

CECO Peerless



**PROVEN SOLUTIONS
FOR THE PRODUCED
WATER INDUSTRY**

CECO
ENVIRONMENTAL

WITH OVER 80 OF YEARS EXPERIENCE, CECO PEERLESS IS THE GLOBAL LEADER IN SEPARATION TECHNOLOGIES FOR THE OIL, GAS AND PETROCHEMICAL MARKETS.



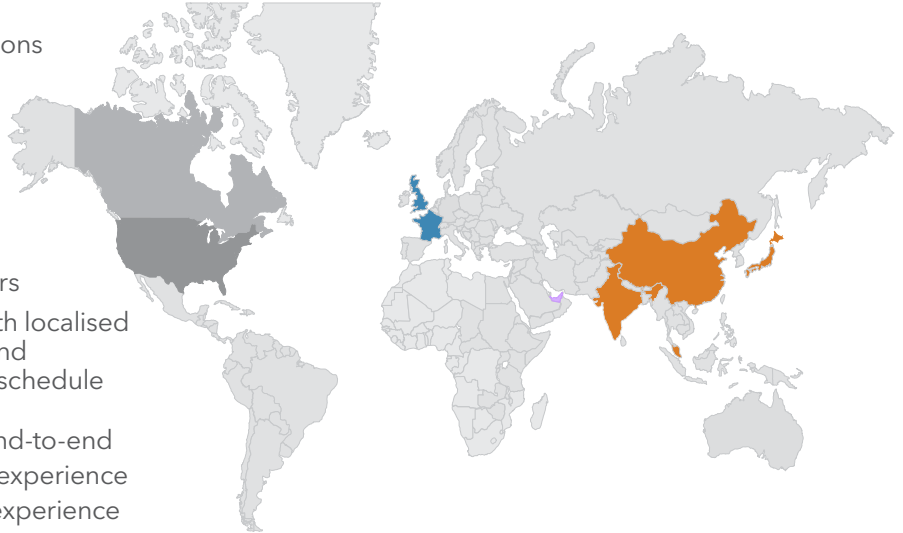
CECO
ENVIRONMENTAL

Offering treatment systems for both onshore and offshore applications, CECO Peerless designs and supplies a wide range of compact, engineered, high-efficiency, processing, separation and filtration equipment for the global oil and gas industry.

CECO Environmental's energy solutions include leading technologies such as CECO Peerless separation and filtration, Burgess Manning oil and gas processing technologies and Skimovex oily water separation.

Key CECO Peerless Facts

- Over 80 years of experience
- 1000s of successful installations and millions of hours of engineering excellence
- Experienced in technology, process, engineering and turnkey solutions
- Expertise from concept through commissioning stages
- Worldwide delivery capability and vast network of local/regional/global partners
- Global presence, multi-cultural teams with localised approach to attain clean, safe, efficient and sustainable solutions within budget and schedule



CECO Peerless provides you with the seamless end-to-end solution. We combine our technologies, process experience and R&D with our multi-disciplined engineering experience to give you every advantage:

- Concept/FEED studies
- Detailed engineering
- Engineered packages
- Modular/skid design and supply
- Turnkey solutions for EPF/CPF/topsides
- Fast track delivery
- Achieve overall performance
- Customer satisfaction
- After sales service



PRODUCED WATER TREATMENT

WITH DECADES OF EXPERIENCE AND EXPERTISE, CECO PEERLESS DELIVERS RELIABLE AND ECONOMICAL COMPONENTS OR COMPLETE WATER TREATMENT SOLUTIONS TO ENSURE OPTIMAL PERFORMANCE AND OIL AND WATER SEPARATION EFFICIENCY.

PRIMARY TREATMENT

CORRUGATED PLATE INTERCEPTORS

CECO Peerless Corrugated Plate Interceptors (CPI) as Oily Water Separators can be designed with various configurations, i.e., in a steel tank, in a concrete basin, or in a pressure vessel. CECO Peerless offers substantial weight and space savings compared with conventional gravity settlers, which is of major importance on oil and gas production fields.

Applications:

- Ballast water
- Oil surface drain water
- Refinery effluent
- Process water
- Desalter effluent
- Produced Water

Material and Construction:

All of our CPI systems are of robust construction based upon conventional design procedures and are normally supplied as fully self-supporting skid mounted packages.

Depending on the properties of the liquid to be treated, the material of the inclined plate packs can be:

- Glass fiber reinforced polyester (GRP)
- Coated carbon steel
- Various grades of Austenitic Steel (SS304, SS316, DSS, SDSS)
- Teflon-coated steel

Depending on the concentration of suspended solids or free oil, the plate spacing and inclination can be varied to suit the specific process conditions. Thus, we are able to offer to our clients the technically optimised solution for each application.



CPI Steel Tank type



CPI Concrete Basin type



CPI Pressure Vessel type

DEOILER HYDROCYCLONES

CECO Peerless Deoiler Hydrocyclones are effectively centrifugal separators that rely on the differential density between the particle and the water to allow separation. The efficiency of the separation is governed by five main factors that include droplet/particle size, differential density, viscosity of the bulk fluid and gravity (utilising centrifugal force.)

The horizontal deoiling hydrocyclone vessel with liners is designed to reduce the oil content of the incoming produced water prior to entering the downstream secondary treatment. The horizontal arrangement allows easy access to the liners for inspection, installation and replacement.

On entering the cyclone tangentially, the fluid begins to spin. This creates a radial force that directs the heavier phase towards the edges of the cyclone and then out of the cyclone underflow owing to differential pressure. The less dense phase is concentrated in the centre of the cyclone before passing out of the cyclone overflow, again due to differential pressure.



Applications:

- Onshore oil and gas processing facilities, early production facilities (EPF)
- Offshore facilities, mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical industries

Benefits:

- Compact design, replacing substantially larger equipment
- No moving parts and minimal maintenance
- Ideal for use where space is minimal
- Outlet oil content reduced to 25-40ppm in one pass

Field Trials:

- Small scale trial units are simple and easy to operate
- Can provide accurate picture of treatability of fluid
- Fully scaleable single-liner trial units
- Suitcase-size trial units

Additional Services:

- CECO Peerless can cater to the future downturn of production and include blanks inside the vessel to allow for a future change in process conditions. This flexibility allows the user to simply remove the blanking plate and replace with a hydrocyclone when new process conditions dictate.
- CECO Peerless is able to supply complete skid mounted Hydrocyclone skid package complete with design and supply of all Instrumentation and Controls.
- Due to the corrosive nature of some of the fluids, the hydrocyclone can be manufactured from exotic materials such as super duplex and inconel.
- CECO Peerless is able to engineer the complete skid package including providing 3D model designs, stress/STAAD structural analysis and heat and mass balance.

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SECONDARY TREATMENT

INDUCED GAS FLOTATION

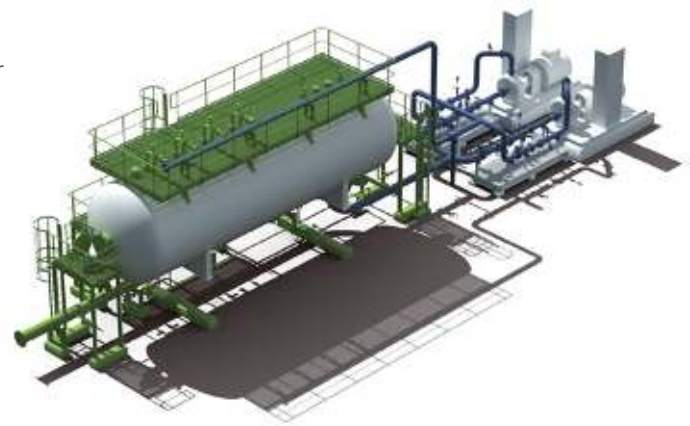
CECO Peerless Induced Gas Flotation (IGF) systems are used to further remove free oil and suspended solids from produced water after the primary treatment ensures that it is safe for disposal and re-use. Based on design flow rate and footprint available, CECO Peerless can offer vertical or horizontal induced gas floatation units.

Applications:

- Onshore - oil and gas processing facilities, early production facilities (EPF)
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- Removal of free oil-in-water to less than 15 ppm
- No turndown limitations
- Easy maintenance and minimum operation cost



DISSOLVED GAS FLOTATION

CECO Peerless Dissolved Gas Flotation units utilise a recirculation pump system to introduce microbubbles, enhancing the separation surface area, improving the oil and solid separation performance.

The CECO Peerless DGF has a sophisticated pumping mechanism to generate micro-bubbles. These pumps utilize dual sided impellers to draw in vapour and precisely mix it with the liquid. This configuration eliminates the need for a separate dissolution vessel as found on many traditional vfloatation systems.

Applications:

- Onshore - oil and gas processing facilities, early production facilities (EPF)
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- Enhanced separation achieving <10 ppm concentration of free oil in water
- High contaminant (solids and oil) removal efficiency
- Easy maintenance and minimum operation cost
- Reduced fuel gas/nitrogen consumption



DISSOLVED AIR FLOTATION

Depending on the discharge requirements and pressure profile, CECO Peerless can supply the dissolved air flotation units with various design options, such as steel tanks or concrete basins and using air saturation vessels, microbubble-generating pumps, and microbubble diffusing membranes.

Applications:

- Wastewater treatment
- Desalination pretreatment
- Process water production
- Offshore produced water
- Onshore produced water
- Refineries and petrochemicals

Benefits:

- High contaminant (free oil and suspended solids) removal
- Cost-effective alternative to conventional sedimentation clarification processes
- Capable of treating a wide range of suspended solids and free oil in water



COMPACT FLOTATION UNIT

The CECO Peerless Compact Flotation Unit (CFU) is the latest generation available on the market. The philosophy of compact flotation is the combination of multiple separation technologies that use cyclonic and flotation principles.

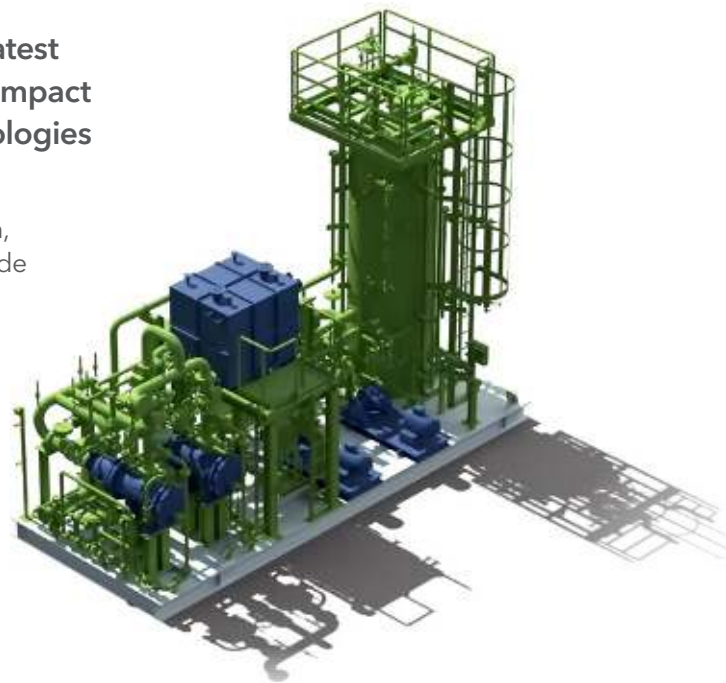
CECO Peerless CFU are available as a single or multiple stage system, combined or separate oil/gas outlets, the CFU is adaptable to the wide variety of oil industry process conditions and applications.

Applications:

- Onshore - oil and gas processing facilities, early production facilities (EPF)
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- Removal of free oil-in-water to less than 15 ppm
- Modular and compact solution for limited-space applications
- Easy maintenance and minimum operation cost



COMBINED CPI + DGF UNITS

The CECO Peerless advanced oil-water separator “CompacSep” is a next generation oily water separation product. It offers the technological advantage of corrugated plate interceptors and dissolved gas flotation technology combined in a single vessel or tank.

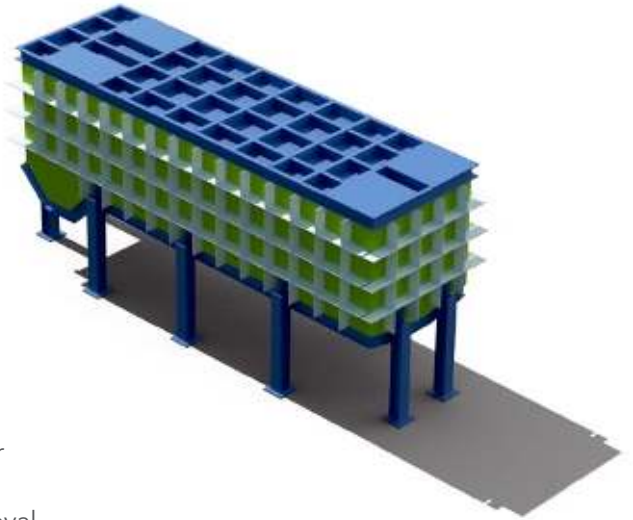
The philosophy of CompacSep is the combination of gravity separation technology using plate packs and dissolved gas flotation principles. This design provides excellent footprint reduction and simplifies the process controls.

Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- Removal of free oil-in-water to less than 10 ppm
- High-efficiency solids removal
- Modular and compact solution for limited-space applications
- Easy maintenance and minimum operation cost



SOUR WATER STRIPPERS

CECO Peerless Sour Water Strippers are used to remove harmful gases like hydrogen sulphide, carbon dioxide, ammonia and other impurities from produced water to ensure that it is safe for disposal and re-use.

The stripper column is provided with high performance process internals to ensure efficient separation and handle variable turndown capability. Steam, fuel gas or nitrogen is used as a stripping medium in the column. These units can be simple or complex based on process requirements.

Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- High-efficiency acid gas (H₂S, CO₂, NH₃) removal
- Compact footprint, simple and robust design
- Easy maintenance and minimum operation cost
- Meet stringent performance guarantee
- Ideal for early production and central production facilities



ADVANCED OXIDATION PROCESS

CECO Peerless Advanced Oxidation Process is a chemistry-based treatment designed to remove organic and some inorganic material from produced water by reduction and oxidation reactions.

AOP is widely used in industrial wastewater treatment and brings a number of benefits such as achieving disinfection, the process doesn't introduce any new hazardous substances into the water and it effectively eliminates organic compounds from wastewater among others.

CECO Peerless Feoxy is a Ferrate-based AOP technology. Ferrate is a versatile oxidant designed to move away from the conventional oxidants chlorine, as well as ozone (O₃), hydrogen peroxide (H₂O₂) and ultraviolet (UV) light. Ferrate (FeO₄)₂⁻ is a supercharged form of iron extremely powerful to serve multiple treatments from a single application

Moreover, Ferrate-based oxidation does not generate toxic disinfection by-products (DBPs) thus, is environmentally-friendly, and solves a various range of treatment challenges than other standard oxidants.

Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water



Benefits:

- Most powerful commercial oxidant for water treatment
- Effective removal of organic and inorganic contaminants
- Oxidation substrates are easy and safe to handle
- Does not produce any harmful byproducts
- Modular and compact solution for limited-space applications
- Easy maintenance and minimum operation cost

Design Options:

Depending on customer requirements and specifications, CECO Peerless can provide systems that involve a mix of the following AOP technologies other than the Ferrate-based design:

- Ultraviolet
- Ozone
- Hydrogen Peroxide
- Fenton's Reagent
- Catalytic O₃+H₂O₂+UV
- Chlorination
- Permanganates
- Chlorine Dioxide

WALNUT SHELL FILTERS

CECO Peerless Walnut Shell Filters is used in the separation and removal of hydrocarbons and solids from water in a final “polishing” stage of the process. The walnut shell filter performs at its best in produced water applications where outlet requirements are very strict.

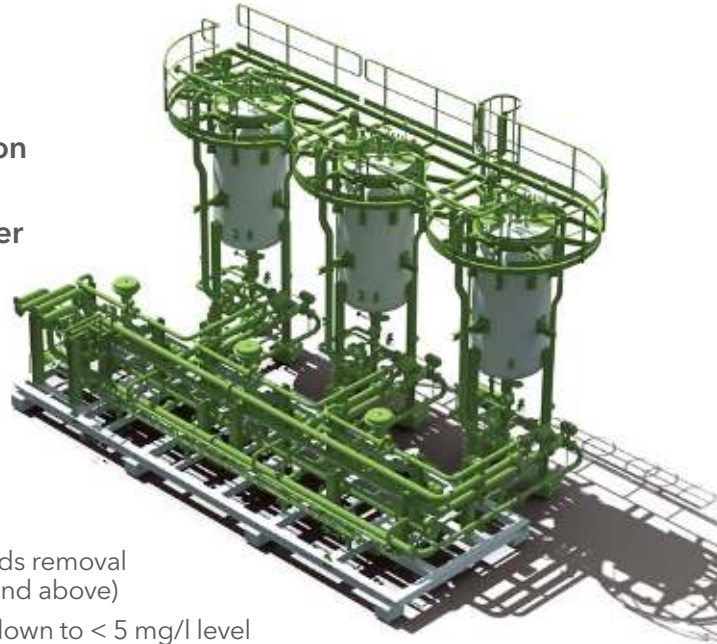
Not only does the walnut shell have the ability to act as a fine filter, but the shells themselves coalesce the oil droplets within the media allowing greater efficiency in the removal.

Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- High-efficiency solids removal (98% of 3 microns and above)
- Free oil reduction down to < 5 mg/l level
- Compact Footprint, simple and robust design
- Easy maintenance and minimum operational cost



ABSORPTION MEDIA FILTERS

CECO Peerless Absorption Media Filters are designed for the removal of total hydrocarbons from water, including amongst many, Phenols, PAH and BTEX. The media is a non-swelling organo clay granular media that removes hydrocarbons from water by means of chemisorption.

The absorption media is supplied in cartridge form for easy removal and replacement but can also be supplied in bulk beds for upflow and downflow operation.

Applications:

- Downstream of a secondary treatment as a final stage polishing filter
- For an upset condition where performance can deteriorate in upstream process equipment

Benefits:

- Absorbs 50 to 100% of its own weight
- Non-swelling and can be in cartridge form for easy maintenance
- Media remains free flowing as filters do not become “blocked” even when fully saturated
- Wide operating temperature and pH



TERTIARY TREATMENT

GRANULAR ACTIVATED CARBON FILTERS

CECO Peerless Granular Activated Carbon (GAC) filtration is very effective in eliminating harmful impurities and contaminants causing bad taste and foul odors, sediments, chlorine and other organic compounds.

Activated carbon works via a process called adsorption, wherein a highly porous pattern in the granulated carbon media adsorbs and entraps contaminants from the water. The contaminant particle is diffused into a pore and becomes absorbed.

Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Wastewater and produced water

Benefits:

- Efficient removal of hydrocarbons, organic compounds, BTEX in water
- Modular and compact solution for limited-space applications
- Easy maintenance and minimum



CARTRIDGE-TYPE FILTERS

CECO Peerless offers both particle removal filters and liquid coalescing filters to further enhance the quality of the treated water after series of separation. The filtration elements comes in cartridge forms which is deal for offshore applications, where quick cartridge replacement is required.

CECO Peerless Particle-Liquid Filter is a single stage device, which flows outside to in, through a high surface area pleated medium. The liquid flow enters the chamber in which the elements reside. The dirt accumulates on the outside, and the clean fluid passes through the central bore of the element and out, into the second chamber and out of the vessel.

CECO Peerless Liquid-Liquid Coalescer are made of Borosilicate Glass media comprising inorganic microfibers supported by polymeric supports in a spatially locked pore configuration with advanced separator layers to maximize droplet formation and disengagement. Small liquid droplets suspended in the continuous phase come together, or coalesce, as the mixture moves through the coalescer medium.



Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (mopu), fpso topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- High-efficiency removal of H₂S, COD and heavy metals
- Long life-span of the backwashable media bed
- High flux filtration thus compact footprint
- Easy maintenance and minimum operation cost
- Meet stringent performance guarantee

MULTI-MEDIA FILTERS

CECO Peerless Multimedia Filtration is a method of filtering sediments and particulates from water by applying pressurized produced water to push liquid through filtration a media bed.

Multimedia Filters are employed to also reduce the turbidity level of the produced water by entrapping impurities within the media. It contains a multi-layer of media such as sand, anthracite granite, and gravel and is arranged according to its densities where the lighter density is placed on the top.



Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- Efficient removal of solids in water, and turbidity reduction
- Modular & compact solution for limited-space applications
- Easy maintenance and minimum operation cost

SPECIAL MEDIA FILTERS

CECO Peerless Special Media Filtration was developed to handle Iron, H₂S, and heavy metals dissolved in water and in high concentration where simple filtration is not enough. Special types of advanced catalytic media are used to remove heavy metals contaminants in produced water.

Contaminants like Iron, Manganese, or H₂S and heavy metals are oxidized and converted into an insoluble form then filtered by the special media. Different types of media are used depending on what kind of contaminants are to be removed.



Applications:

- Onshore - oil and gas processing facilities
- Offshore - mobile offshore production, FPSO topsides
- Refineries and petrochemical complex
- Waste water and produced water

Benefits:

- High-efficiency removal of H₂S, COD and heavy metals
- Long life-span of backwashable media beds
- High-flux filtration thus compact footprint
- Easy maintenance and minimum operation cost
- Meet stringent performance guarantee

SOLIDS MANAGEMENT

SAND WASH PACKAGES

CECO Peerless Sand Wash packages are designed to treat sand jetting water originating from the upstream separator vessels.

The separator vessels will be internally-fitted with a sand jetting system. The slurry from these separators passes through the desanding section of the sand wash vessel containing the desanding hydrocyclone liners. In this section the solids are separated by gravity from bulk water, falling into the sand wash vessel accumulation area. Bulk water then exits the package via the flow control valve.

Applications:

- Wellhead solids removal in multiphase flow
- Protection of equipment from blockage or erosion
- Sand cleaning for overboard discharge

Benefits:

- High-efficiency solids removal
- Compact footprint, simple and robust design
- No moving parts for easy maintenance and minimum operational cost



DESANDING HYDROCYCLONE

CECO Peerless Desanding Hydrocyclones are pressure-driven cyclonic separators that utilize a certain pressure drop across the unit to force the separation of the solids from the bulk phase produced water or condensate.

The efficiency of the separation is governed by five main factors that include droplet/particle size, differential density, viscosity of the bulk fluid and gravity (utilising centrifugal force.)

Applications:

- Onshore - oil and gas processing facilities, early production facilities
- Offshore - mobile offshore production units (MOPU), FPSO topsides
- Refineries and petrochemical complex
- Wastewater and produced water



CECO Peerless

CECO Peerless is an experienced and reliable global leader in designing and supplying a wide range of compact, high-efficiency, separation and filtration equipment. Founded in 1933, CECO Peerless also serves the oil and gas production, gas pipeline transmission and power generating industries around the world.



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