



# ***GLOBAL REFRIGERANT RECOVERY--- REGULATION & SITUATION***

**2018 OZONE2CLIMATE TECHNOLOGY ROADSHOW  
AND INDUSTRY ROUNDTABLE**

**KEN LOGAN**



# 全球制冷剂回收的法律 法规及现状

2018臭氧气候技术路演及工业圆桌会议

KEN LOGAN

## *Why Recover Refrigerant?*

- It's the right thing to do environmentally.
- It saves the earth's natural resources.
- Using reclaimed refrigerant instead of virgin can be the key to meeting or exceeding international phase down commitments (ODS + GHG).
- It makes business sense, it creates employment.
- It's the law.







## 为什么要回收制冷剂?

- 这是对环境友好的正确举措。
- 这是拯救地球自然资源的举措。
- 使用回收的制冷剂替代新生产的制冷剂是达到甚至提前履行“削减ODS和温室气体国际公约”的关键步骤。
- 这是一个商业行为，同时带来就业。
- 在很多国家，这是法律强制要求。

## *Global Environmental Regulation*

- The Montreal Protocol is the global treaty to phase out the use of Ozone Depleting Substances.
- The inclusion of an HFC phase down mechanism by the Kigali Amendment to the MOP, moves global refrigerant regulation under one treaty.
- Countries implement the MOP by creating their own bespoke legislation to meet their treaty commitments.



## 主要的环境法规

- “蒙特利尔议定书” 是淘汰ODS的全球性条约。
- 2017年的基加利修正案把HFC纳入到 “蒙特利尔议定书” 内，把约束制冷剂的法规放到了同一个框架内。
- 各个国家根据自己制定的法规去履行各自在条约中的承诺。



# Global Environmental Regulation

- **Europe, F-Gas Directive** (as amended).
- **Japan, Act on Rational Use + Proper Management of Fluorocarbons** (as amended).
- **Australia, Ozone Protection + Synthetic Greenhouse Gas Management Act** (as amended).
- **USA, Section 608 of the Clean Air Act** (as amended).
- **Canada, Ozone Depleting Substances + Halocarbon Alternatives Regulation** (as amended).

Mandatory recovery of all Fluorocarbon gases during manufacture, servicing and end of life in Refrigeration and A/C systems, includes many other regulatory requirements to minimise ODS + F-Gas emissions.

- Gas Manufacturers / Supply Chain → Ban Disposables (not USA)
- No Venting Regulation → Ban Gas Release
- Refrigerant Leakage + Use Reporting → Gas Tracking

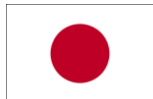


## 全球主要的环境法规

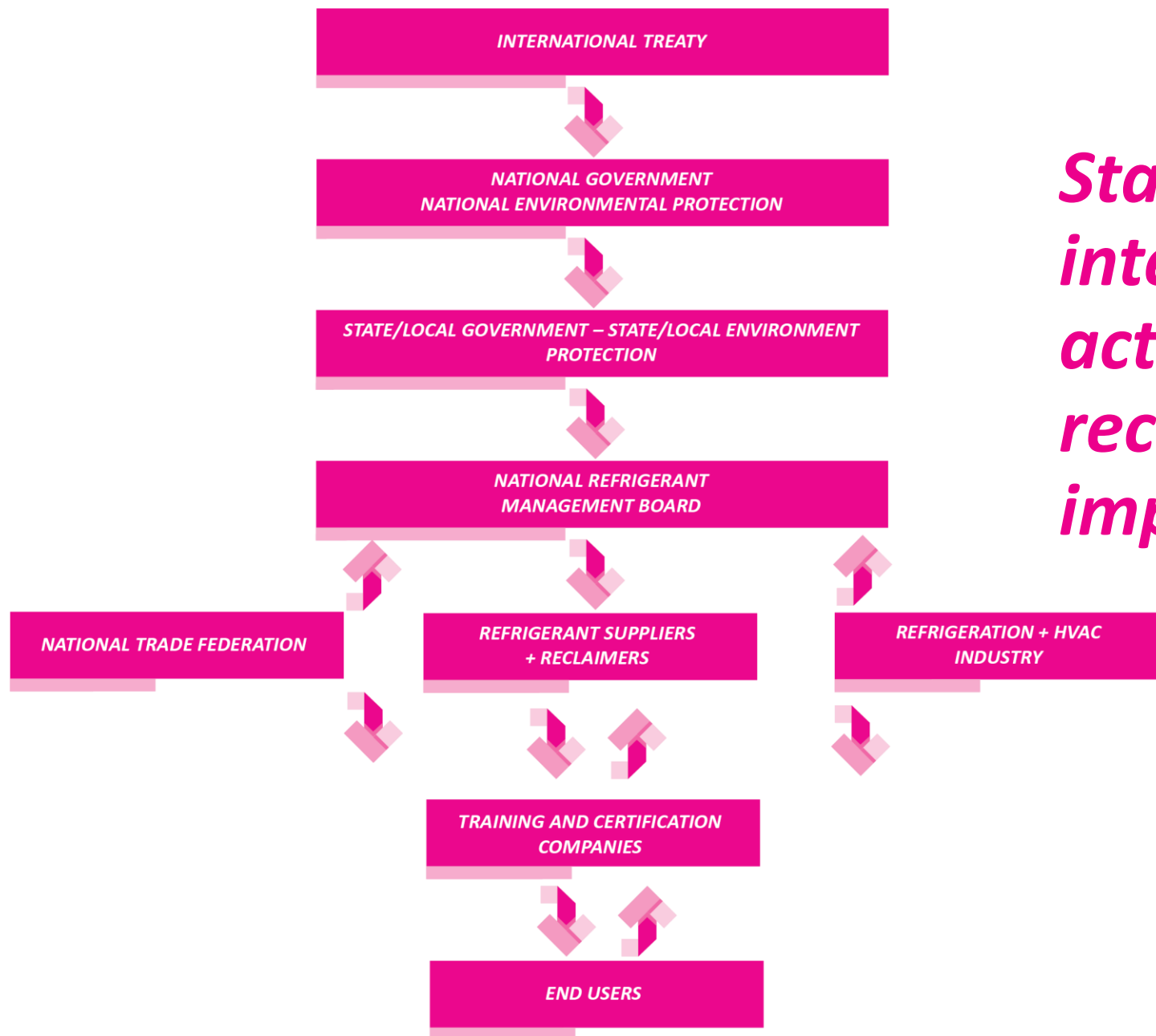
- 欧洲, F-气体指令
- 日本, 正确使用和管理氟碳化合物的法案
- 澳洲, 臭氧层保护和合成温室气体管理法案
- 美国, 清洁空气法案608条款
- 加拿大, 控制破坏臭氧层物质和氯氟碳化合物替代品的法规

强制性对空调制冷设备的生产、使用及终止过程中回收所有的氯氟碳气体，包括诸多限制和减少破坏臭氧层气体（ODS）和氟化气体(F Gas)的排放的措施。

- 在制冷剂生产和储运端→禁止使用一次性包装(美国除外)。
- “禁止排空”法规→禁止一切制冷剂在使用端的排放。
- 制冷剂泄漏和使用的报告→制冷剂的跟踪。







*Stakeholders,  
international treaty to  
actual refrigerant  
recovery  
implementation*



**利益相关者，从国际条约  
到制冷剂回收的实际操作**

## Key Points, Refrigerant Recovery

Challenges	Enablers	Solutions/Technologies
No enforcement of regulation	Local Gov., EPA + Industry federations	Fines, loss of reputation, loss of new business
No current infrastructure for used refrigerant	Refrigerant wholesalers and Refrigerant manufacturers, new start up companies	Investment required, also Gov. initiatives <b>/ Reclamation + Separation Process</b>
Personnel not trained or no recovery equipment or ability to log refrigerant records	Industry federations / new training providers, Equipment manufacturers/ new service providers	New employment opp. to meet existing + new regulations / <b>“Rapid Recovery” Machine</b> <b>Bar code scanners from mobile ‘apps’</b>
End users do not request recovery or follow up environmental responsibilities	Needs pressure from customers + Gov. to change end user perception	Can result in more business + new contracts if behaviour changes
Not enough refrigerant is being recovered, so why bother	All stakeholders, as doing nothing is not an option	A joint effort of all stakeholders is required regulation is not enough just on its own

## 制冷剂回收的要点

挑战	促成者	解决方案/技术
法规的执行力不足	地方政府，美国环保署，工业联合会	罚款，公司声誉损失、业务损失
没有处理使用过的制冷剂准备的 基础设施	制冷剂批发商、生产商及新成立的公司	需要投资和政府采取主动 <b>/ 制冷剂处理和分离工艺</b>
未受训练的人员、没有回收设备 或没有能力做好正确的档案	工业联合会 /新的培训公司、器材生 产商 /新的服务提供商	为达到现有和新的法规会带来就业机会 <b>/ “快速回收” 机器，移动的二维码扫描仪 等。</b>
空调设备使用方不要求制冷剂回 收或不跟进环保责任	需要来自消费者和政府的压力去改变 使用方的认知	如果行为发生改变，会带来更多业务和订单
“回收的制冷剂这么少，为什么 还去费事回收呢？”	所有利益相关者	需要所有利益相关者共同参与，只有法规是 不够的

# Key Technologies, Refrigerant Recovery

- | Area          | Technologies  |
|---------------|---|
| • Recovery    | • high pressure pump on vehicle, recover 300kg in 30 minutes instead of 6 hours                                       |
| • Reclamation | • Removal of moisture, acid, non condensable, = to AHRI 700 specification   |
| • Separation  | • Returning mixed refrigerants to single or reusable components through fractional distillation columns eg R410A /R22 |
| • Destruction | • Only If required, preferred method is Plasma Arc Technology (pyrolysis)   |





# 制冷剂回收主要技术

## 领域

- 回收
- 处理
- 分离
- 销毁

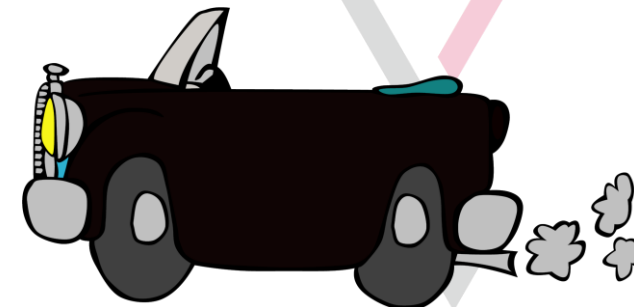
## 技术

- 放在回收卡车上的高压泵，30分钟回收300公斤制冷剂，传统方式要6小时
- 去除水分、酸和不饱和气体，使之达到AHRI 700 规格
- 把混合的制冷剂通过蒸馏塔分离成单组份或多组分的可使用的制冷剂，比如R410A /R22
- 如果需要的话，用等离子电弧技术销毁



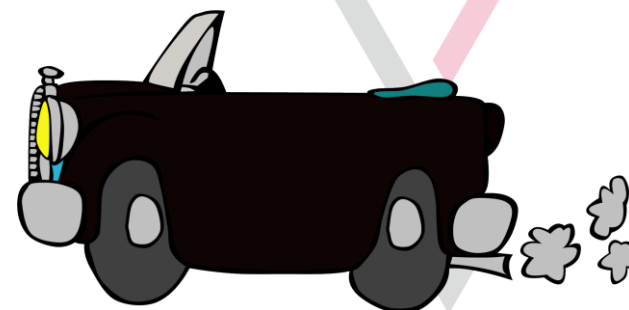
## *Environmental Regulation Result, USA*

- In 2016, 15,000 Tons was estimated as the recovered/reclaimed/recycled refrigerant volume in the USA from used Ref/HVAC systems.
- In Co<sub>2</sub>e terms this would equal circa 30 million Tons, if emitted to atmosphere, or could also be expressed as the equivalent of removing 6.4M passenger cars emissions from the road for one year.
- A-Gas through its Rapid Recovery business has 50 sites across the USA all with specialised mobile refrigerant recovery equipment



## 环境法规的结果, 美国

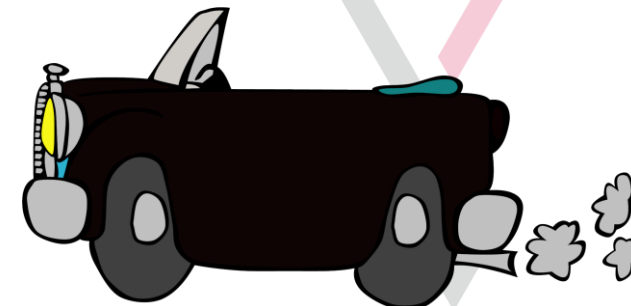
- 2016年在美国共有1万5千吨的制冷剂从废弃的制冷设备中被回收、处理和重复利用。
- 这个数量相当于减排二氧化碳3000万吨，或相当于640万辆汽车行驶一年的二氧化碳排放量。
- A-Gas 在美国的子公司“快速回收公司”（Rapid Recovery）有超过50个场地，全部配备特制的快速回收移动设备。



## *Environmental Regulation Result, Europe*



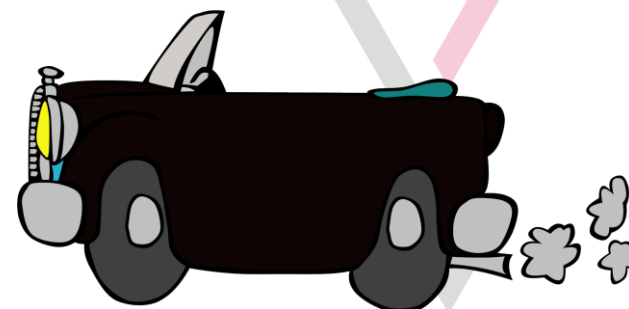
- In 2016, 5,000 Tons of refrigerant was estimated as the recovered/reclaimed recycled refrigerant volume in Europe, from used Ref/HVAC systems.
- In Co<sub>2</sub>e terms this would equal circa 10 million Tons or could be expressed as the equivalent of removing the emissions of 2.1 M passenger cars from the road for one year.
- A-Gas in Europe has facilities in 3 countries each with its own mobile team to recover refrigerant from any job site, on land or sea.





## 环境法规的结果, 欧洲

- 2016年在欧洲共有5千吨的制冷剂从废弃的制冷设备中被回收、处理和重复利用。
- 这个数量相当于减排二氧化碳1000万吨，或相当于210万辆汽车行驶一年的二氧化碳排放量。
- A-Gas在欧洲3个国家都有基地，其配备的机动团队可以从陆地或海上的任何地点快速回收制冷剂。





## *Refrigerant Recovery, where to begin?*

Starting to recover refrigerant is reasonably low cost.

Some investment in equipment and training is necessary.

The skill set required is complimentary to existing Ref/HVAC work.

Apps are available to record + track refrigerant use to meet specific regulatory requirements.

Reclaim facilities are the next step to process the recovered refrigerant.





## 制冷剂回收, 怎样才能开始呢?

- 回收制冷剂可以从小的开始，成本不会太高。
- 在设备和培训上一些必要的投资是需要的。
- 所需要的技能是对目前已有空调制冷工作的补充。
- 在移动扫描仪上的APP可以记录和跟踪制冷剂的使用，以达到法规的要求。
- 投资处理装置是回收制冷剂的下一步骤。



## Refrigerant Recovery Opportunities 1?

If a country uses 5M disposable cylinders of R410A in a year, circa 400g of refrigerant can be left over in each 'residual heel', which in time will leak to the atmosphere.

If the 'residual heel' was recovered from each can and reclaimed, it could equal 2,000 Tons, this could save 4 Million Tons Co2e being vented.

Based on a refrigerant price of RMB40 per kg, this is worth RMB80 M.



## 制冷剂回收 机会一？

- 如果一个国家每年使用5百万个R410A一次性钢瓶，假设每个钢瓶至少有400克的制冷剂残留会排放到大气中。
- 如果能够把这些制冷剂残留全部回收和利用，相当于既节约了2000吨的制冷剂，同时又实现了二氧化碳减排400万吨。
- 如果该制冷剂的售价是人民币40元一公斤，可以节约人民币8000万元。





## *Refrigerant Recovery Opportunities 2?*

A country disposes of 1M old A/C systems each with a charge of 1kg of R22.

If all the system charge was recovered before scrapping, the refrigerant reclaimed could be circa 1,000 Tons of R22.

This could have a potential value of 20M RMB.

Environmental saving would be 55 ODP Tons + 1,810.000 Tons of Co<sub>2</sub>e.





## 制冷剂回收 机会二?

- 如果一个国家每年销毁1百万个充装了1公斤的R22空调设备
- 如果在销毁前能够把制冷剂回收，可回收的R22制冷剂可达到1000吨。
- 这相当于人民币2000万元的货值。
- 同时减排ODP55吨，减排二氧化碳180万吨。

## *Refrigerant Recovery Opportunities 3?*

Used one shot cans and medical dose inhalers have a residual heel of HFC gas remaining, which, in time, will be released to atmosphere.

It is possible to recover the gas, even from these small sized containers in a fully closed loop system.

The cans can then be safely recycled for their metal content.







## 制冷剂回收 机会三?

- 一次性134a小罐和医用吸入器都会有气体残留，销毁时不可避免地会排放到空气中。
- 把这些小罐中的气体在一个完全封闭的系统中回收是可行的。
- 这些小罐一旦没有压力，就可以很安全的回收其金属了。



# Global Refrigerant Recovery

*Starting out*



*VS. Highly Advanced Refrigerant Recovery*





# 全球制冷剂的回收

从一个小的开始

到 非常专业的制冷剂回收





# Global Refrigerant Recovery

*Starting out*



*VS.*

*Highly Advanced Refrigerant Recovery*





# 全球制冷剂的回收

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## *What about Mixed Refrigerants?*

Yes, they can be separated and then reclaimed to international specifications.

The equipment is more complex and specialised but it can be done.

Refrigerant should be evaluated by proper analysis and then stored for future processing rather than being emitted or destroyed.



## 制冷剂混在一起怎么办?

- 是的，它们可以被分离然后处理到符合国际质量标准。
- 所需设备会更复杂和专业，但是可以做到。
- 需要对混合的制冷剂作分析，然后安全存储直到将来被处理，而不是直接排放到大气中或被销毁。



## *Global Refrigerant Recovery, Summary*

- As we have seen refrigerant recovery is possible, environmentally beneficial and cost effective.
- It does require all stakeholders in the process to work together to reach the ideal outcome.
- Global Recovered Refrigerant volumes are growing year on year, there remains a huge opportunity to get all countries on board.

## 总结---全球制冷剂的回收

- 从我们的经验看，制冷剂回收利用是完全可以做到的，而且对环境友好，成本也有优势。
- 这需要所有的利益相关者共同努力，去达到理想的结果。
- 全球范围内制冷剂回收的数量每年都在增长，如果所有国家都能参与进来，回收的潜力将更加巨大。



# *No Leakage No Emission We Recover, Reclaim & Recycle!*

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**Reclamation** is the process during which used halocarbons are processed through a proprietary reclamation system to remove impurities.

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没有泄漏就没有排放，  
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氯氟碳化化合物的回收处理和利用(CFCs, HCFCs, HFCs, HFOs, Halons , HFOs)

回收处理是指用一种特殊的工艺把回收来的制冷剂及各类氯氟碳化化合物进行提纯、分离，以达到重复利用的标准。

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