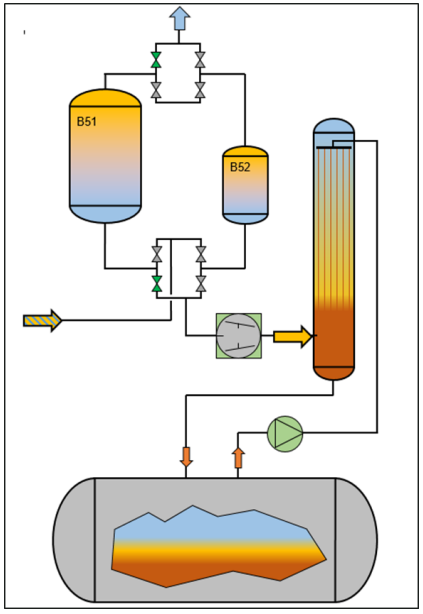
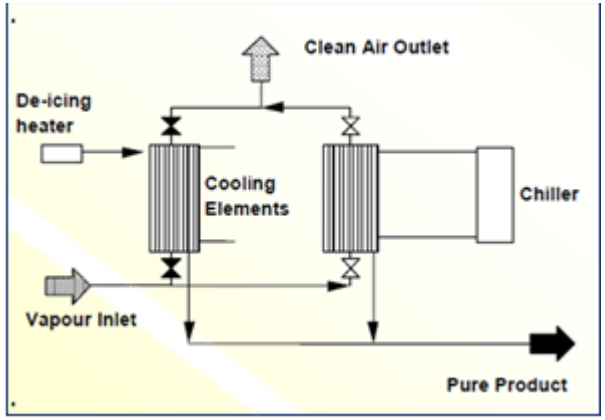
Process comparaison

There are a number of methods on the market for recovering vapours during loading of oil products. The most common and well adapted method is based on adsorption on activated carbon. The latest development in these field was initiated by CADABCO by using of dry vacuum pumps. Below is a comparison between CADABCO activated carbon Unit and Condensation unit
The CADABCO Technology is recognized worldwide by the major oil companies as the

„Best available technology“

	CADABCO Process	Condensation Process
		

	CADABCO Process	Condensation Process
Flexibility	The process parameters for the design of the recovery system are variable in terms of flowrate and concentration. When the truck deliver the gasoline to the retail station the unit must recover 32m3 within 20min During car filling (stage 2) the unit will receive only 0 to 5m3/h	
	Advantage	
	No need of buffer storage or over sizing of the unit The activated carbon bed will be used as buffer for collecting hydrocarbons by truck unloading In activated carbon only the hydrocarbons are collected. 1 kg activated carbon can adsorb 0.45kg hydrocarbons. 1 m3 activated carbon can therefore store 170 kg hydrocarbons (= 60 m3). The unit will regenerate the activated carbon bed during the time between to truck unloading **Free Flow** The flowrate through the system can freely vary between 0 and the maximum design throughput. **Free Concentration** The Hydrocarbon concentration at the entrance oft he SVRU can vary between 0% up to more then 50% without any risk. **Free composition** All possible variation of the components in the vapours from C1 to C8+ can be proceed.	**No**

	CADABCO Process	Condensation Process
	Disadvantages	
	None	The unit has to be designed for the maximum troughput The vapours cannot be stored with this system and has to be treated immediately.
Safety	SVRU's are generally installed and used in explosion hazardous areas. The vapour to be treated itself can be in the explosive range (Zone 0). In both process, the three ingredient for an explosion are possible at the same time/ Combustible gas, Oxygen and ingnition sources (rotating equipment, heat or static electricity).	
	Advantage	
	All equipment's are ATEX Certified including the control system and can be installed in Zone1 **Low process pressure** The CADABCO unit is working by atmospheric pressure and vacuum. **Low process temperature** The CADABCO unit is working by low temperature. Below 50 °C. **Fail closed valves** All the valves are single acting pneumatic valves. The Instrument air can be supplied by the customer or trough a	No rotating equipments in the vapour phase

	CADABCO Process	Condensation Process
	nitrogen bottle installed in the skid. **Simple process** A simple process is reducing the risk of accidents and is less dependent on control and monitoring elements.	
	Disadvantages	
	Hot Spots Activated carbon can heat up in certain cases. However, the system already switches off at 60 ° C.	**Installation of the chiller** Generally the chiller is not explosion proof and must be installed in a safe area A explosion proof cooling compressor for the chilling system will be very expensive
Installation	Mechanical, electrical installation and the connection of the Unit	
	Advantage	
	SKID mounted The unit is completely packaged and need only a 400V power supply	**None**
	Disadvantages	
	Size oft he unit Due tot he Carbon bed the unit need around 5m2	**2 SKIDS** One skid hs to be installed in the safe area and the cooling lines must be routed between the two skids

	CADABCO Process	Condensation Process
Energie consumption	The energy consumption should be of course as low as possible.	
	Advantage	
	Lowest energy consumption A CADABCO MINIVAC has the lowest energy consumption compared to all other available process worldwide. So even in comparison with other activated carbon process. At 40% initial concentration the consumption is below 0.1 kWh per m3 treated vapours	**None**
	Disadvantages	
	Unfortunately Consumes still energy	**very high energy consumption**
Life time	Generally the expected life time of a process unit should be 15 to 20 years.	
	Advantage	
	High quality of system components All components of a CADABCO MINIVAC are designed	**Quality of system components** The cooling systems are well know technology

	CADABCO Process	Condensation Process
	for a minimum life time of 15 years. **Simple process** A simple process usually results in a longer life time.	The life time depends of course of the quality of the components
	Disadvantage	
	None	**Sensitivity of the Cooling compressor** After the experience of some consumers, the life time of the compressor is 5 to 7 years. The exchange is relatively expensive.
Maintenance	Maintenance is an important cost factor and human factor. Specialists for specific procedures are not always available to help. Also important is the availability of spare parts.	
	Advantage	
	High quality of system components The components of a CADABCO MINIVAC are of high quality. The dry vacuum pumps need only a low maintenance (Oil replacement once per year). **Instrument Air** The Nitrogen bottle used for actuating the valves has to be replaced maximum once per year **Simple process** A simple process results in less maintenance. No special requirements are placed on operating and maintenance	

	CADABCO Process	Condensation Process
	personnel.	
	Disadvantage	
	None	**Low temperature** The vapours have to be cooled by -80°C . The hea exchanger need to be defrosted on each cycle.
Emission	The standard emission levels are different depending on the process.	
	Advantage	
	Low standard emission level The standard average emission level for activated carbon unit is around 1 g/m3. **Possibility to reach low emission level** By increase of the vacuum capacity design or by increasing of the regeneration time the CADABCO unit can commit with very low emission level (150mg/m3).	
	Disadvantage	
		Limited emission level The standard average emission level for membrane unit is around 50 g/m3. Low emission level can only be reached by deeper cooling

	CADABCO Process	Condensation Process
Recovery	The product recovery depends of course on the emission level. But the end Volume of the recovery depends also on the temperature	
	Advantage	
	Temperature MINIVAC is working at the same temperature than the underground storage **Monitoring** The level monitoring of the MINIVAC buffer tank allow the measurement of the product recovered by the Unit	
	Disadvantage	
		Temperature Sending cold product in the underground storage will reduce the volume due to temperature contraction (0,1% per 1°C)
Cost	The cost of a MINIVAC installation include the cost of all the components and the operational costs, over a period of 10-15 years.	
	Advantage	
	Simple process	**Initial cost**

	CADABCO Process	Condensation Process
	The operationnel cost of a MINIVAC CADABCO are the lowest compared to the other types of process.	The initial cost of a condensation unit is low.
	Disadvantage	
		Operating cost The operating cost are very high