



QFL4520 – Química Ambiental II

Parte III – Redução, Tratamento e Disposição de Resíduos

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Parte III – Resíduos

- *Emissões, Efluentes e Resíduos Sólidos;*
- *Tratamento de Emissões;*
- *Tratamento de Efluentes;*
- *Tratamento e Disposição de Resíduos Sólidos;*
- *Redução de Resíduos.*



Aula 10:

- *Emissões, Efluentes e Resíduos Sólidos.*



Tipos de "Resíduos"



Classificação dos "Resíduos"

Quanto ao "estado físico":

- *Emissões (gases);*
- *Efluentes (líquidos);*
- *Resíduos sólidos (sólidos).*

Quanto ao risco:

- *Perigosos;*
- *Não perigosos.*

Quanto à regulamentação:

- *Regulados;*
- *Não regulados.*

Quanto ao reúso:

- *Reutilizáveis ou recicláveis (podem ser usados em outros processos);*
- *Não-reutilizáveis ou não-recicláveis.*

Quanto à dispersão:

- *Dispersos;*
- *Concentrados.*



Emissões Gasosas



Controle de emissões "fontes dispersas"

Controle de emissões em automóveis

- Alvo = CO, Nox e Hidrocarbonetos

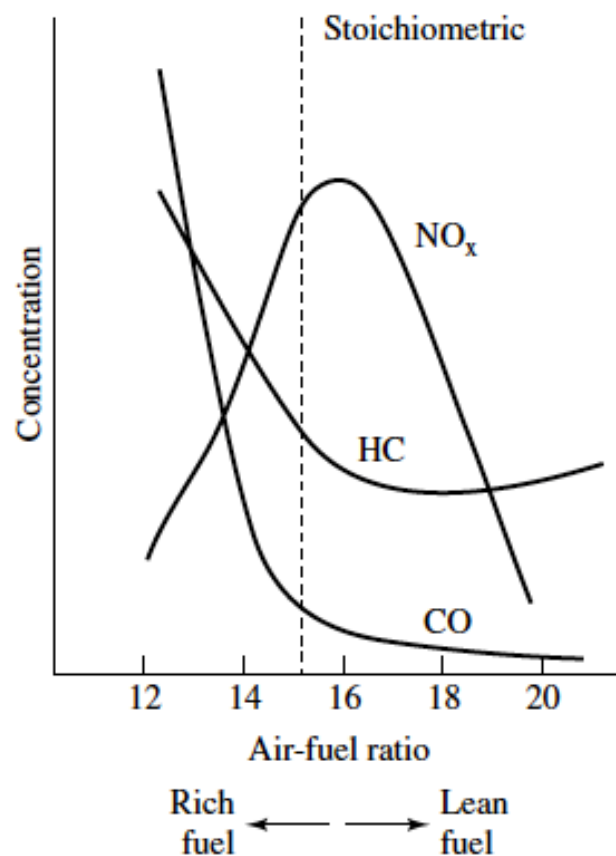


Figure 9.13 Composition of auto exhaust as air-fuel ratio varies.



Catalisador de automóvel

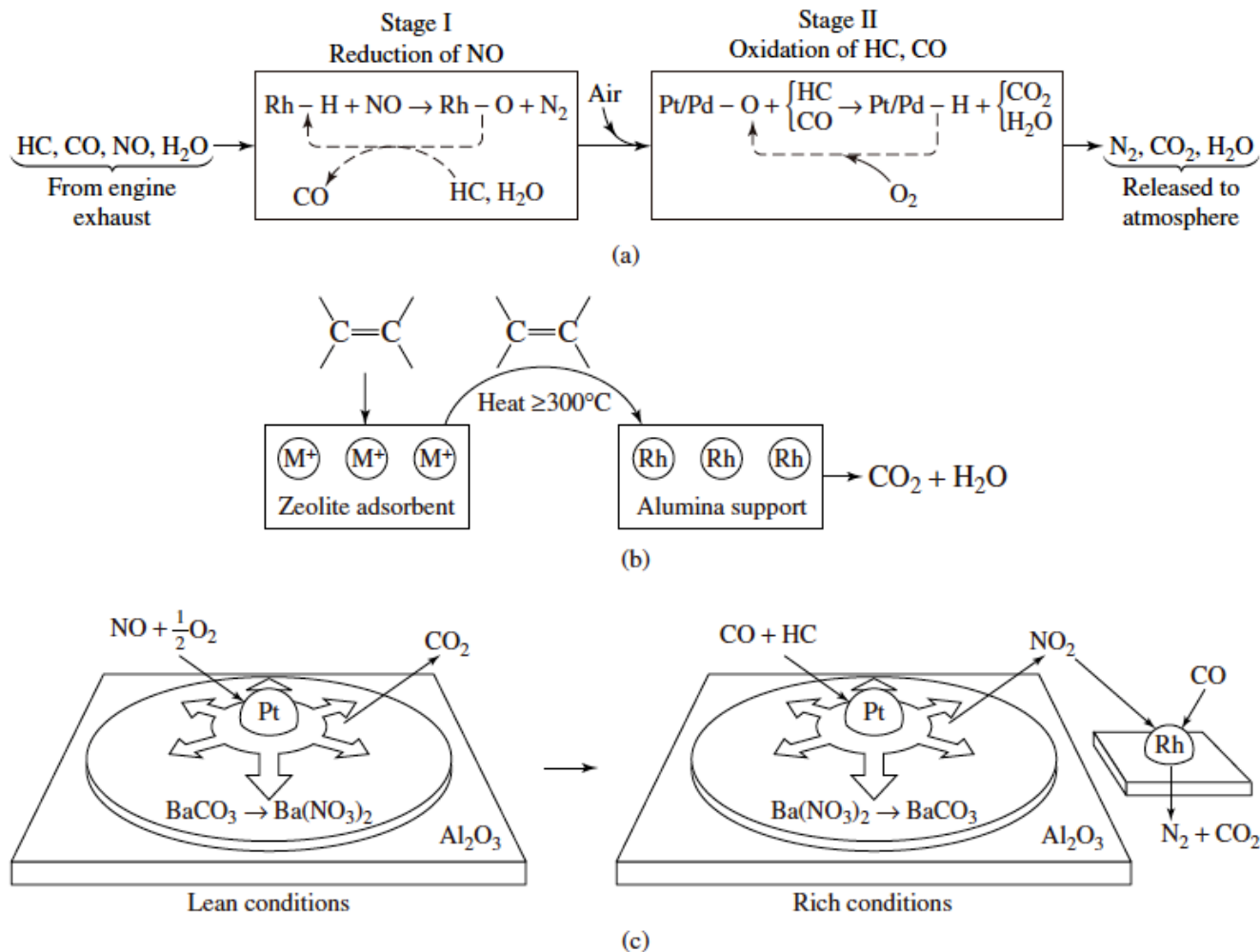
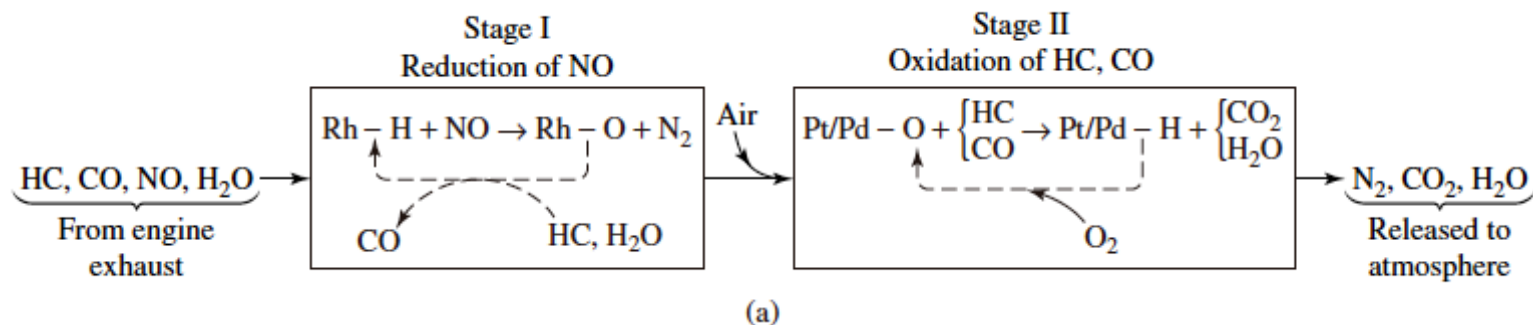
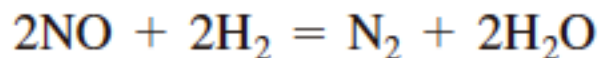
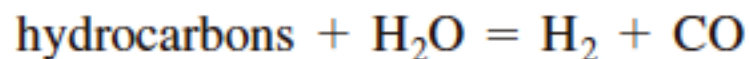


Figure 9.14 (a) The three-way catalytic converter for removal of hydrocarbons (HCs), carbon monoxide (CO), and nitric oxide (NO) from automobile exhaust. (b) Advanced methods of removal of HCs from exhausts during cold starts using zeolite adsorbents. (c) More efficient reduction of NO to N₂ using platinum embedded in barium carbonate.



Catalisador de automóvel

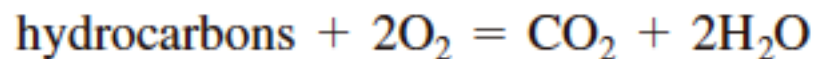
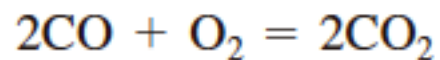
Câmara de Redução





Catalisador de automóvel

Câmara de Oxidação





Controle de emissões “fontes concentradas”

Controle de emissões em termoeletricas

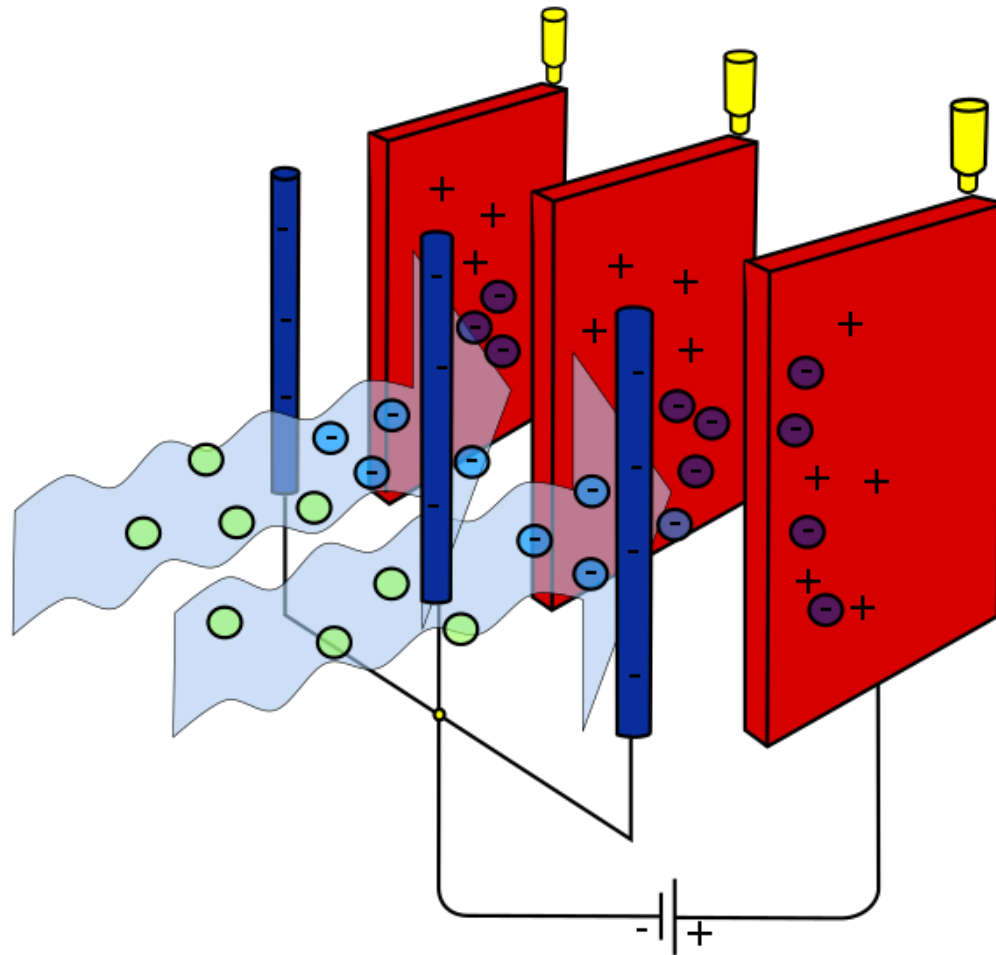
- Alvo = “Flue gas” – CO, NO_x, SO₂, Hg, material particulado, HCl



<https://en.wikipedia.org/wiki/File:GRES-2.jpg>



Material Particulado – precipitador eletrostático



https://en.wikipedia.org/wiki/File:Electrostatic_precipitator.svg



Material Particulado – precipitador eletrostático



https://en.wikipedia.org/wiki/File:Inside_of_the_electrostatic_precipitator.jpg



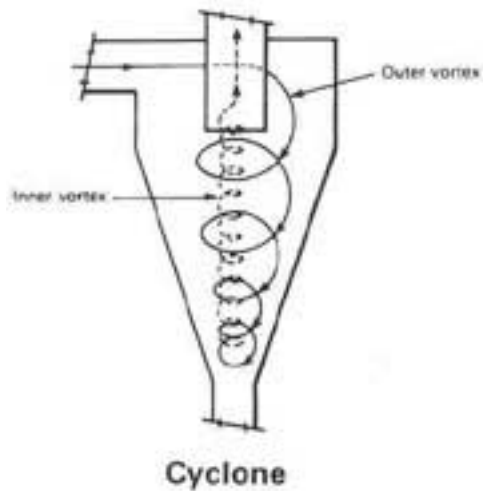
Material Particulado – precipitador eletrostático



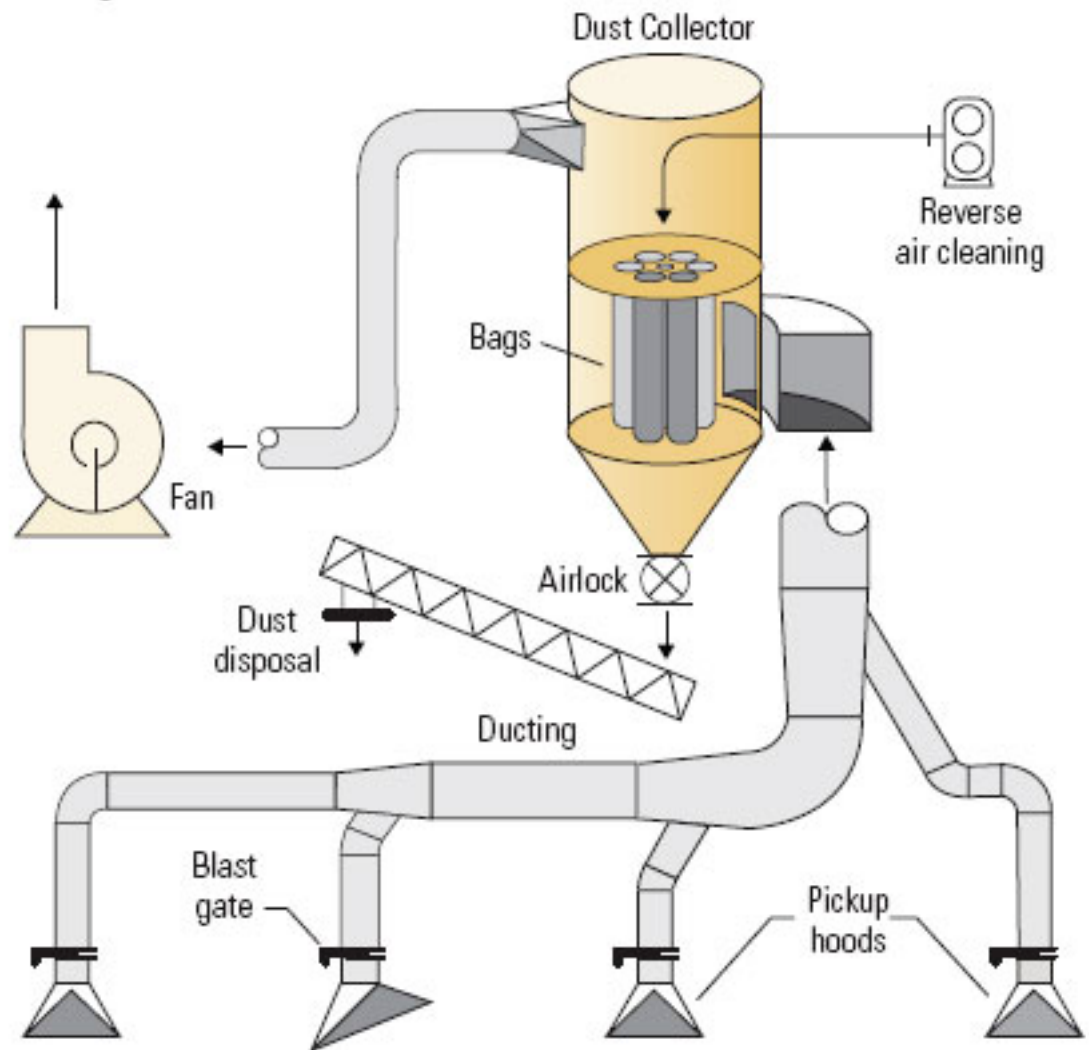
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Material Particulado – Coletor de poeira



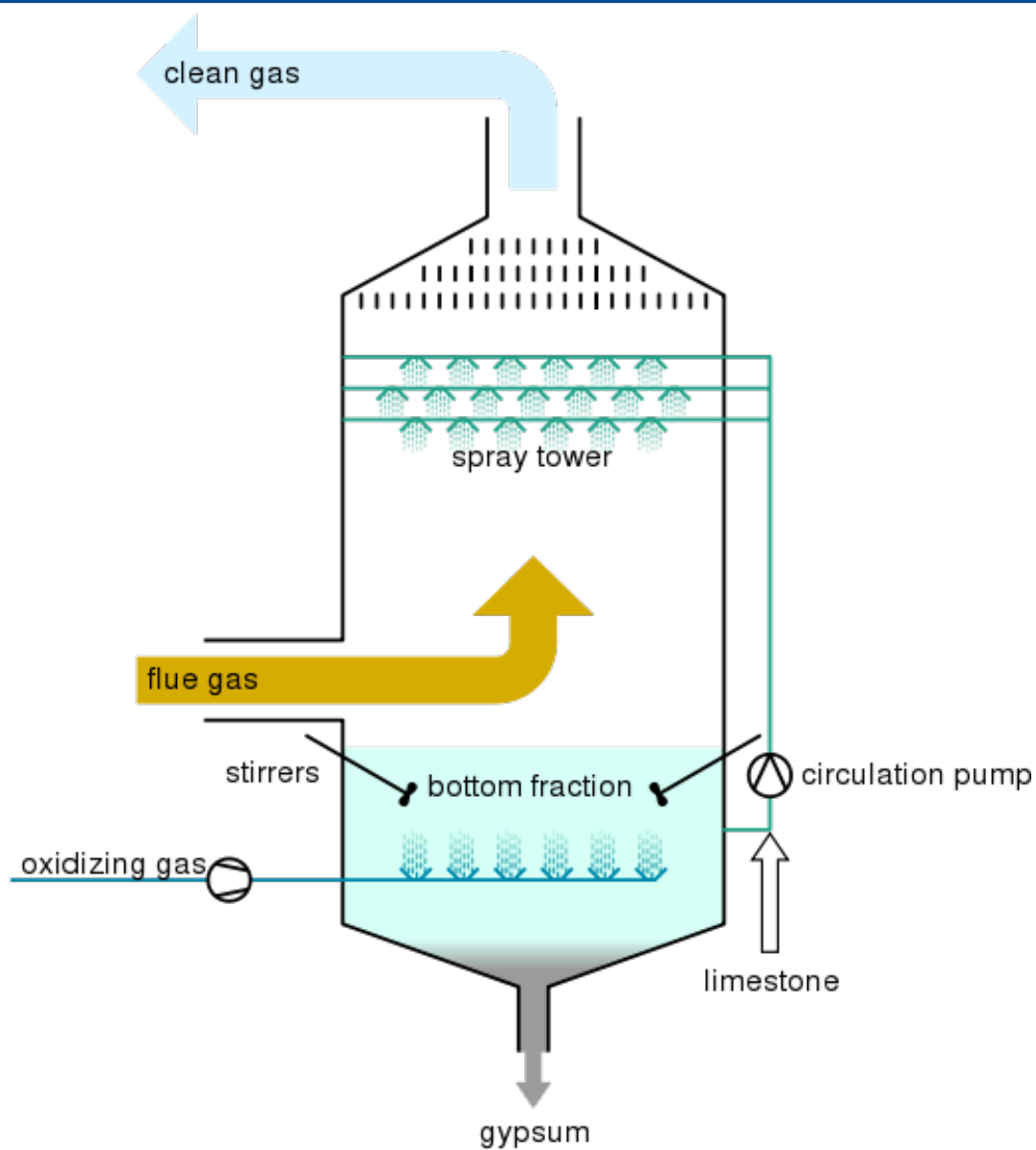
<https://upload.wikimedia.org/wikipedia/commons/a/a7/SCyclone.jpg>



https://en.wikipedia.org/wiki/Dust_collector#/media/File:Dust_collector.jpg



Lavador ("Scrubber") – SO₂, HCl, Nox, etc

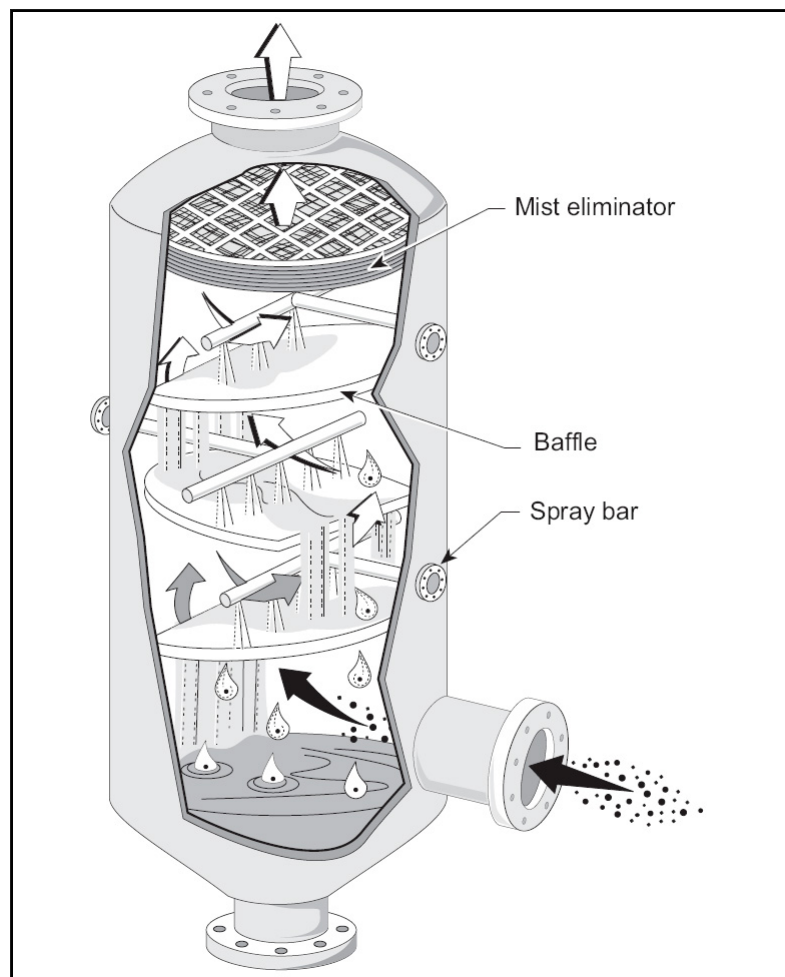


https://en.wikipedia.org/wiki/File:Flue_gas_desulfurization_unit_EN.svg



Lavador ("Scrubber") – SO₂, HCl, Nox, etc

"Baffle Spray" = "aerossol ou spray com defletor"

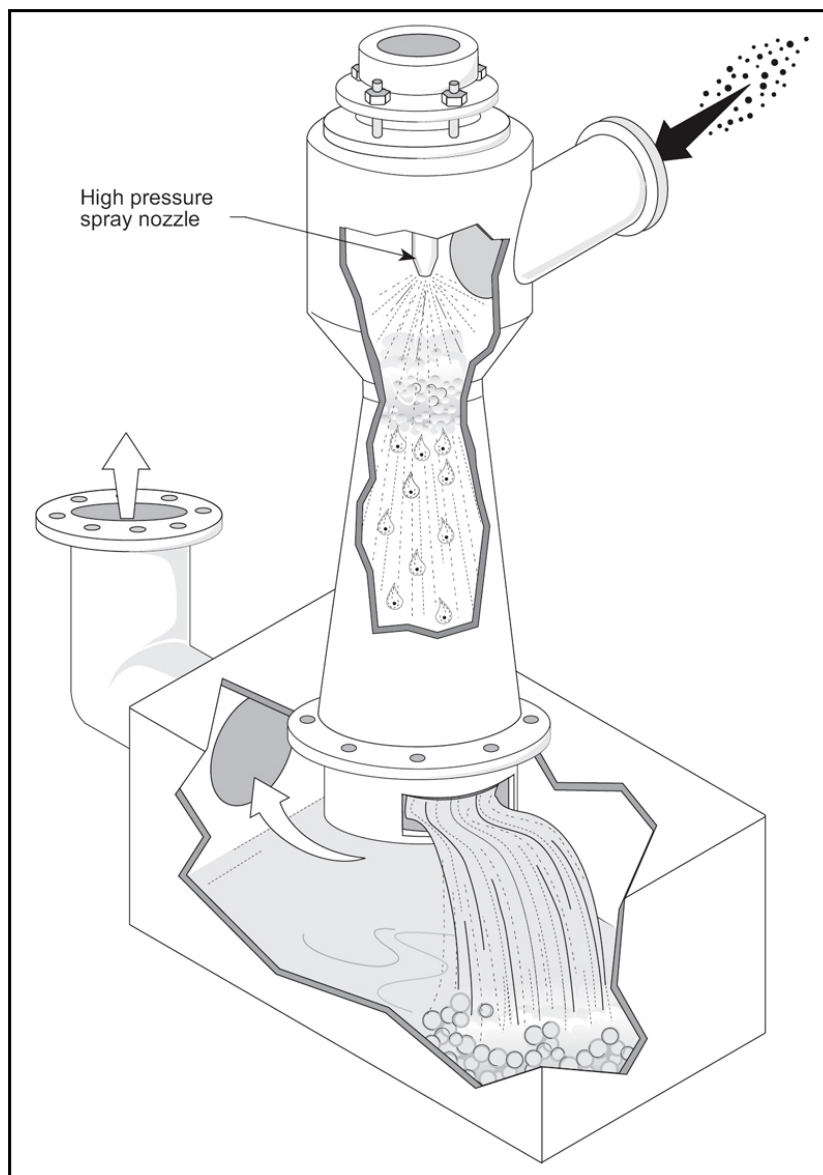


https://en.wikipedia.org/wiki/Baffle_spray_scrubber#/media/File:Bafflespray.jpg



Lavador ("Scrubber") – SO₂, HCl, Nox, etc

"Defletor Venturi"

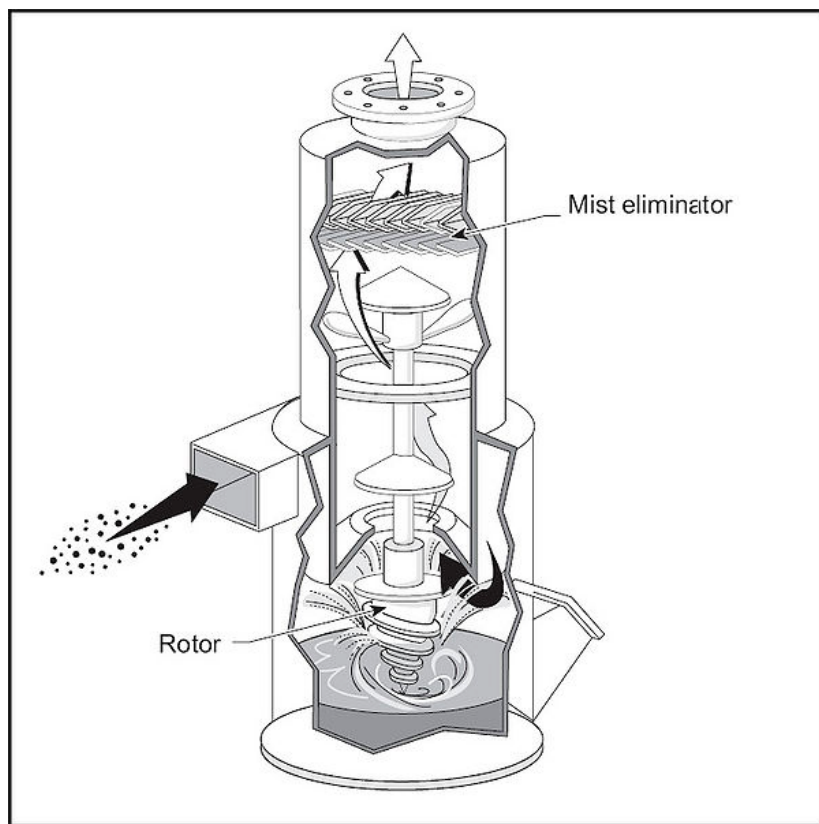


https://en.wikipedia.org/wiki/Ejector_venturi_scrubber

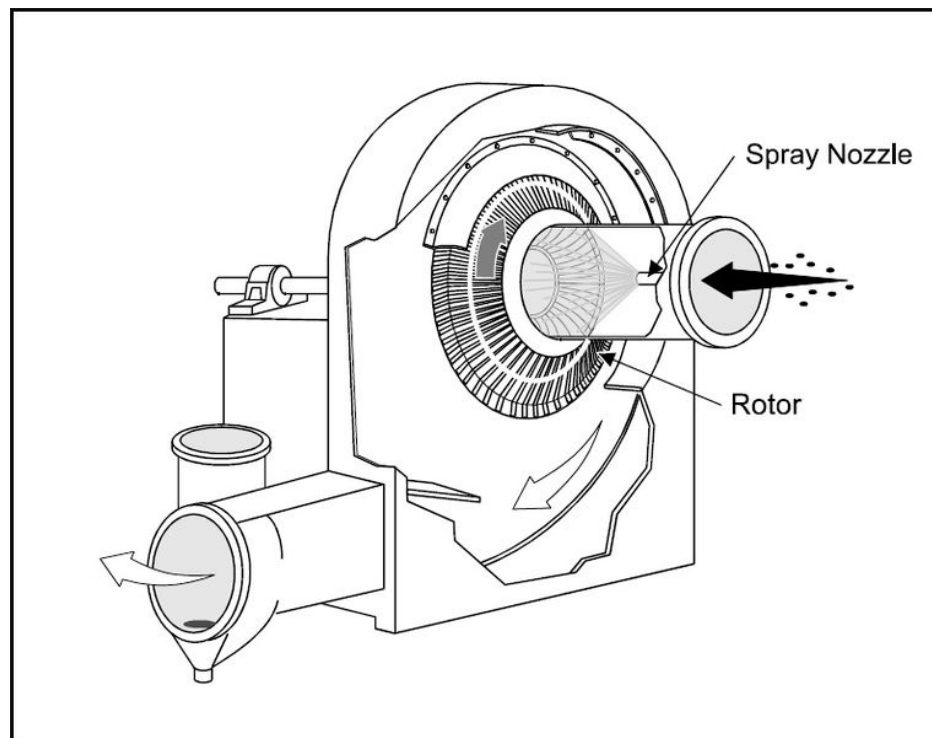


Lavador ("Scrubber") – SO₂, HCl, Nox, etc

Com auxílio mecânico



<https://en.wikipedia.org/wiki/File:Inducedspray.jpg>

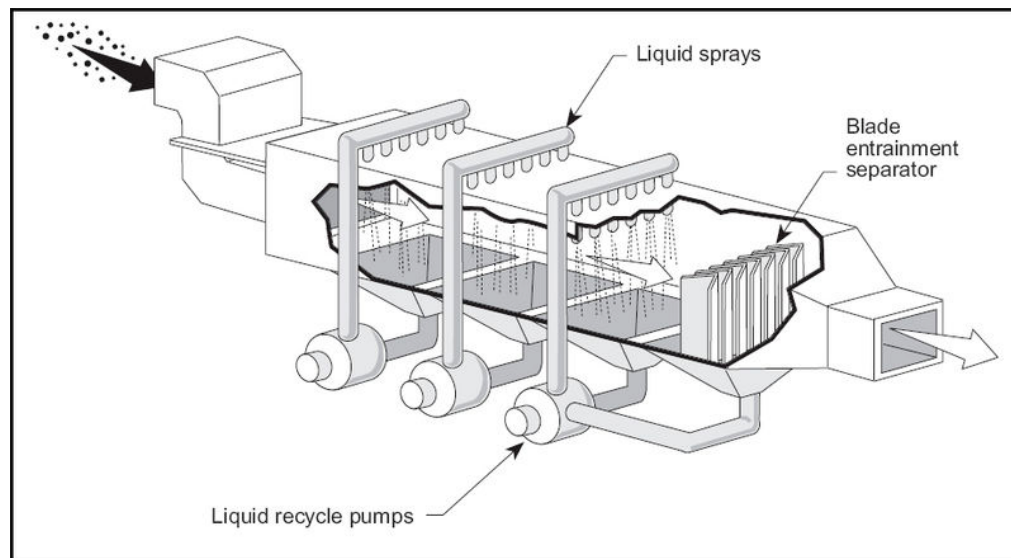
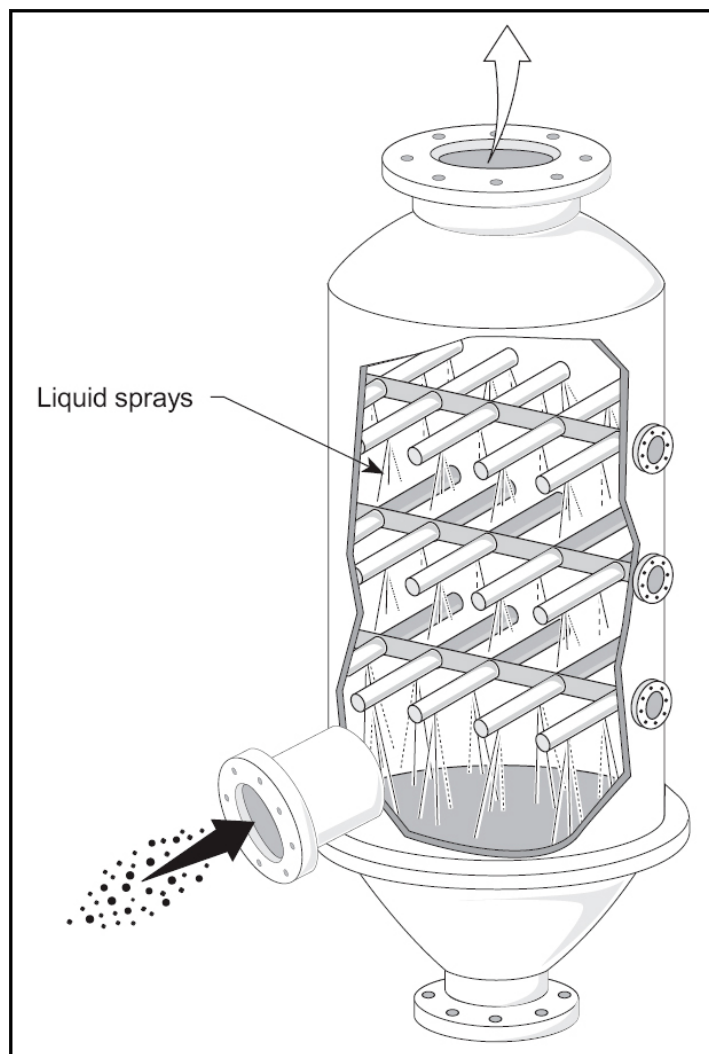


<https://en.wikipedia.org/wiki/File:Centrifugalfan.jpg>



Lavador ("Scrubber") – SO₂, HCl, Nox, etc

Torre de spray



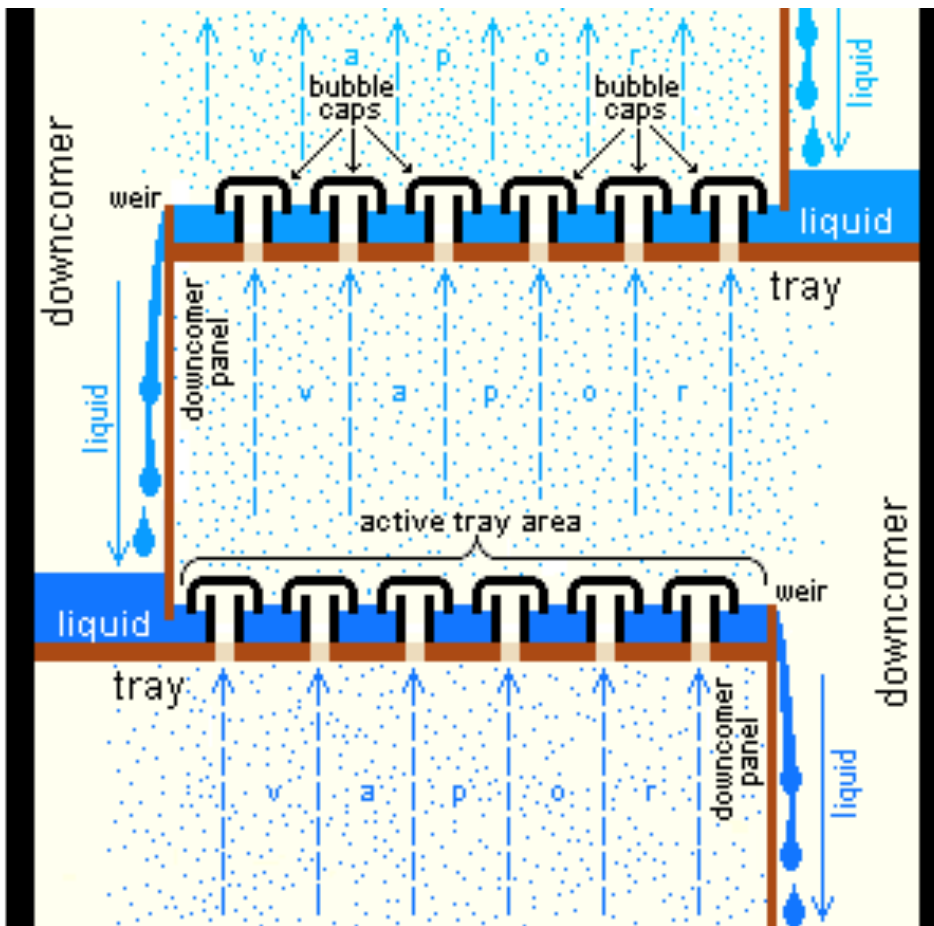
<https://en.wikipedia.org/wiki/File:Crosscrtspraytow.jpg>

https://en.wikipedia.org/wiki/Spray_tower#/media/File:Cntrcrtspraytow.jpg



Lavador ("Scrubber") – SO₂, HCl, Nox, etc

"Stripping"



https://en.wikipedia.org/wiki/File:Bubble_Cap_Trays.PNG