherlands B.V.**

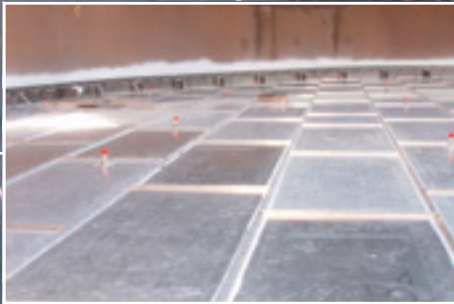
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## INTERNAL FLOATING ROOFS (IFR'S) FULL (DIRECT) CONTACT HONEYCOMB

*Besides the most common pontoon type IFR CTS also offers a direct (full) contact IFR which reduces the emissions of Volatile Organic Compounds (VOC's) up to more than 98%. Typically a full contact IFR is intrinsically ensuring the emission reductions required as it is covering almost the complete liquid surface. The CTS full contact internal floating roofs are manufactured from aluminium modules (panels), incorporating a light weight but strong honeycomb aluminium stiffening structure. The individual modules are fully welded and pressure tested prior to shipment, so the integrity of the modules is always guaranteed. On site the modules are positioned into the tank and easily assembled using a state-of-the-art hook and pin design to interconnect the modules. Apart from being very effective a full contact roof is also low in height, maximizing storage capacity for the tank involved.*

### Aluminium IFR's, standards and safety

CTS' Aluminium IFR's are designed and constructed according all relevant international standards such as API 650 and/or EN14015. Local or user requirements are of course also reviewed and covered.

Also safety standards such as a.o. ATEX and NFPA and all emission requirements such as a.o. EPA (USA) and IPPC BREF (Europe) are fully covered from CTS as your supply partner.

### Features

- Emission reduction in excess of 98% and as a result full contact internal floating roofs are classified as BAT (Best Available Technique) and BACT (Best Available Control Technique) by EPA (USA) and under the BREF (Best Reference Guide) Storage tanks (EU – IPPC, 2006)
- Maintenance free
- Compatible with all stored products, including 100% aromatics
- Lightweight aluminium structure
- For tank diameters between 4 and 120 meters
- Expected service life in excess of 30 years
- Designed for each specific tank
- Easy installation, full installation manuals and project support available
- Compliant with all international (environmental) standards such as API, EN, BREF IPPC, EPA and specific requirements such as EEMUA, PGS 29 and VLAREM etc.
- Successfully used by all reputed major oil and tank storage companies
- Suitable for high filling and emptying rates as well as Nitrogen filling line pigging and mixing operations
- Can be equipped with several different seal designs in an extensive range of materials

## INTERNAL FLOATING ROOFS (IFR'S)

### Seal arrangements

There are several different seal arrangements available for internal floating roofs. Each seal has its own specific areas of service. Seal materials will have to be reviewed depending on the stored products.

### The most common seal arrangements are:

- Single wiper seal
- Double wiper seal
- Liquid mounted mechanical shoe plate seal (often combined with a rim mounted independent secondary wiper seal)
- Foam seal

Let our team of specialists recommend you the preferred seal for your application.

### Engineering aspects

Each roof will be designed for the tank it has to be fitted in. CTS has developed sheets with all relevant engineering information. This includes amongst others the tank diameter, stored product, cleaning routines, pumping rates and pigging requirements. The full contact internal floating roof normally requires an opening in the tank roof or tank shell for loading into the tank.

### The roof modules, the vital part

Essential for the performance of the roof is the quality of the modules. In this respect it is good to know that all modules are pressure tested prior to shipment. Each module is equipped with a testing plug and the internal honeycomb structure is perforated, facilitating testing of the complete module.

The basic design of the roof exceeds the floatation requirements of API 650 by 350%, where the metallic skin exceeds API requirements for minimum thickness by more than 180%. This is the best way to ensure the all-important integrity of the roof.

### Proven efficiency

Our roofs are extensively tested and monitored. Overall emission reductions have proven to exceed 98%. Feel free to request details of these emissions measurements and tests, so you will feel comfortable with our products and their performance.

### Replacing corroded external roofs

Besides being used in fixed roof tanks an internal floating roof is an excellent alternative for replacing heavily corroded external floating roofs, when combined with an aluminium dome roof. This combination will eliminate rain water ingress, drain lines and extensive repairs such as blasting and painting, and results in very low emissions compared to steel external floating roofs. This means that the gains go well beyond reducing only maintenance costs and out-of-service time.

### Detailed product information

Obviously this leaflet could not address all details of our internal floating roofs. Full engineering information including material specifications, engineering drawings, references and other relevant information is available upon request. Please do feel free to ask for your copy.



Full contact IFR and aluminium dome.



Liquid mounted shoe seal, bottom view.



BP Refinery full contact IFR during inspection.

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