ABOUT US

- We design, fabricate, and install systems for the automotive, beverage, chemical, cogeneration, dairy, steel, pharmaceutical & wastewater processing industries.
- Our joint focus extends into all industrial water & wastewater applications.

OUR SPECIALTY: SEPARATION TECHNOLOGY

- **Membrane Based Systems**
- **Waste Heat Recovery & Re-use**

WASTE HEAT FOR EVAPORATION

WASTE HEAT DRIVEN EVAPORATION:

- Condensate capture & re-use
- Concentrate collection & disposal

PHASE TRANSITIONS: Evaporation & Condensation

- Evaporation is the removal of water in the vapor phase, from a solution.
- Condensation is the reverse of evaporation, a change in physical state, from gaseous phase to liquid phase. Condensate can be recycled through plant processes.
- The remaining concentrate is collected for disposal.

THE PROCESS – Part 1

HEAT

An external heat source is necessary to supply required energy to preheat the wastewater. Water is then vapourized and condensed. The condensate is recycled within plant processes.

EXCHANGE

Heat transfer from the energy source to the product can take place directly or indirectly. Our design uses a direct contact approach, spread across a large surface area.

THE PROCESS – Part 2

PHASE SEPARATION & CONDENSATION

The two-phase stream must be separated into its components to yield a distillate and a concentrated waste liquid.

Conventional Evaporators

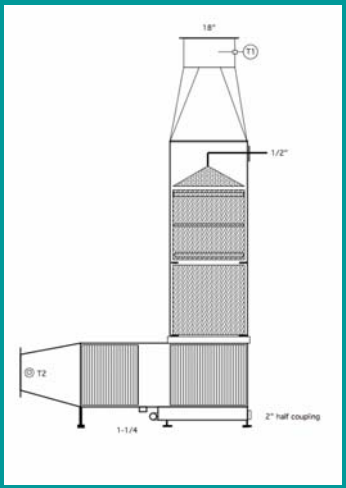
- Mechanical Vapour Recompression
- Thermal Vapour Recompression
- Multi-effect - Usually large systems
- Fire tube - Usually small systems
- Atmospheric - Usually small systems

ABE-TAF EVAPORATORS

- Direct hot gas to liquid heat transfer, with up to 30% energy recovery.
- Driven by low grade waste heat.
- No scaling or corrosion of heat transfer surfaces
- Elevation of B.P. not an issue
- Can be made of polymeric materials
- Simple and reliable

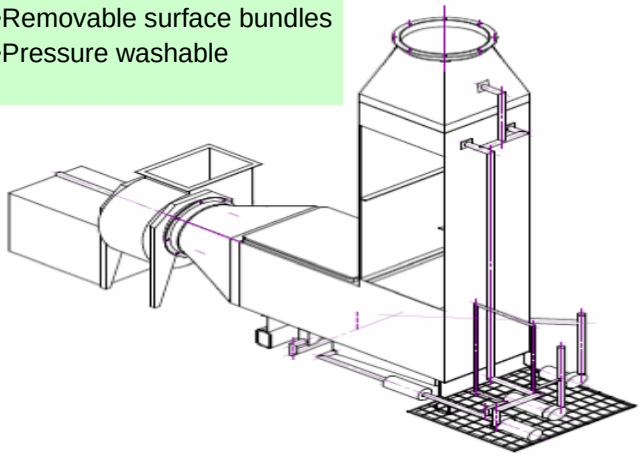
Evaporation by Direct Heat Transfer

- Hot gases enter top of unit
- Hot gases contacted with water
- Rapid equilibrium established
- Exit temperature ~ 50°C
- Recover 1/3 of energy by pre-heating air.
- Balance available for other uses such as space or water heating.

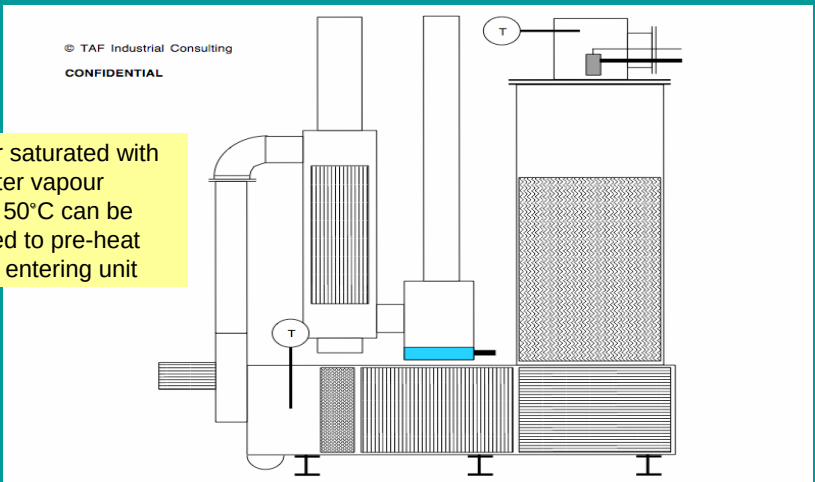


The Basic Direct Heat Transfer Module

- Removable surface bundles
- Pressure washable



Design Variations for Direct Heat Transfer Evaporators



•Air saturated with water vapour
•At 50°C can be used to pre-heat air entering unit

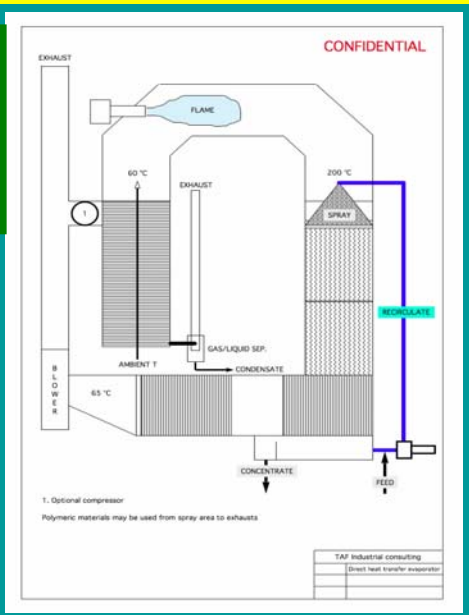
Gas Fired with Heat Recovery

VERY SIMPLE TO OPERATE

1. Start feed pump
2. Fill with liquid and re-circulate
3. Start blower
4. Start burner (modulating)

USEFUL CONTROL PARAMETERS

1. Refractive Index
2. Conductivity
3. Specific Gravity
4. pH
5. Flash Point
6. Boiling Point curve



Waste Heat Recovery & Natural Gas Fired Supplement

STEEL PLANT HEAT RECOVERY

Waste heat from an annealing Furnace is used as energy source For evaporation of plant waste water from process, floor washings etc.

Hot gases (190°C) are drawn from Exhaust duct to evaporator. Water Evaporation cools gases to 55°C. Humidified gases are returned to Exhaust duct.

Potential Issues

- Odour potential depends on wastewater characteristics
- Air emissions - visible vapour plume
- Air Approvals process may take time in some jurisdictions

•Picture shows water vapour plume from natural gas fired

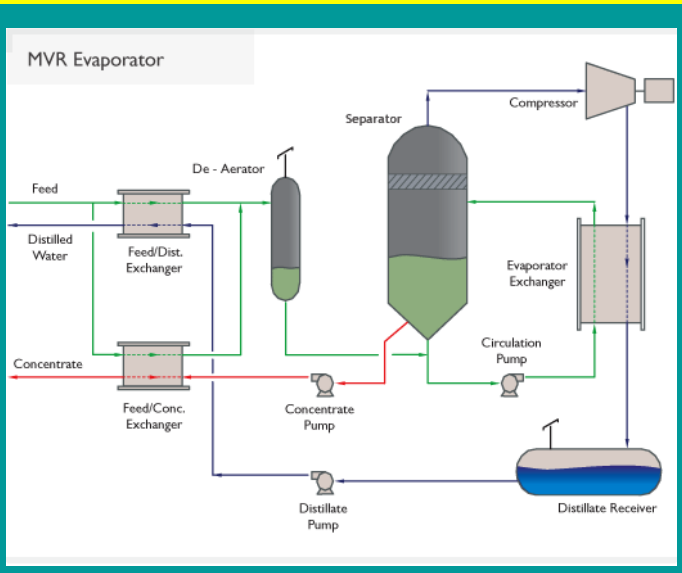
•Evaporator with partial (30%) heat recovery

•Evaporation rate is 6,000 L/day

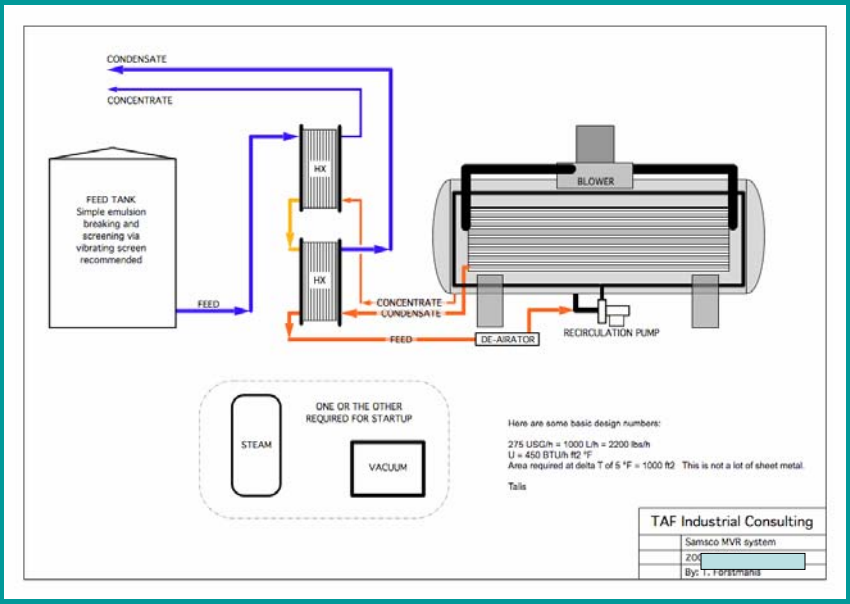
Mechanical Vapour Recompression

- **Energy efficient**
- No Air Emissions
- No Air Approvals

MVR PRINCIPAL



MVR by ABE-TAF



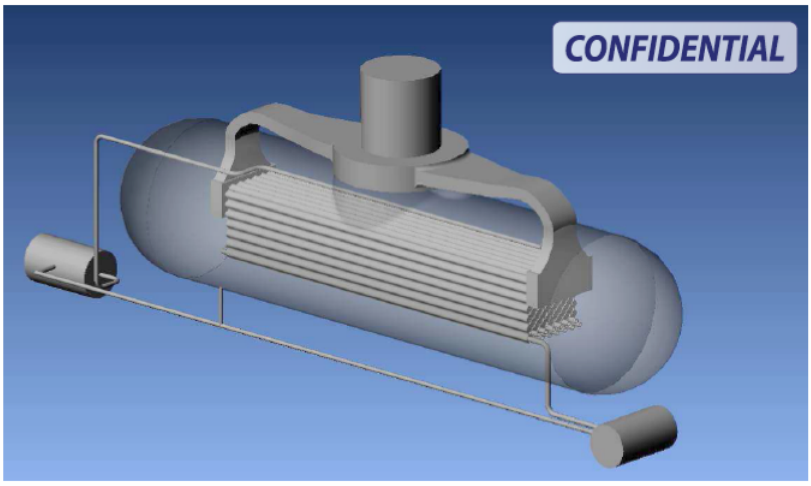
ABE-TAF MVR ADVANTAGES

- Heat transfer area made from thin sheet metal
- Thin falling film enhances heat transfer
- Turbulence enhances heat transfer
- Large heat transfer area is affordable
- Ideal design for vacuum operation (delta T/P)
- Innovative removal of non-condensable gases
- Small internal liquid volume. Simple chemical cleaning of heat transfer surfaces
- Large heat transfer areas facilitate lower energy consumption. Less than 15 kWh/m^3 is possible

TECHNOLOGY COMBINATIONS

- Use large MVR evaporator to evaporate bulk of volume as limited by elevation of B.P.
- Use small direct heat transfer evaporator to further evaporate concentrate from MVR evaporator (elevation of B.P. is not a problem)

What it looks like…..



Separation Technologies & Innovation by ABE-TAF

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