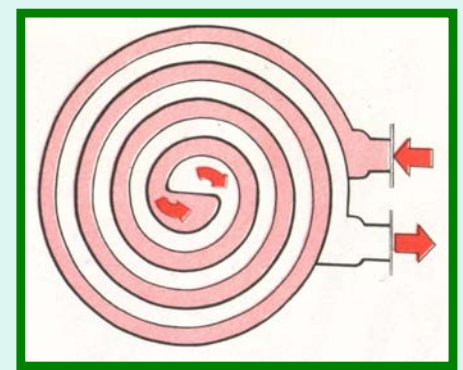
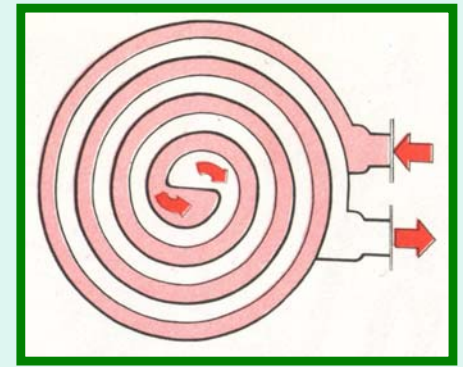


SCHIMBATOARE DE CALDURA SPIRALE



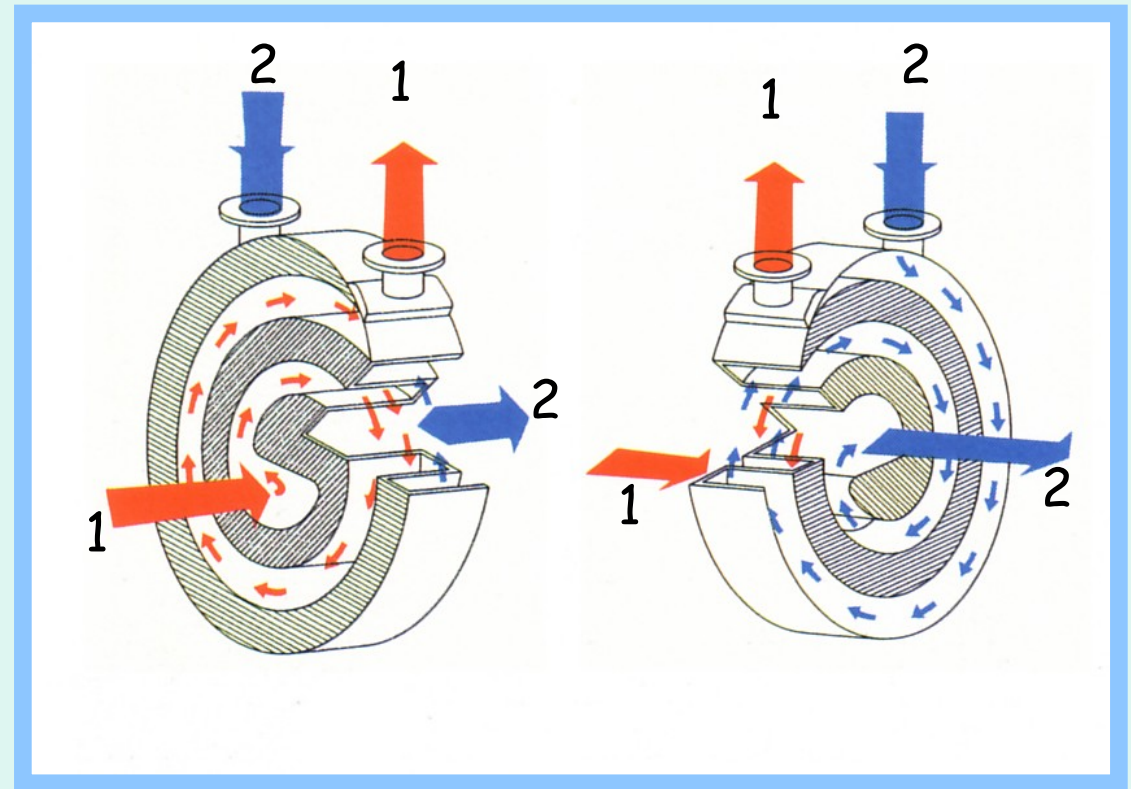
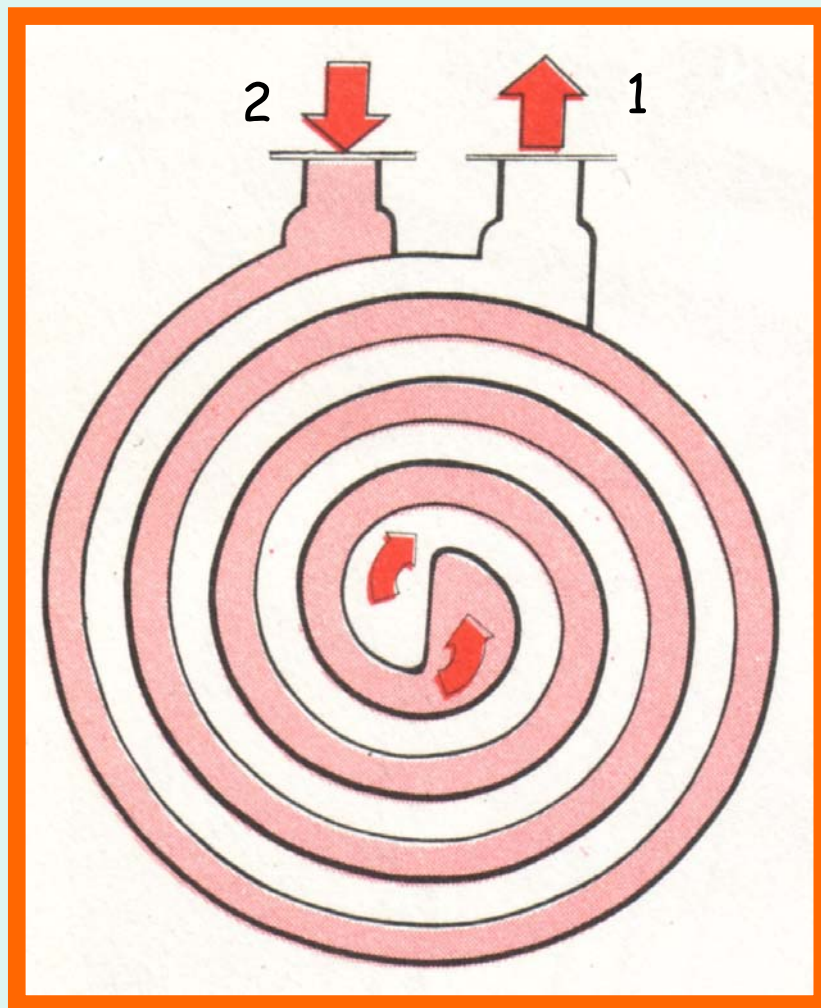
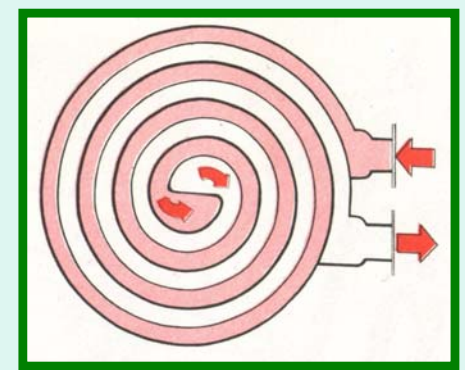
SCHIMBATOARE DE CALDURA SPIRALE



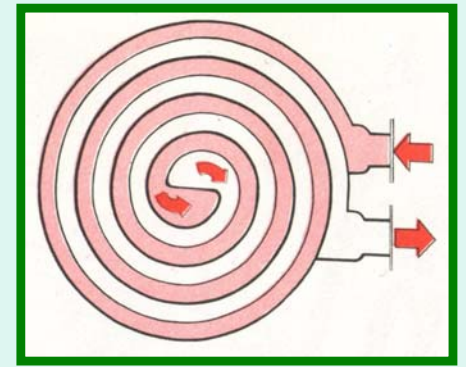
- Utilizate pentru prima oara de catre ROSENBLAD;
- Sunt alcatuite din doua fasii metalice infasurate a.i. formeaza doua canale paralele, cate unul pentru fiecare fluid;
- Latimea canalelor: $5 \div 20$ mm;
- Oferă avantaje deosebite in aplicatiile la temperaturi extreme, oferind o suprafata mica de contact cu mediul exterior.

SCHIMBATOARE DE CALDURA SPIRALE

- SCHEMA DE PRINCIPIU



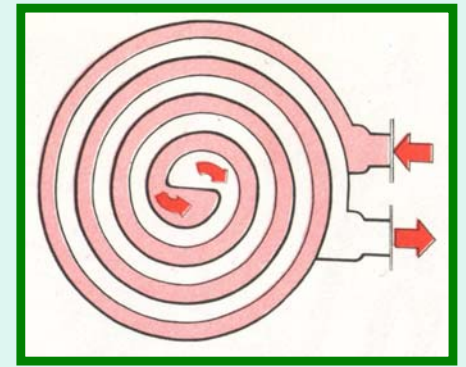
SCHIMBATOARE DE CALDURA SPIRALE



Avantaje:

- Coeficienti mari de transfer termic;
- Compactitate (A/V mare);
- ΔP mici;
- Rezistentă la murdarire;
- Curățire relativ ușoară.

SCHIMBATOARE DE CALDURA SPIRALE

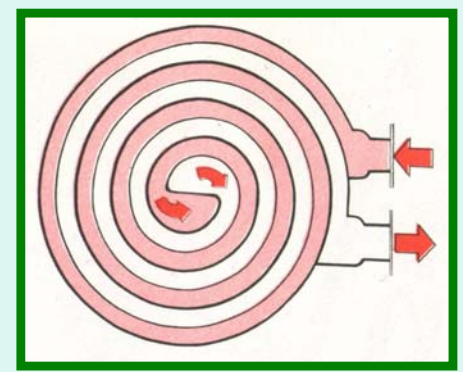


Tipuri de SCS

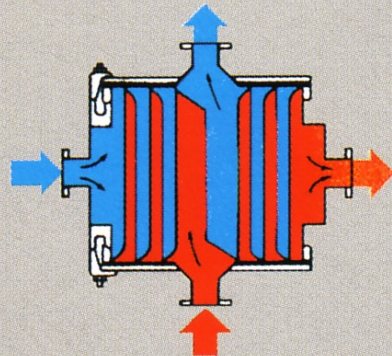
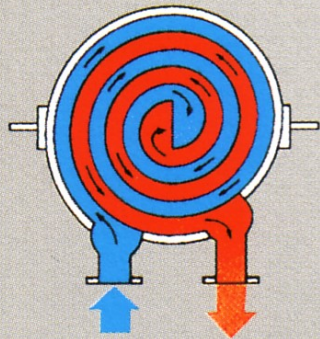
(dupa distributia curgerii si a racordurilor):

1. Cu capace plate;
2. Cu curgere incrucisata;
3. Cu curgere combinata:
spirala + incrucisata;
4. Cu curgere incrucisata si camera
superioara de distributie.

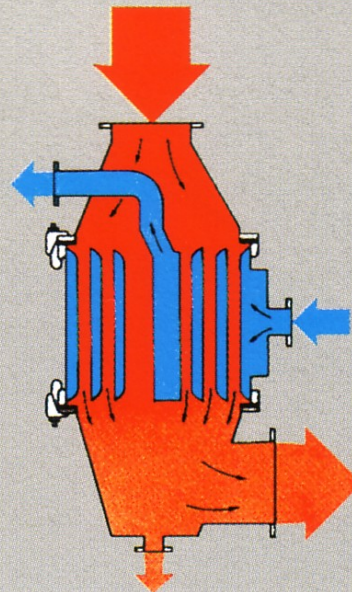
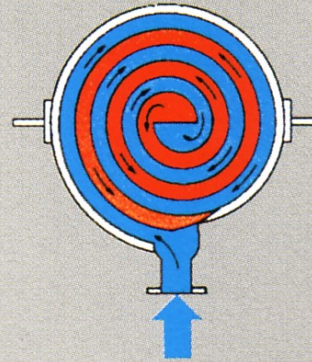
SCHIMBATOARE DE CALDURA SPIRALE



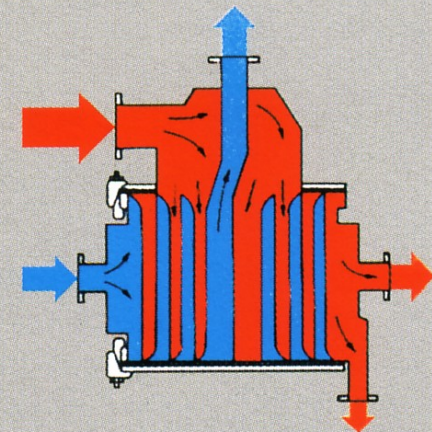
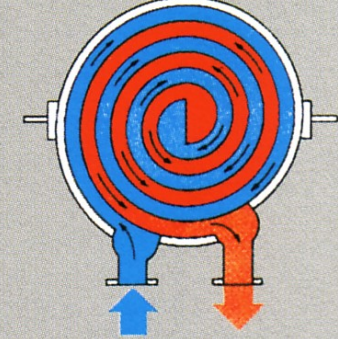
Tip 1



Tip 2



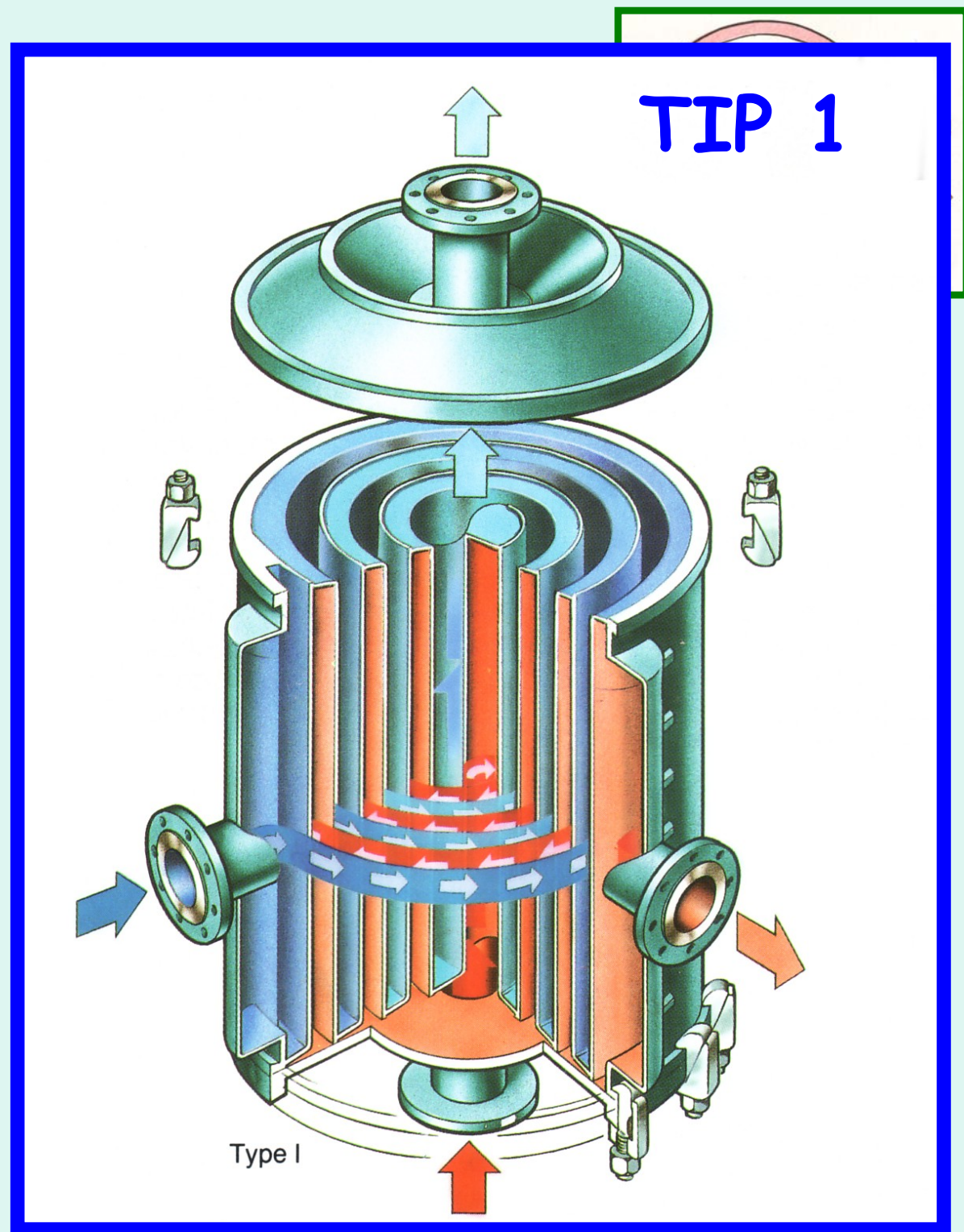
Tip 4



SCHIMBATOARE DE CALDURA SPIRALE

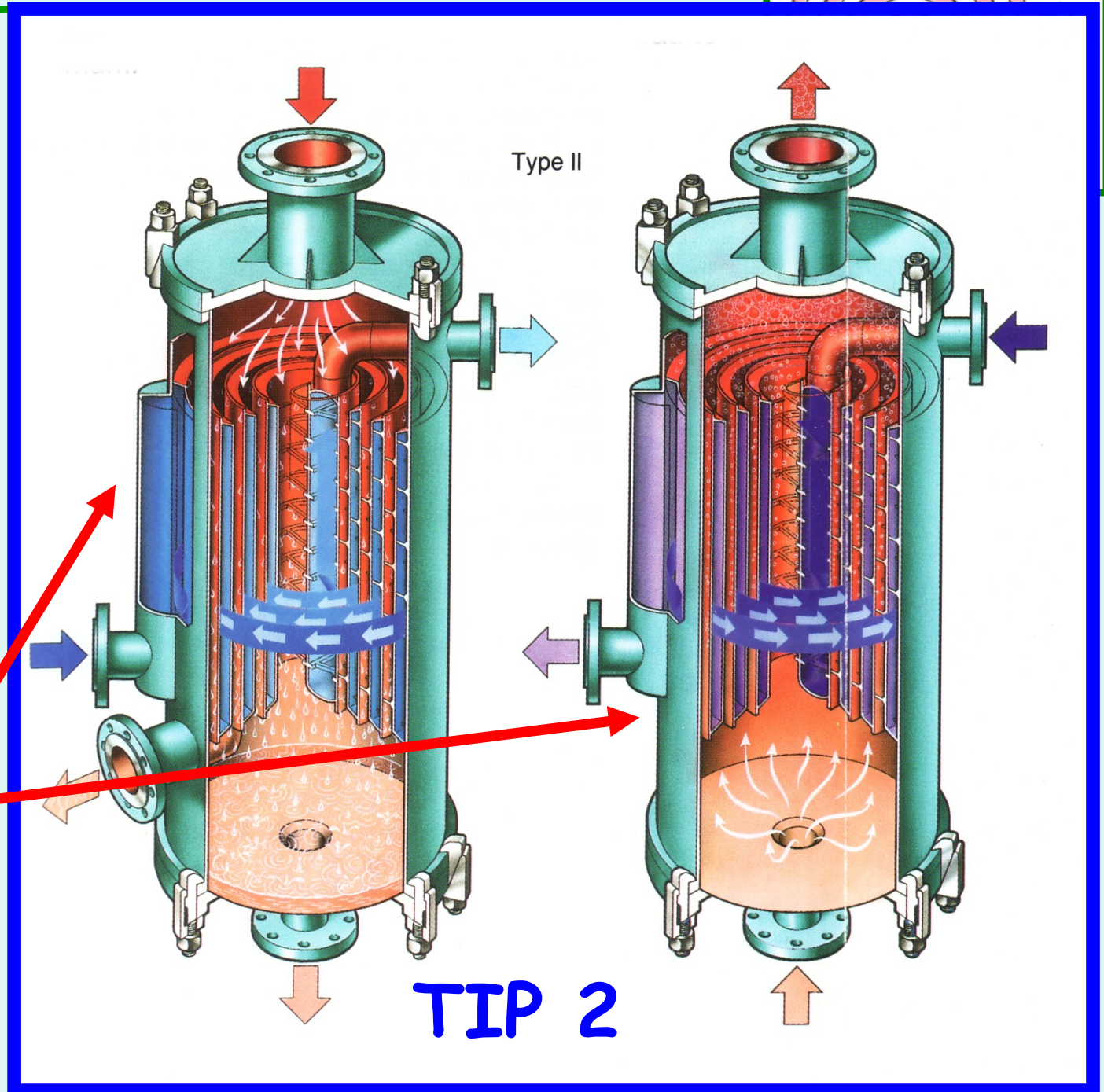
- Contracurent pur;
- Autocurătirea depunerilor solide;
- Utilizat pentru:
 - Transfer L - L;
 - Condensare*;
 - Racire gaze*.

* Se monteaza vertical



SCHIMBATOARE DE CALDURA SPIRALE

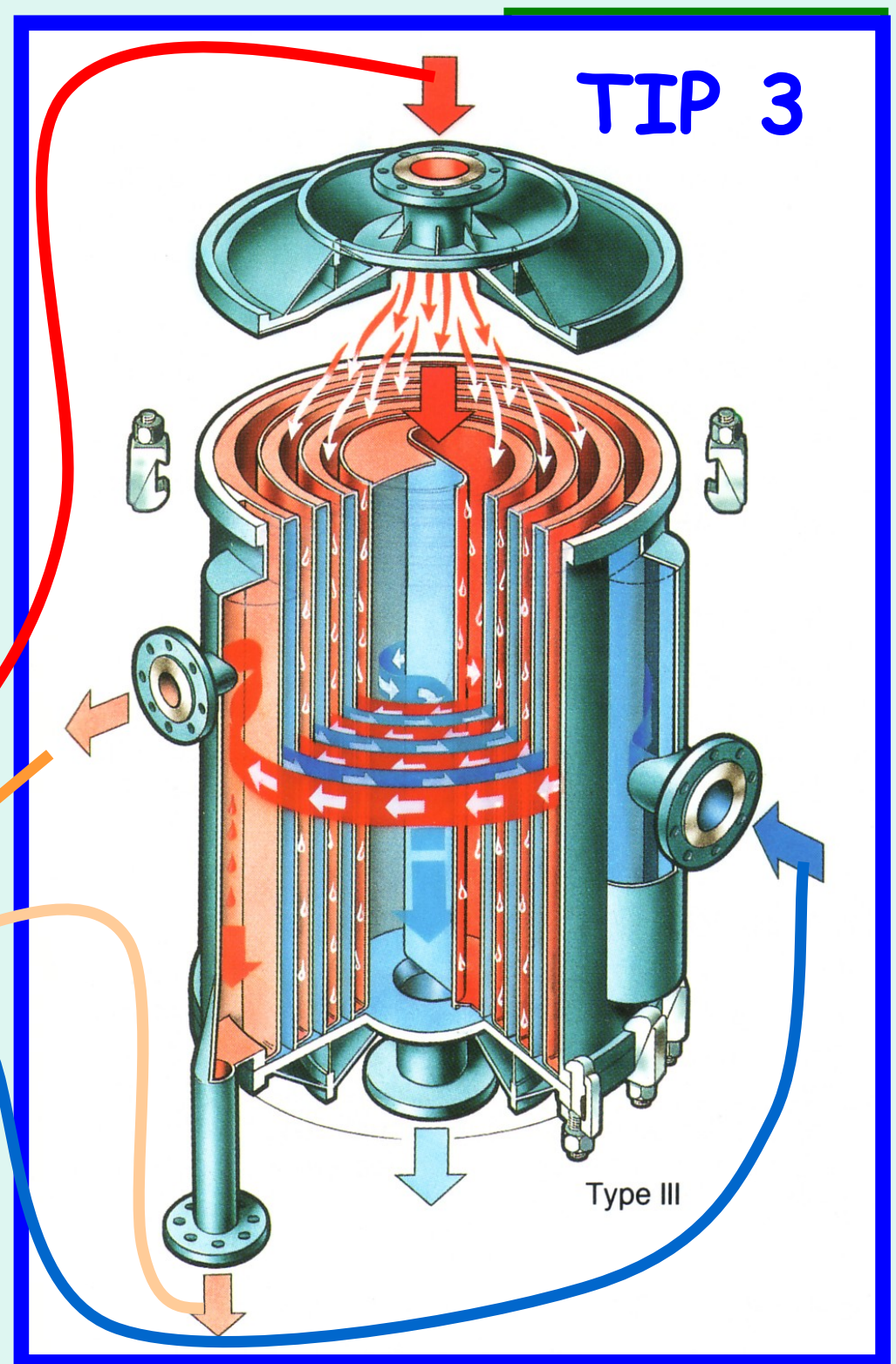
- Un singur fluid in curgere spirala (agentul termic):
 - Condensator;
 - Vaporizator.



SCHIMBATOARE DE CALDURA SPIRALE

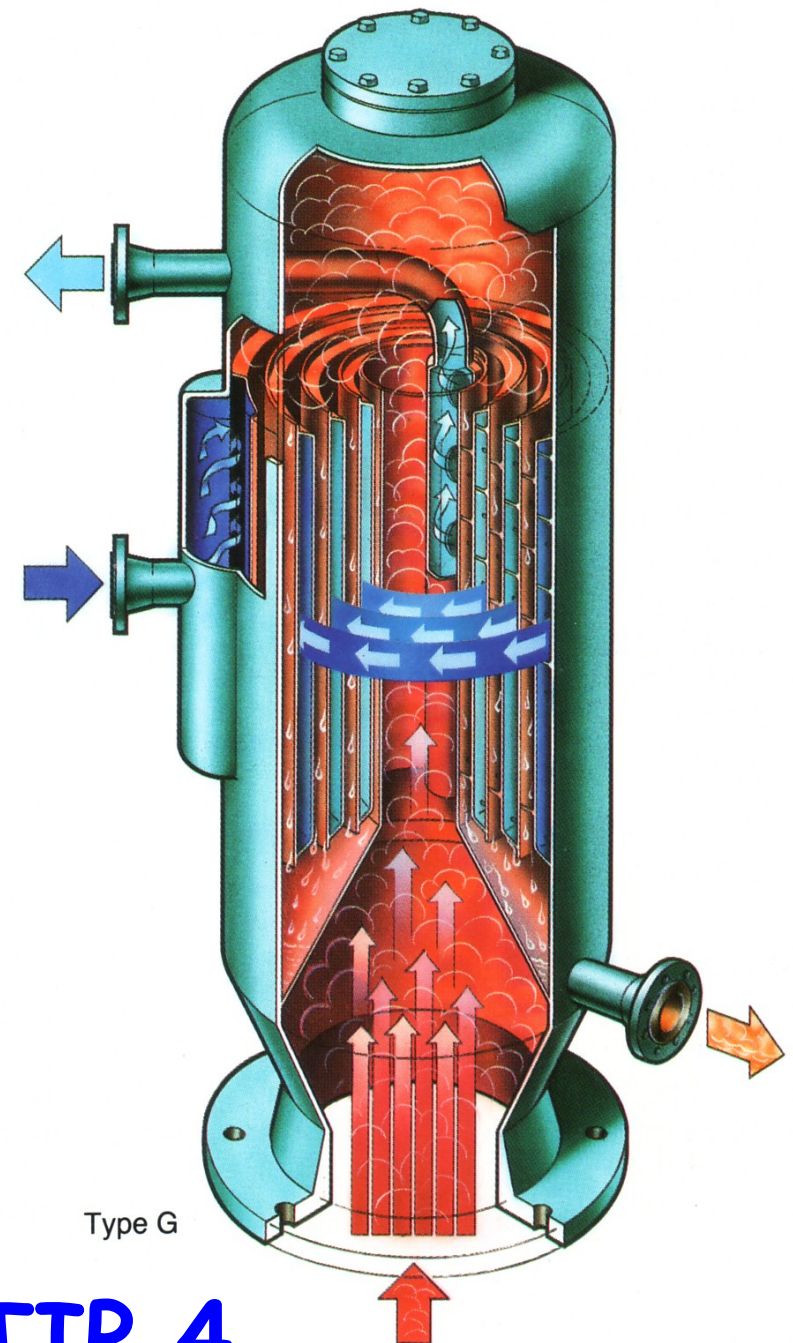
- Utilizat pentru condensare urmata de subracirea condensatului.

Vapori
Gaze necondensabile
Condensat
Agent de racire



SCHIMBATOARE DE CALDURA SPIRALE

- Se monteaza direct la varful coloanelor, reactoarelor etc., avand rol de condensator de varf.
- Elimina necesitatea conductelor de legatura cu coloana sau reactorul.



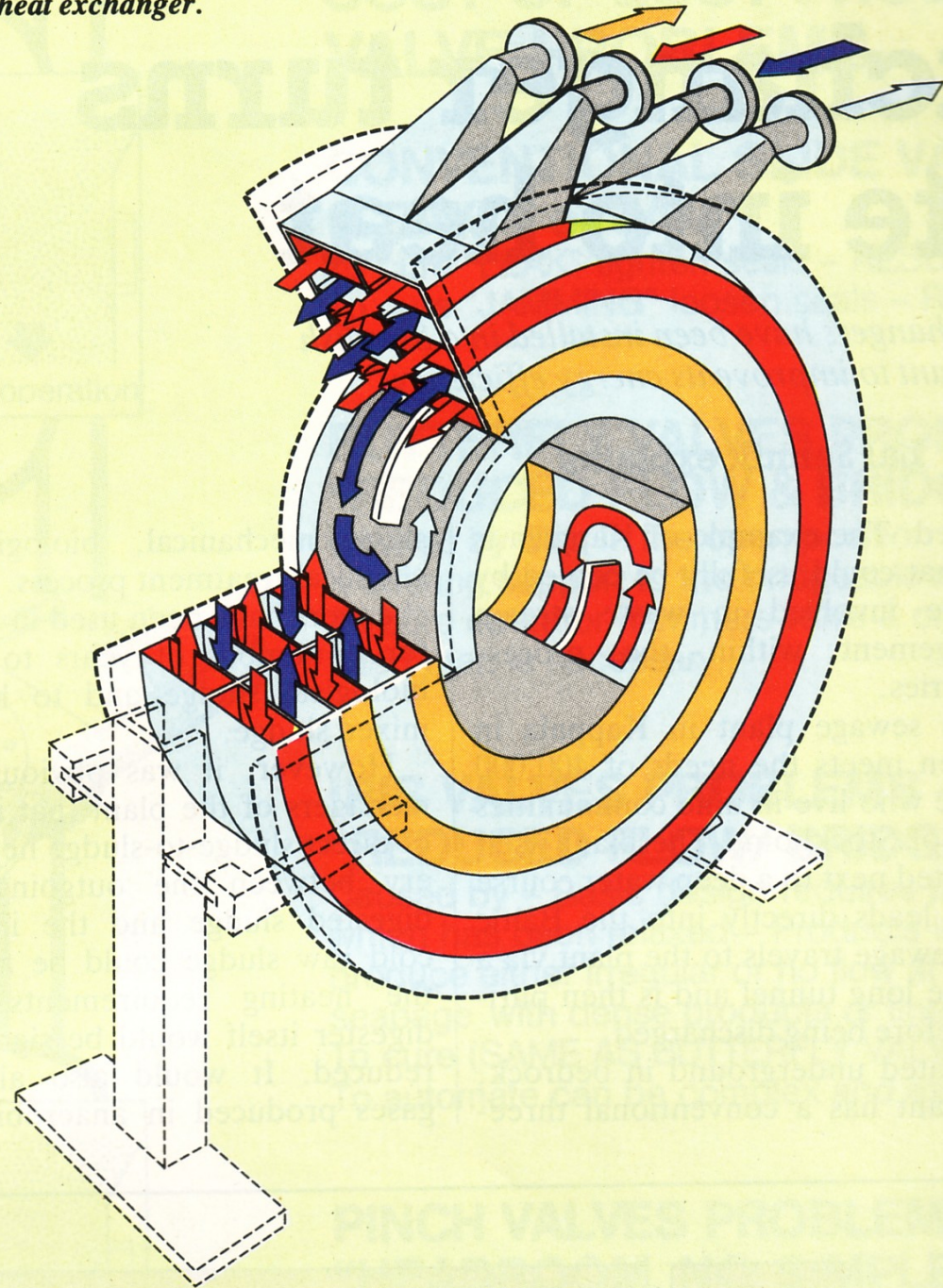
TIP 4

SCHIMBATOARE DE CALDURA SPIRALE

Cu canale divizate:

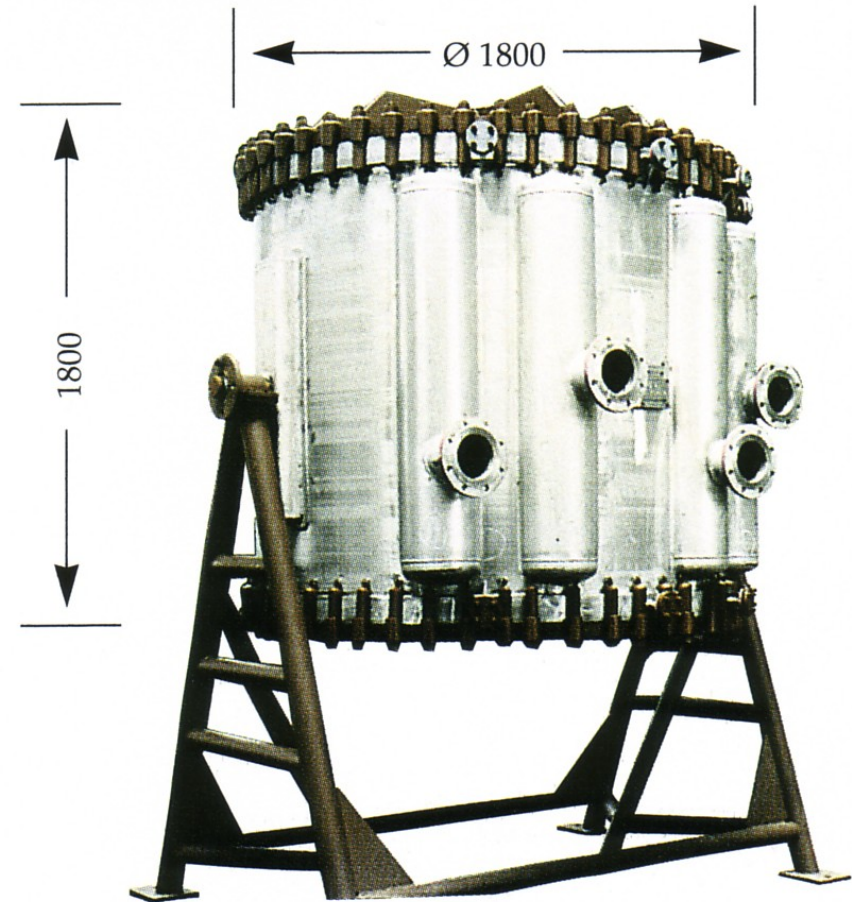
- Alimentarea si evacuarea pe la periferie;
- Intoarcere de 180° la centru, canalele fiind divizate in 2;
- Valorifica ΔT mici;
- Recuperarea caldurii din suspensii;
- Acces usor la canale prin indepartarea capacelor.

● Flow pattern in a divided channel spiral heat exchanger.



SCHIMBATOARE DE CALDURA SPIRALE

Cu canale divizate:



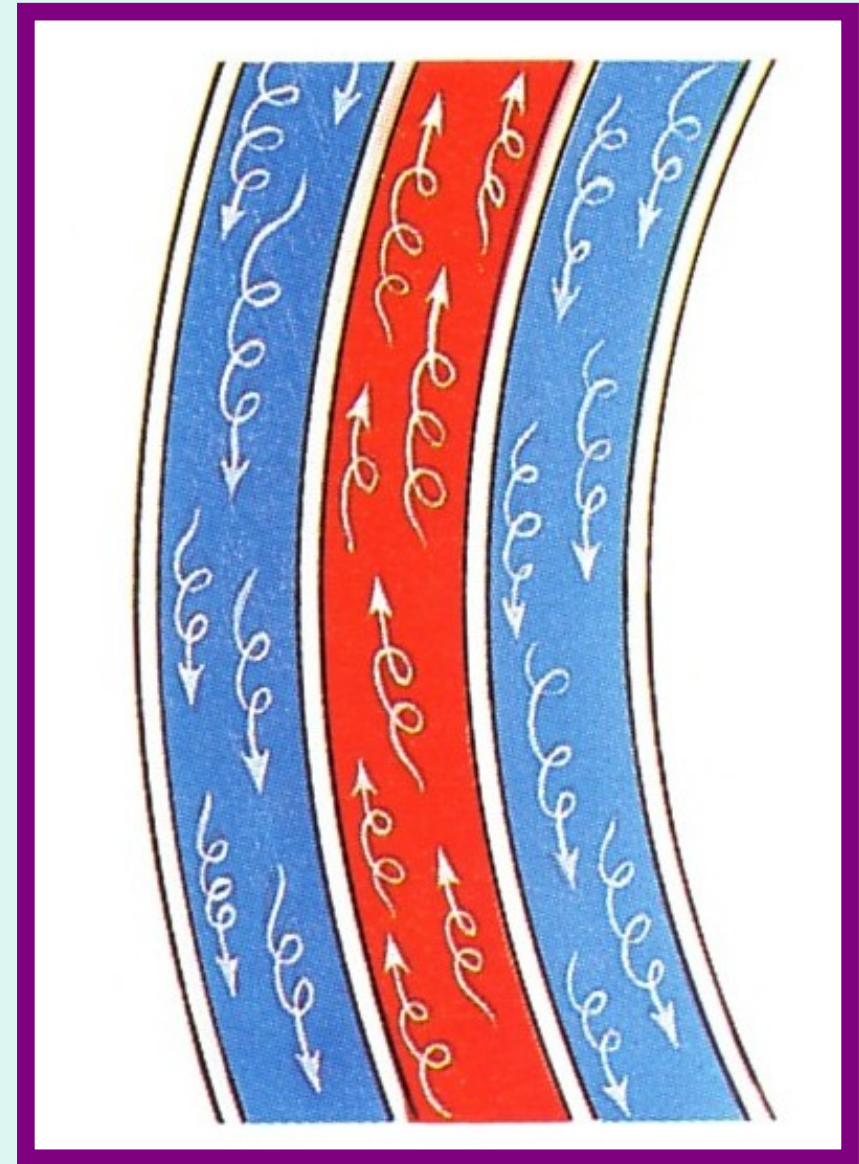
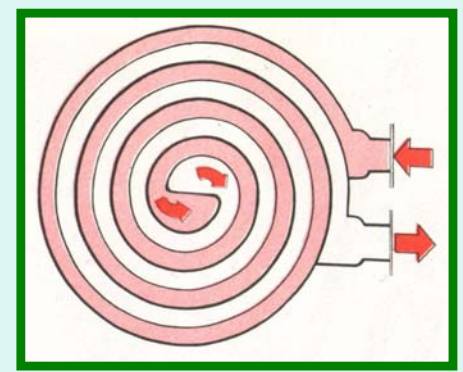
Double channel SHE's 580 m²

Typical sizes for type 1 units are:

Heat Transfer Surface (m ²)	Overall Length (m)	Overall Diameter (m)
450 – 650	2000 – 3000	1750 – 2300
185 – 420	1500 – 2000	1300 – 1750
45 – 140	900 – 1500	600 – 1300

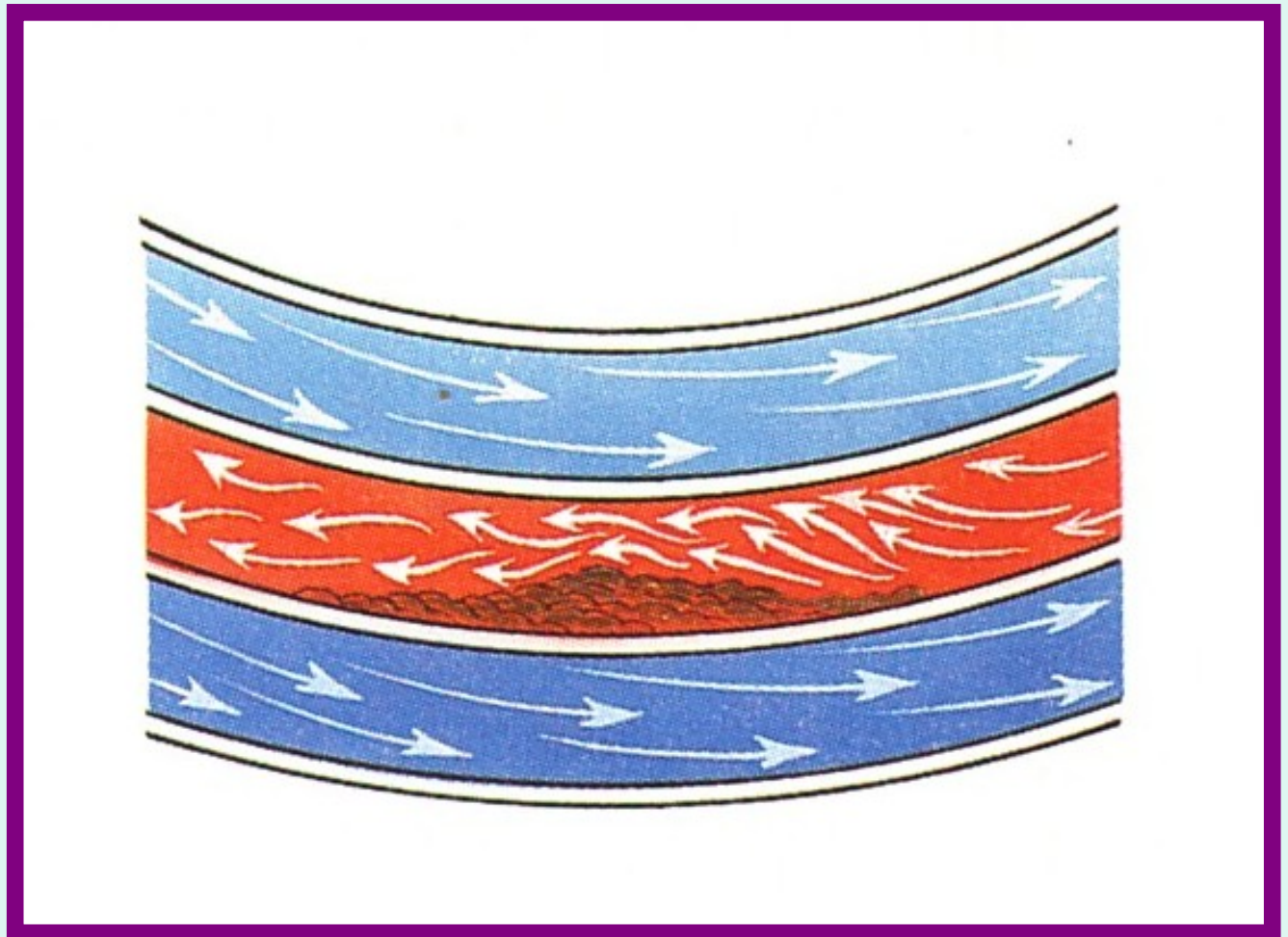
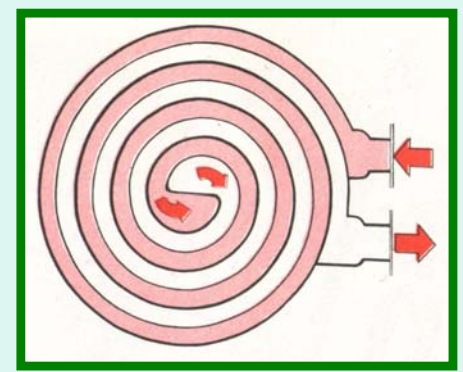
SCHIMBATOARE DE CALDURA SPIRALE

- Turbulenta ridicata



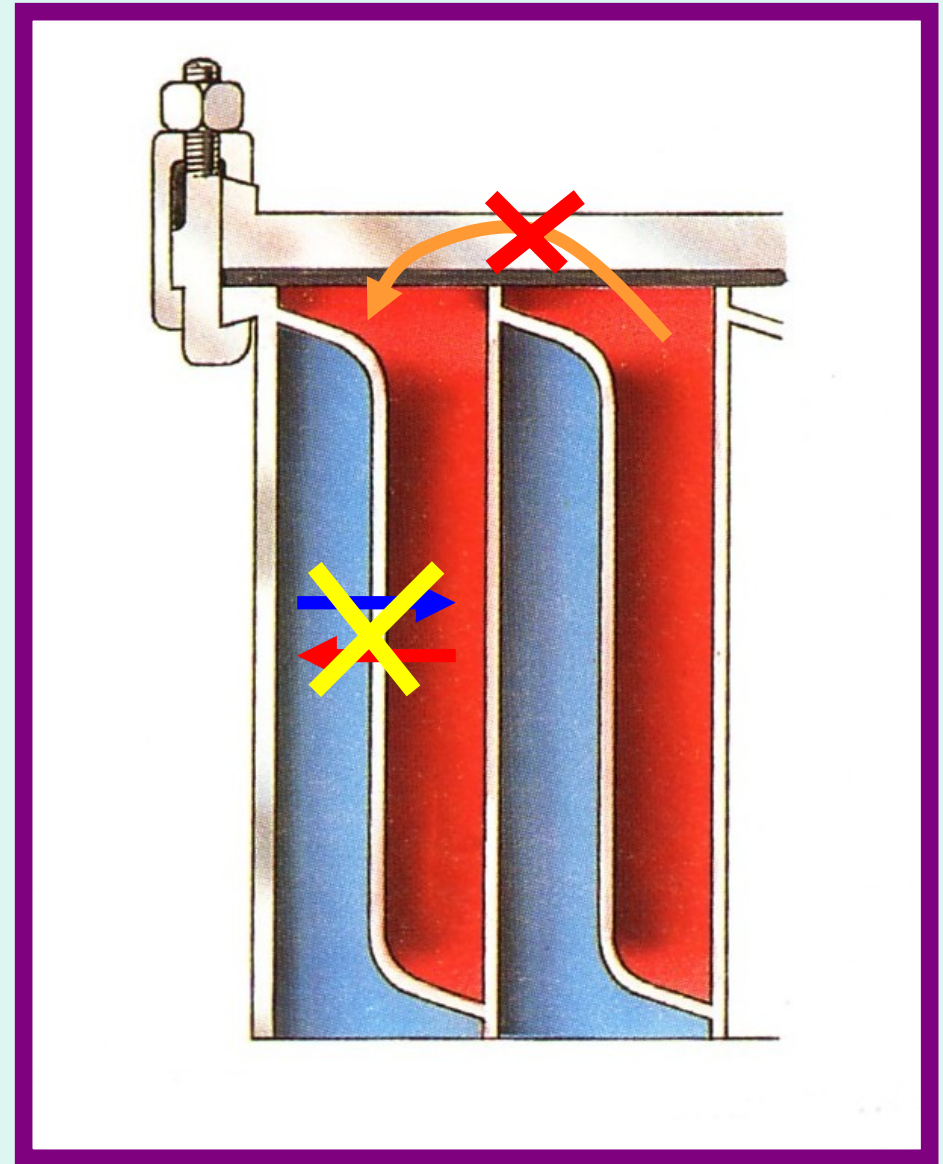
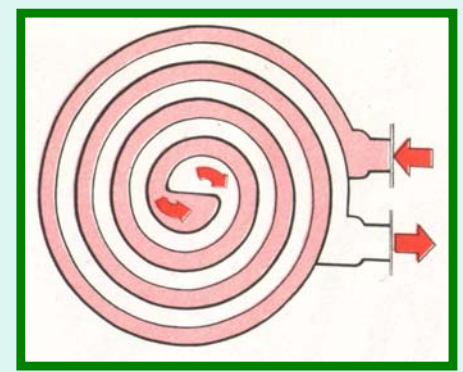
SCHIMBATOARE DE CALDURA SPIRALE

- Actiune de autocurative



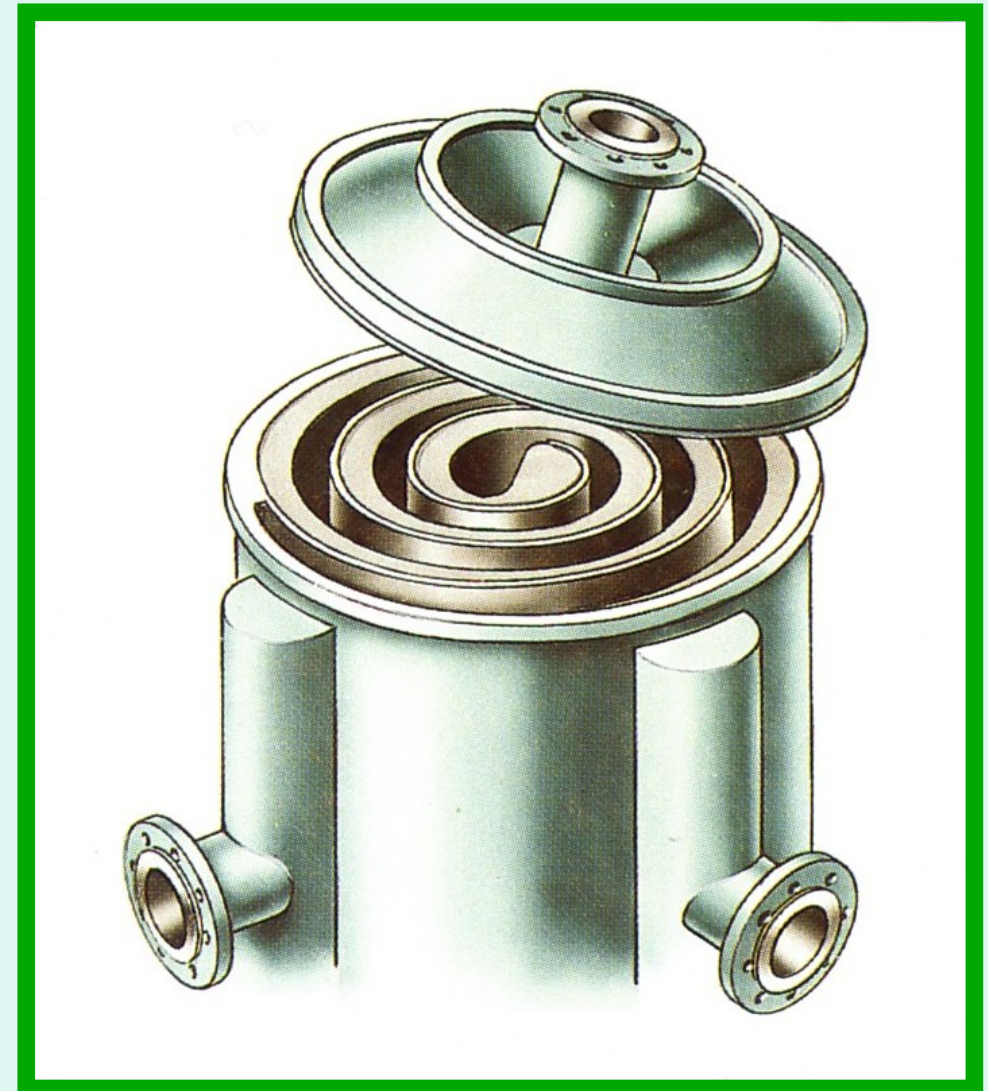
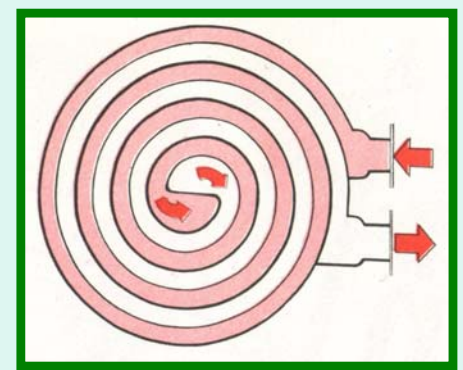
SCHIMBATOARE DE CALDURA SPIRALE

- Evitarea scurtcircuitarii curgerii fluidului;
- Evitarea amestecării celor două fluide.

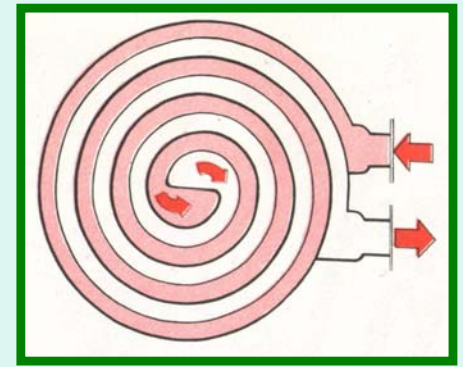


SCHIMBATOARE DE CALDURA SPIRALE

- Acces usor la spatiile de curgere prin indepartarea capacelor

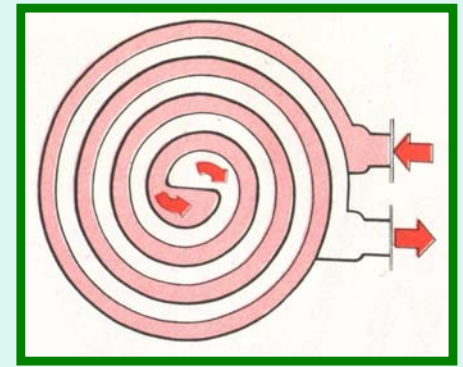


SCHIMBATOARE DE CALDURA SPIRALE



- **Viteza de curgere a fluidelor:**
 - Pana la 2 m/s - lichide;
 - Pana la 20 m/s - vapori sau gaze.
- **Coeficienti ridicati de transfer termic:**
curgere curbilinie (similara curgerii prin serpentine curbe).
- **Rezistenta hidraulica redusa:**
nu exista variatii bruste (marime, directie) ale vitezei.

SCHIMBATOARE DE CALDURA SPIRALE



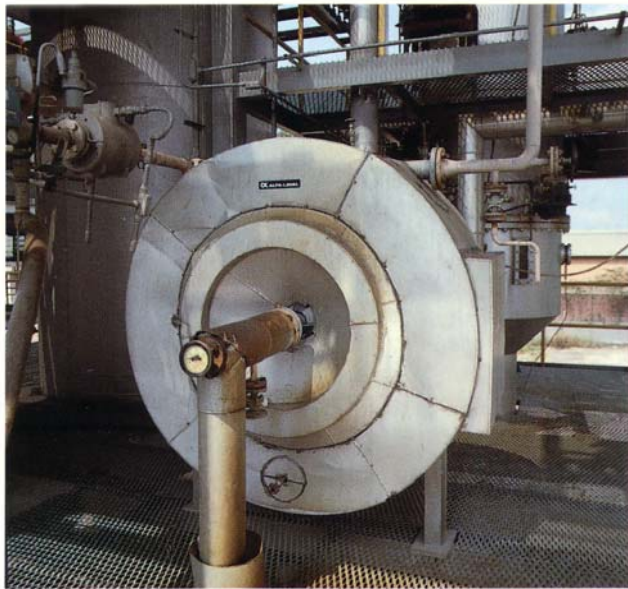
- **DEZAVANTAJE:**

- Fabricare complicata;
- Presiune de lucru redusa (max. 1,5 MPa);
- Cost relativ ridicat;
- Etansare dificil de realizat;
- Montare si curatire dificile.

SCHIMBATOARE DE CALDURA SPIRALE

APLICATII:

- Industria chimica



Singapore Polymer Corporation in Singapore chose the Type I spiral heat exchanger for its ability to keep the raw PVC slurry in suspension during heating.

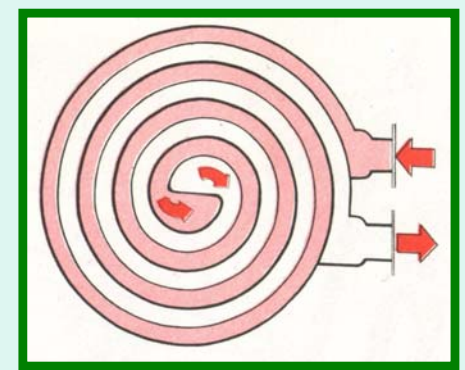


Queensland Alumina in Queensland, Australia, selected the spiral heat exchanger Type I for heating bauxite slurry.

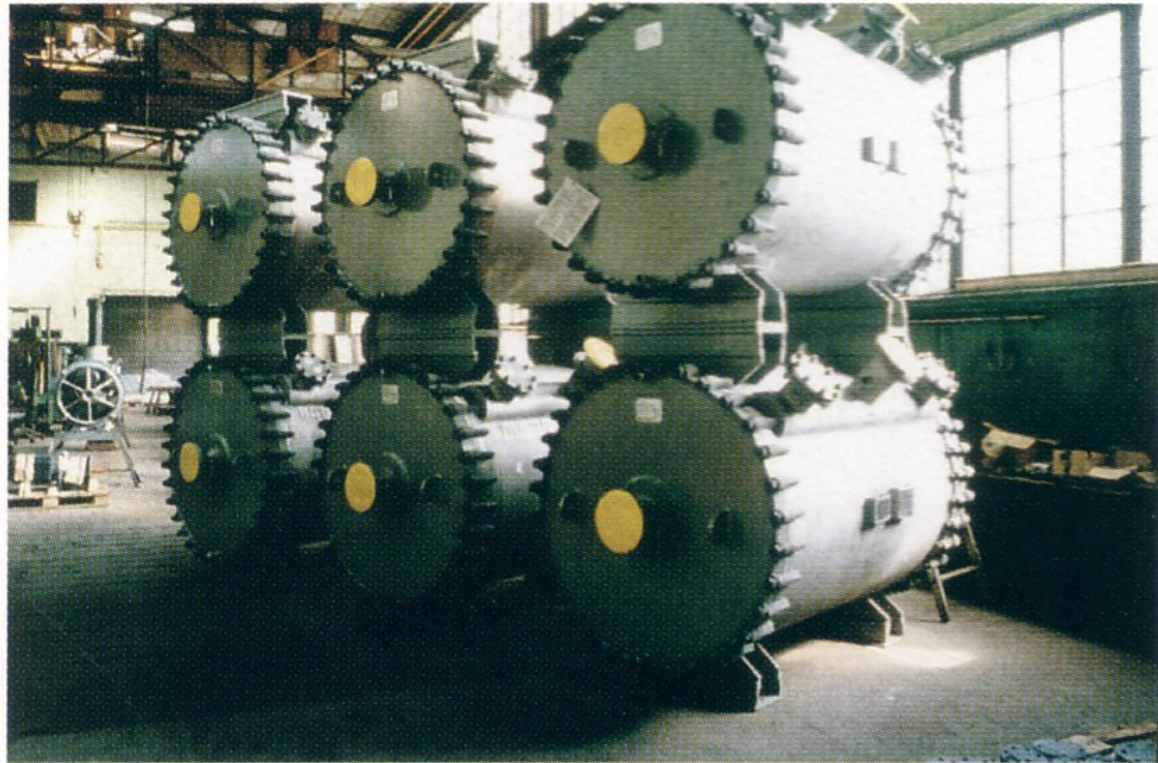


Spiral heat exchanger units consisting of two spiral heat exchangers Type II mounted on top of each other are used by ICI in Billingham, the UK, as partial water vapour condensers in the ammonia plant.

SCHIMBATOARE DE CALDURA SPIRALE



APLICATII: Industria metalurgica

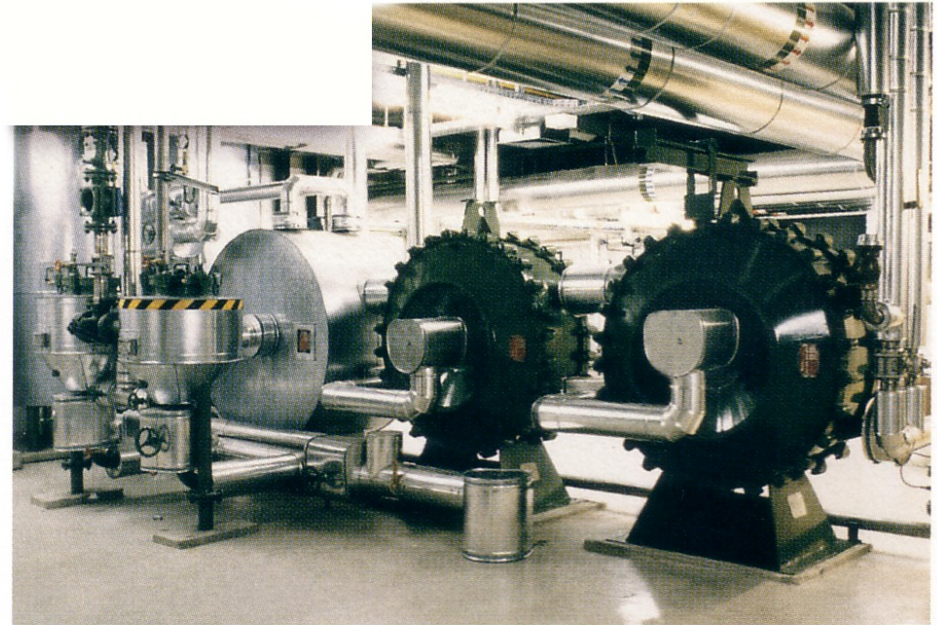


6 of 45 Spiral Heat Exchanger in same
design Steel Industry

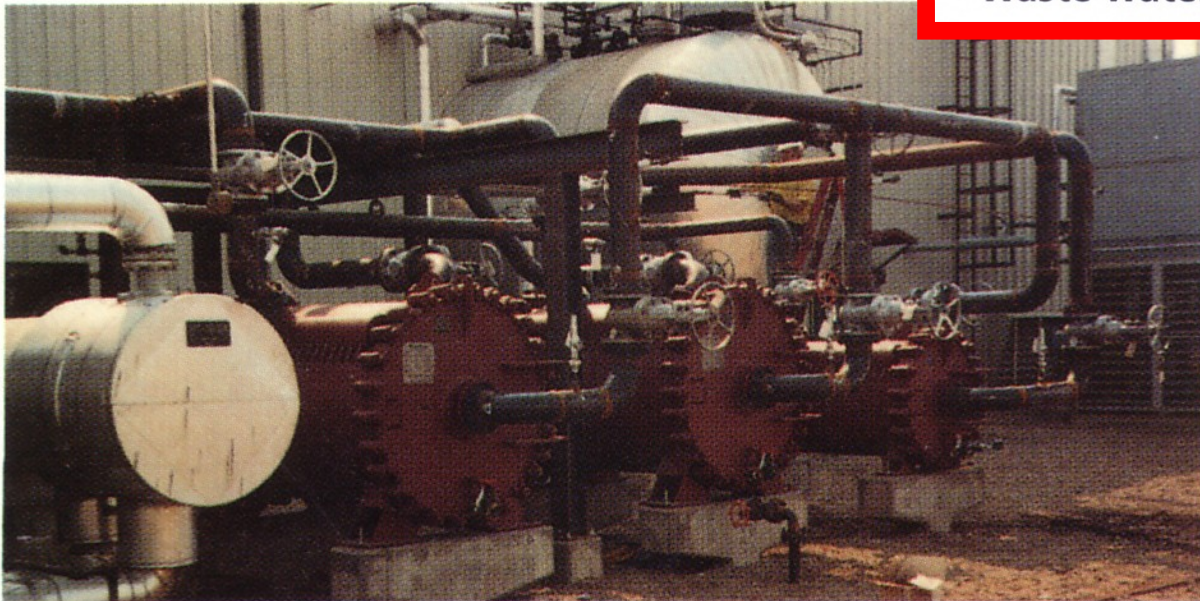
SCHIMBATOARE DE CALDURA SPIRALE

APLICATII:

- Tratarea si epurarea apelor



Waste water disinfection plant "Alino"



Shell Canada in Peace River, Alberta, Canada, use four spiral heat exchangers Type IH for preheating boiler feed water by means of produced water.

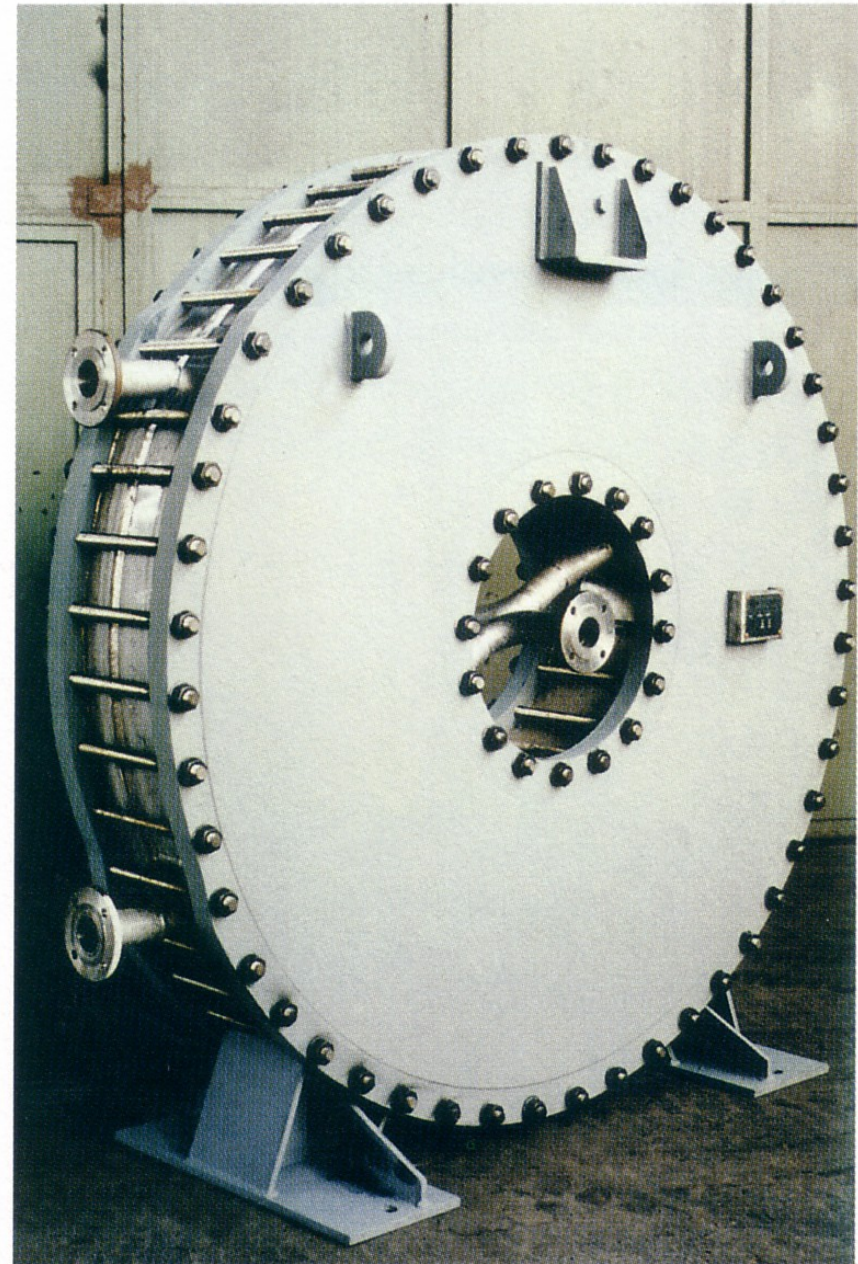
SCHIMBATOARE DE CALDURA SPIRALE

APLICATII:

- Industria alimentara



Spiral heat exchanger for disinfection with heated cover

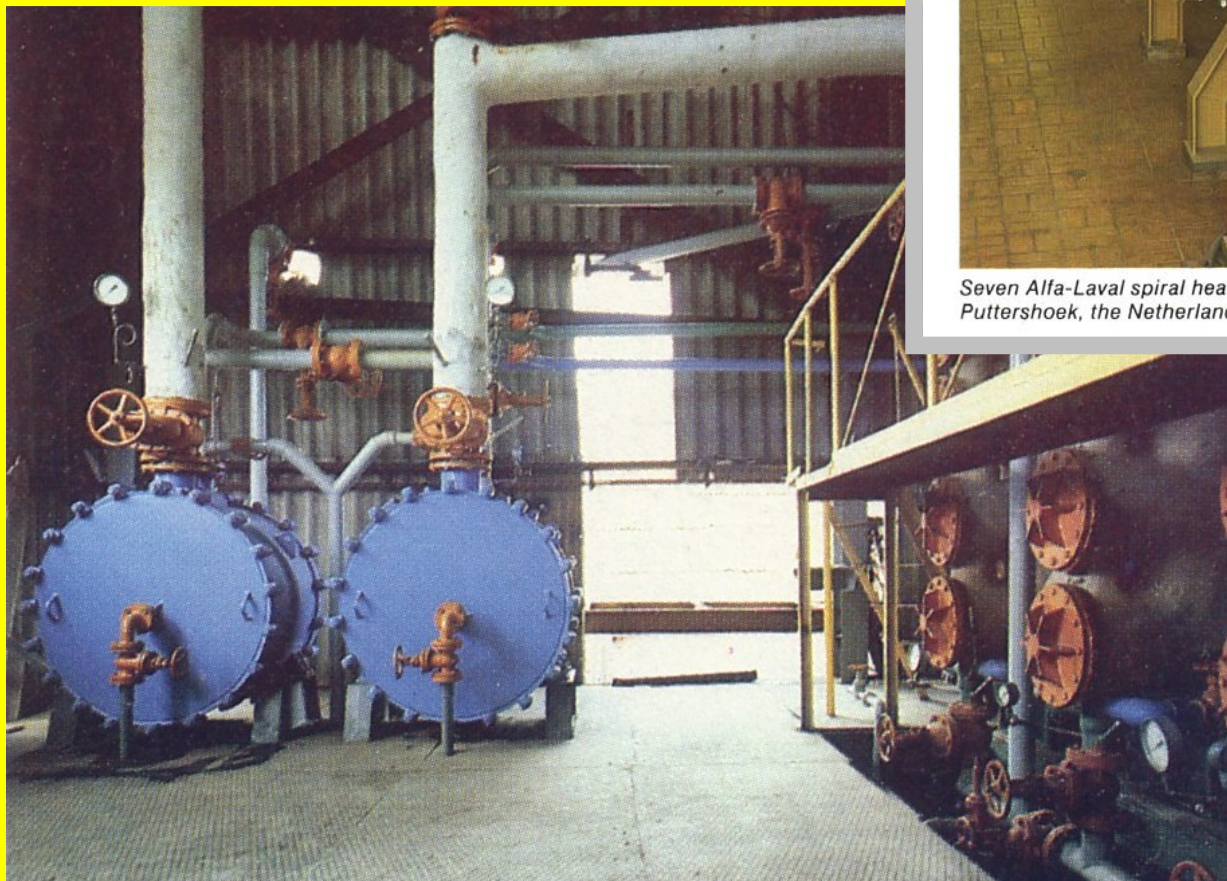


Core-Ø 700 with stud bolts heating of red wine mash

SCHIMBATOARE DE CALDURA SPIRALE

APLICATII:

- Industria zaharului

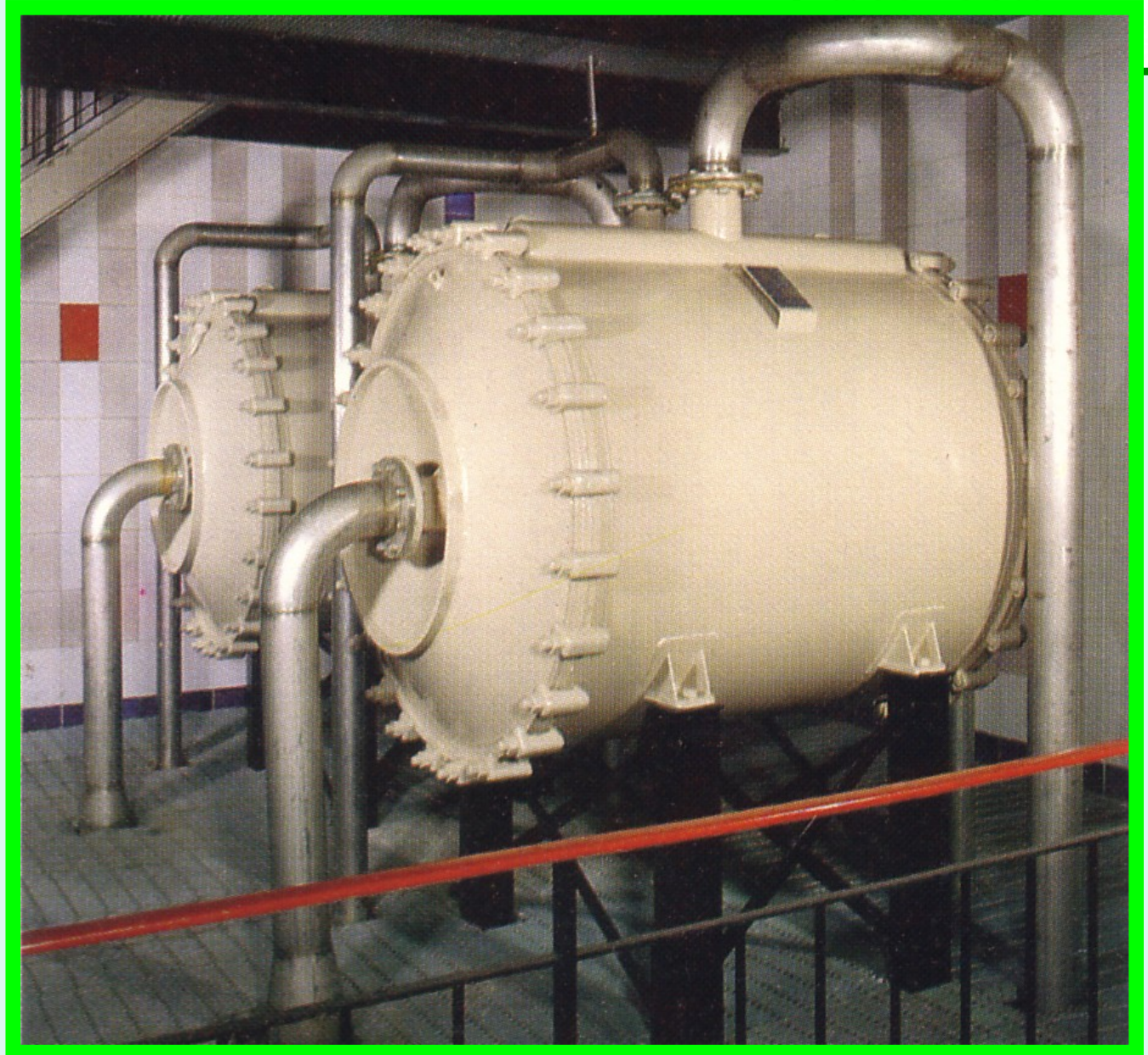
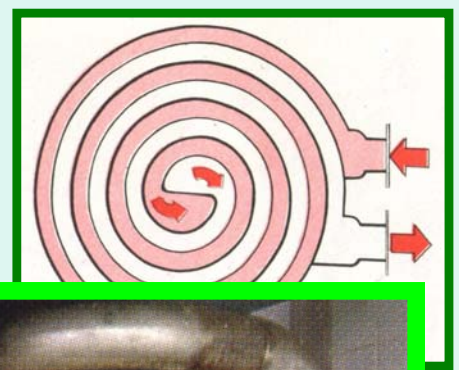


Seven Alfa-Laval spiral heat exchangers heat prelined sugar juice at Coop. Vereniging Suiker U A, Puttershoek, the Netherlands.

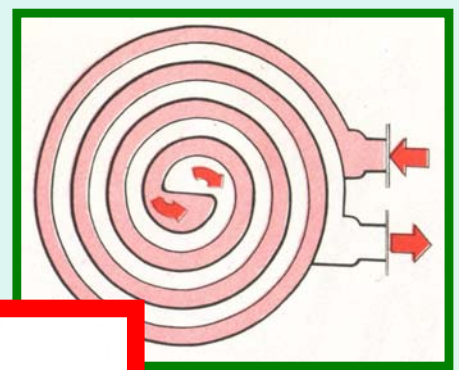
SCHIMBATOARE DE CALDURA SPIRALE

APLICATII:

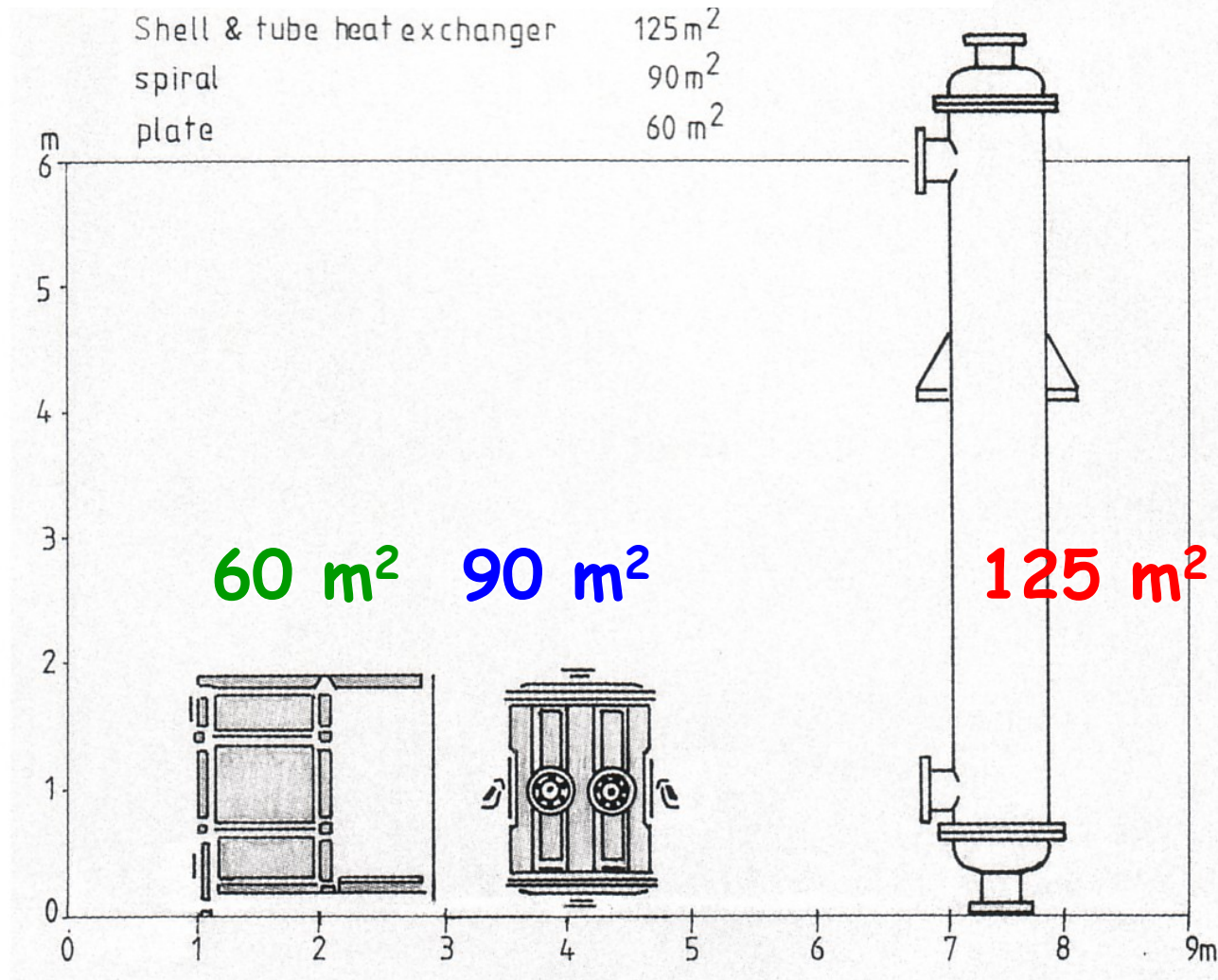
- Industria alcoolului



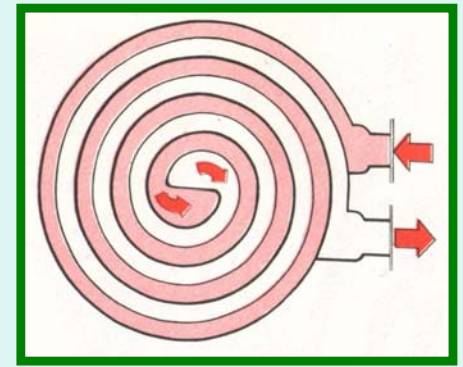
SCHIMBATOARE DE CALDURA SPIRALE



Sarcina termica identica



SCHIMBATOARE DE CALDURA SPIRALE



- Calculul coeficientilor de transfer termic:

$$Nu = \frac{\alpha \cdot d_{ech}}{\lambda} = \pm \frac{\frac{b}{r_c}}{\ln \left[1 \pm \frac{b}{r_c} \cdot \frac{1}{Nu_0} \right]}$$

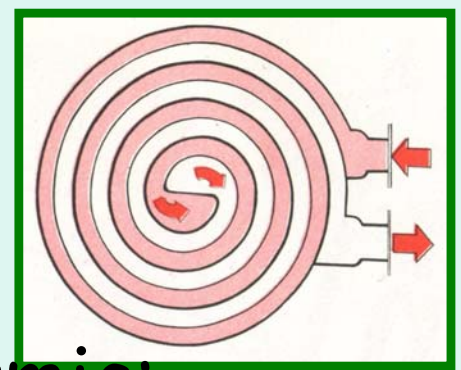
r_c - raza de curbura a spirei;

"+" - partea exterioara a peretelui;

"-" - partea interioara a peretelui;

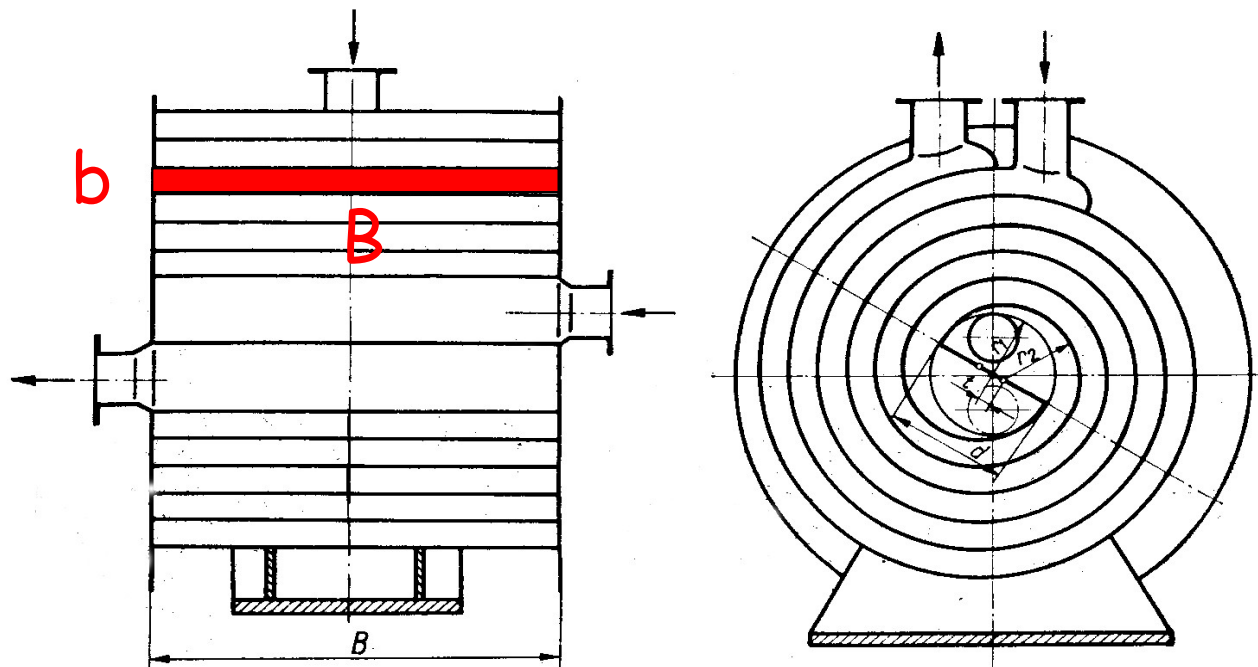
"0" - pentru conducta dreapta.

SCHIMBATOARE DE CALDURA SPIRALE



- Calculul coeficientilor de transfer termic:

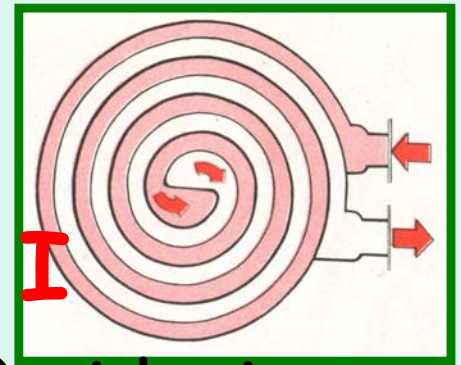
$$d_{ech} = \frac{4A}{P_u} = \frac{4(b \times B)}{2(b + B)} = 2 \frac{b \cdot B}{b + B}$$



Schimbător de căldură spiral

SCHIMBATOARE DE CALDURA SPIRALE

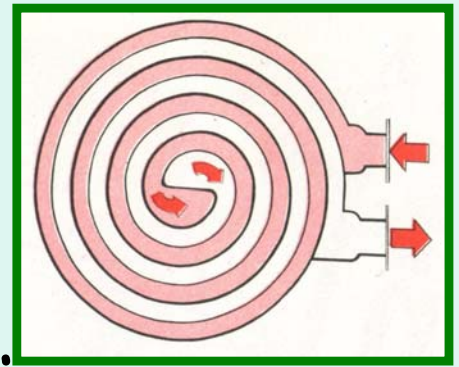
DIMENSIONARE I



1. Se impun: diametrul initial al spirei (d) si latimea foii, B ($350 \div 750$ mm);
2. Se alege latimea canalului, b ($6 \div 15$ mm);
3. Se alege grosimea peretelui, δ ($2 \div 8$ mm);
4. Se calculeaza $T_{med\ 1,2}$ si prop. fluidelor;
5. Se calculeaza sarcina termica (din BT);
6. Se calculeaza ΔT_{med} ;
7. Se calculeaza α_1, α_2, K ;
8. Se calculeaza A din ecuatia transferului termic;

SCHIMBATOARE DE CALDURA SPIRALE

DIMENSIONARE I



9. Se calculeaza lungimea utila a spirei, l:

$$l = \frac{A}{2B'} ; B' = B - 20 \text{ mm}$$

10. Se determina numarul de spire:

$$n = \frac{t - d}{4t} + \sqrt{\left(\frac{t - d}{4t}\right)^2 + \frac{1}{2\pi \cdot t}}$$

unde $t = 2(b + \delta)$ este pasul spirei;

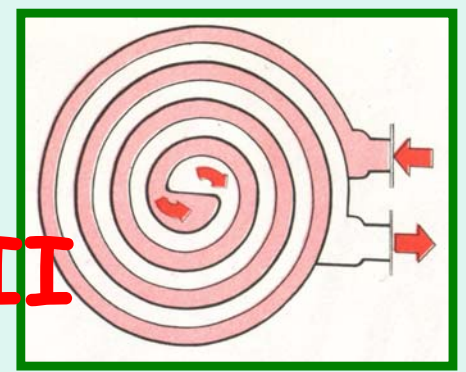
11. Se calculeaza diametrul exterior al SCS:

$$D = d + 2.n.t + \delta$$

12. Se calculeaza ΔP prin aparat.

SCHIMBATOARE DE CALDURA SPIRALE

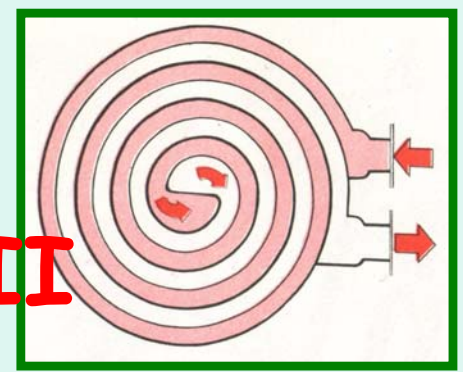
DIMENSIONARE II



1. Se calculeaza $T_{med\ 1}$ si $T_{med\ 2}$ si se determina proprietatile fluidelor;
2. Se calculeaza sarcina termica a SCS (din BT);
3. Se calculeaza ΔT_{med} ;
4. Se estimeaza valoarea lui K ;
5. Se calculeaza A din ec. transferului termic;

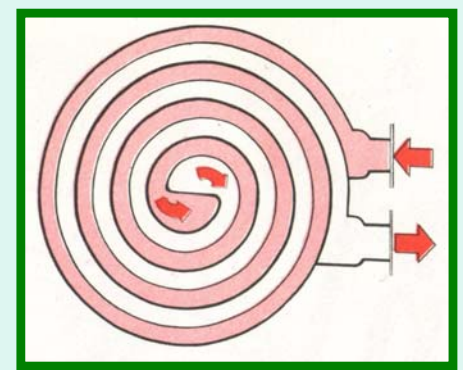
SCHIMBATOARE DE CALDURA SPIRALE

DIMENSIONARE II



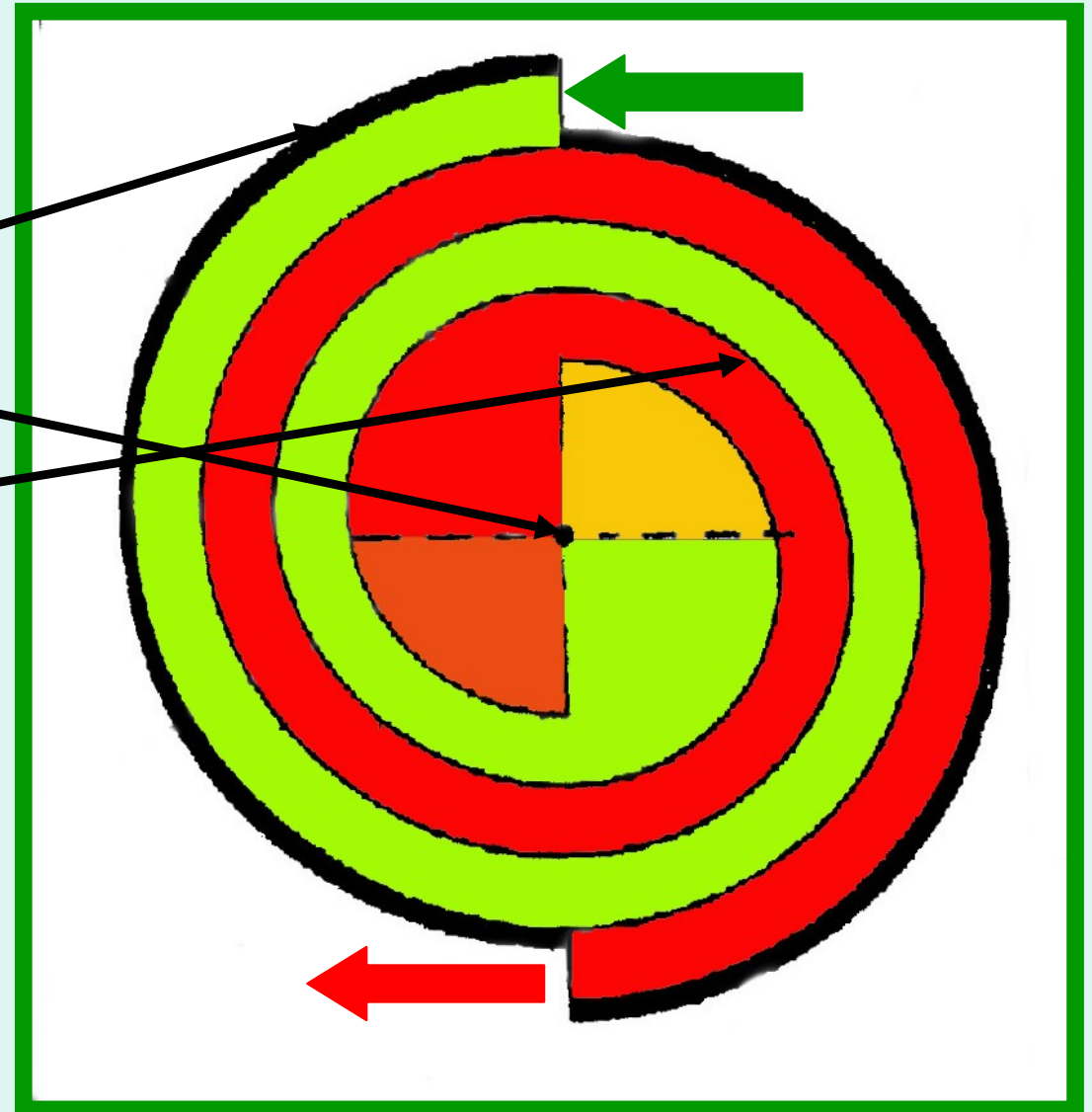
6. Se aleg (din tab.) valorile recomandate pentru vitezele fluidelor prin canale si se calculeaza sectiunea canalului;
7. Se alege latimea foii spirei;
8. Se calculeaza latimea canalului (din aria de curgere);
9. Se determina diametrul exterior al SCS;
10. Se calculeaza ΔP prin aparat.

SCHIMBATOARE DE CALDURA SPIRALE SPECIALE

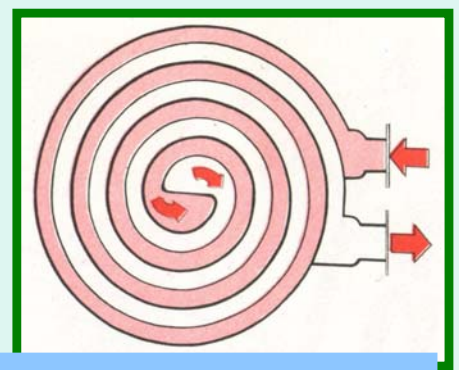


INCINERATOR CATALITIC PENTRU AER CONTAMINAT

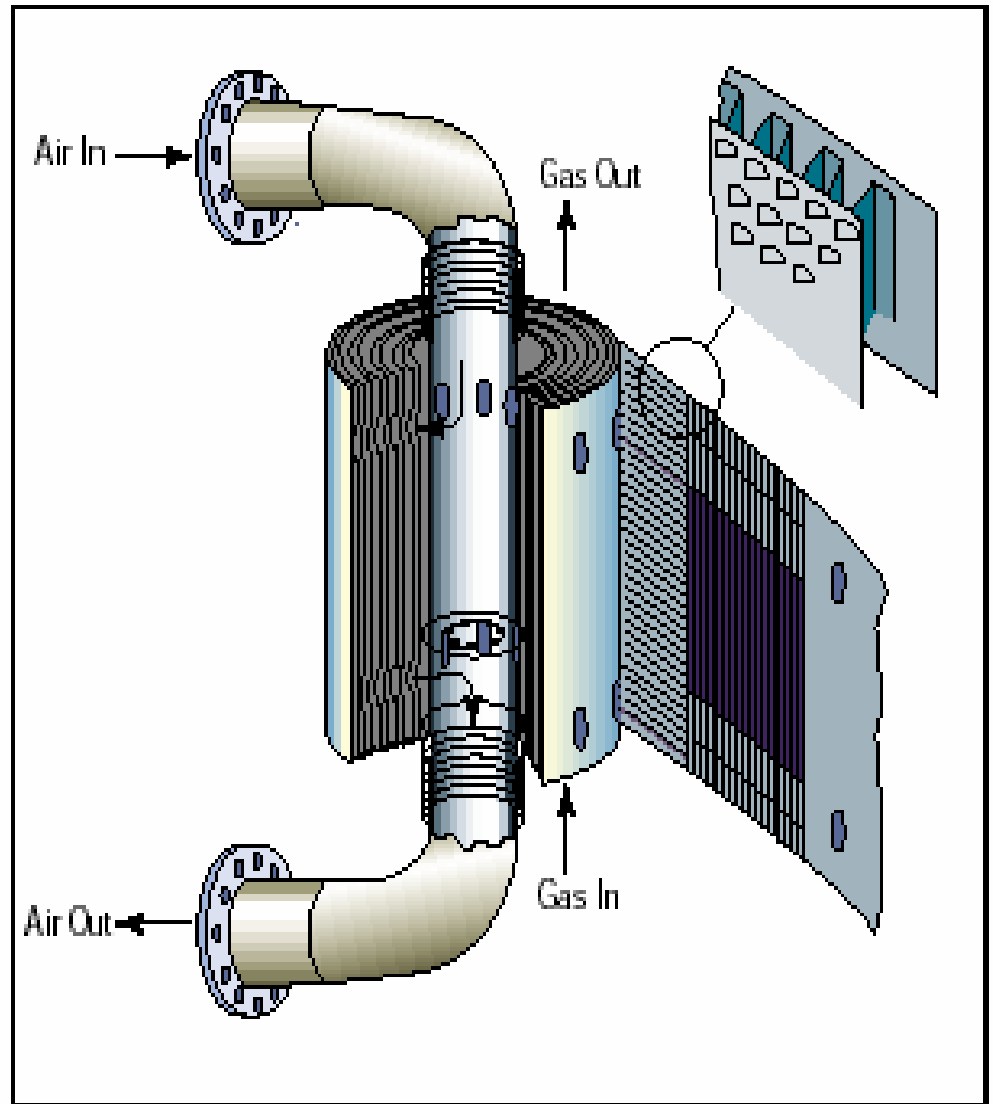
1. Izolatie termica;
2. Rezistenta electrica;
3. Strat catalitic;
4. Intrare curent rece;
5. Iesire curent incalzit.



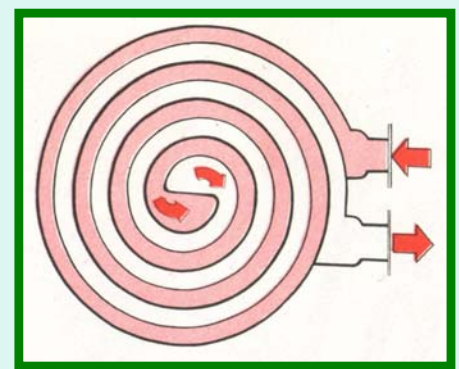
SCHIMBATOARE DE CALDURA SPIRALE SPECIALE



RECUPERATOR DE CALDURA SPIRAL



SCHIMBATOARE DE CALDURA SPIRALE SPECIALE



CIRCUIT A
Single unit . Typical flow < 50 GPM (190 LPM)

CIRCUIT B
Single unit . Typical flow < 15 GPM (57 LPM)

Length of heat exchanger

Compact – High Heat Transfer Rate – High Capacity

TEMPERATURE PRESSURE AND CORROSION LIMITS
stainless steel used. The use of stainless in a very com stress over a broad range of temperatures. The heat ex angers have been designed to 360 PSI in the spiral circuit B and 230 PSI in the axi circuit A.

TherMax[®] COMPACT MODULAR DESIGN makes for easy installation and servicing. Manifolding is simplified for larger applications. Heat loss is low, requiring little or no insulation.

CYLINDRICAL HEAT EXCHANGER of plate design using a dimpled heat transfer sheet, wound in a self-enclosed spiral.

LOW INTERNAL VOLUME with maximum single circuit capacity at 76 fluid ounces (2.2 liters).

TherMax[®] ALL WELDED CONSTRUCTION means no gaskets to fail. TIG welding is used on the sheet edge which separates Circuit A from Circuit B.

SPIRAL CIRCUIT B
Design pressure 360 PSI
BAFFLE MATERIAL
SILICONE –operating temperature -60°F (-50°C) to 480°F (250°C)
Other materials available. Consult factory.

AXIAL CIRCUIT A
Design pressure 230 PSI
No baffle.

INNOVATIVE DESIGN provides the most effective surface for all applications and the patented fabrication process maintains consistent, high quality production.

STAINLESS STEEL JACKET welded to and wrapped around spiral bundle.

MATERIAL 316L STAINLESS
Jacket thickness: 3.75" dia. models .039"
2.75" dia. models .032"
Surface thickness: 3.75" dia. models .032"
2.75" dia. models .020"

TherMax[®] HEAT TRANSFER SURFACE is a dimpled sheet with the dimples providing the sheet spacing and localized turbulence, resulting in very high heat transfer rates.

HIGH OVERALL HEAT TRANSFER – Enhanced turbulence with low pressure drops, and wetted perimeters 5 to 6 times that of equivalent tubular designs with heat transfer rates 3 to 4 times that of tubular heat exchangers.

Compact cylinders from 3" (70 mm) x 6" (158 mm) to 5" (120 mm) x 20" (515 mm).
Weight: 2.4 lbs. to 31 lbs. (1.1 kg to 14 kg).

APPLICATIONS:

INDUSTRIAL • PROCESS SYSTEM • COGENERATION • SOLAR • PLATING • ELECTRONICS • COMMERCIAL & INDUSTRIAL WASHERS
EVAPORATORS / CONDENSERS • CHILLERS • HEAT RECOVERY • BOILERS (STEAM & WATER) • VAPOR RECOVERY • WATER HEATERS