

**Vacuum Gas eXchanger for FOUP
VGX-system (PAT.)**

VEC Corporation
www.vec300.com

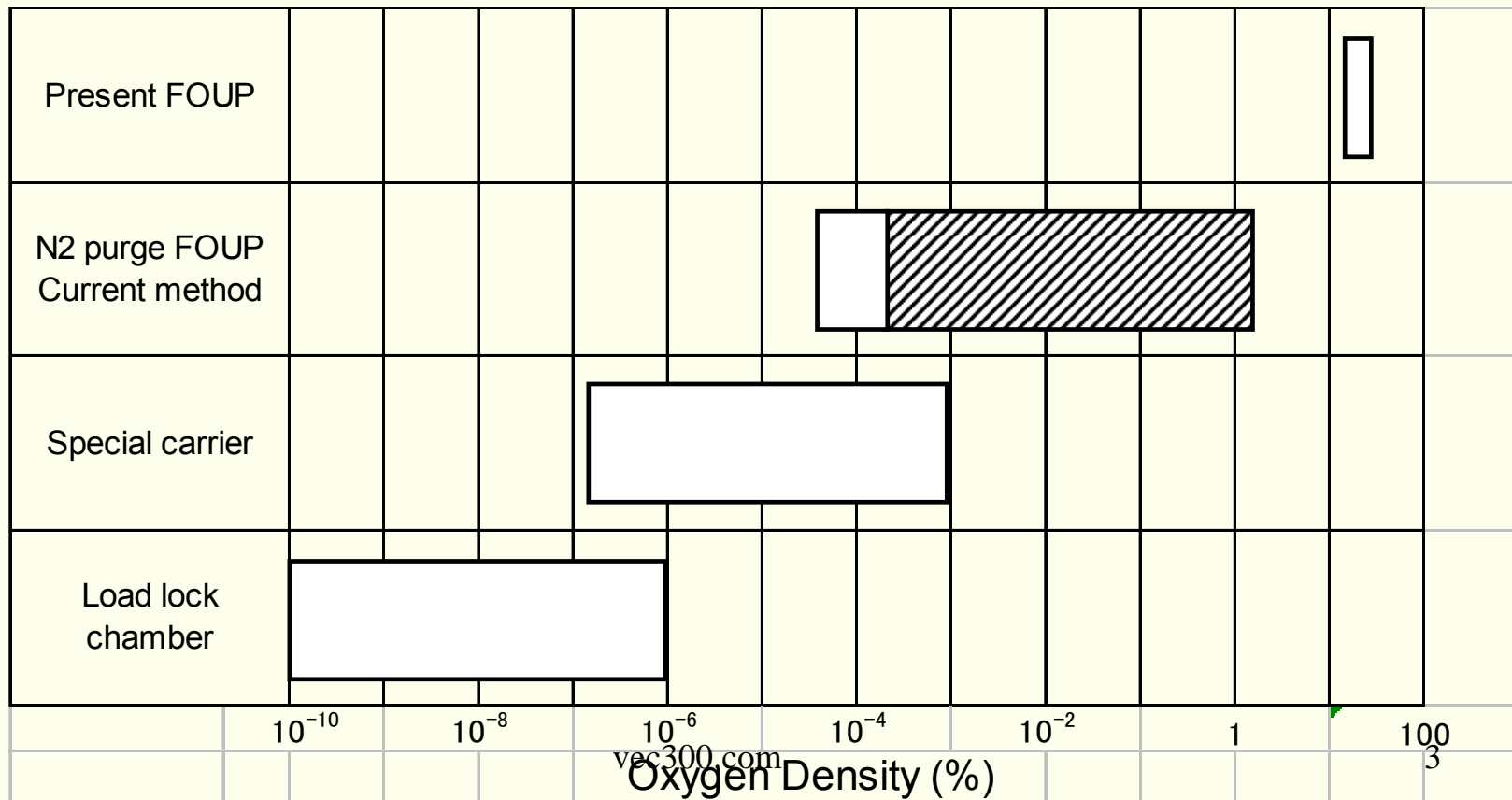
Demand on N2 Purging

- Injecting the inert gas (N₂) is effective to prevent the wafer surface from oxidizing in FOUP.
- By injecting the inert gas (N₂), wafers can be preserved for a long period without being damaged. (In stocker, etc)

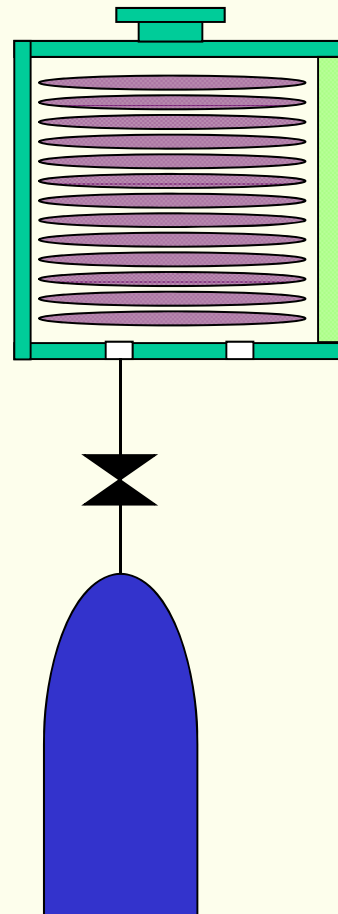
Target O2 Density in FOUP






The following figure shows the expectation of device makers on the purging effect for present FOUP.

Makers expect to decrease O2 density in plastic FOUP to around **0.001 % (10 ppm) within the short time.**



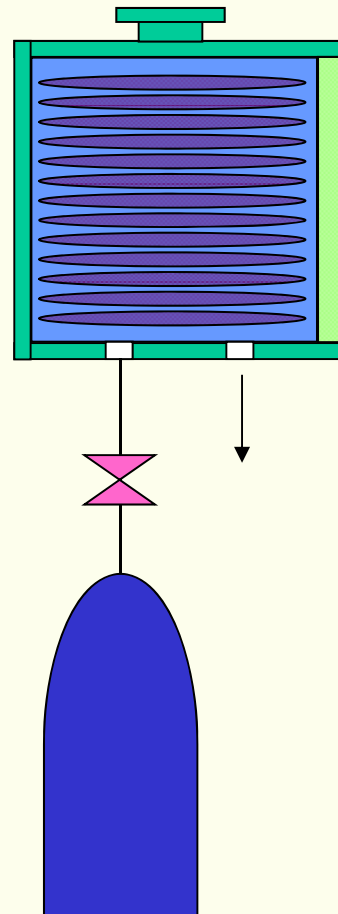
Current Method (1)








-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

To one of the FOUP purge ports (usually, there are two.), connect an inert gas (N2 gas) supply source. Open the other port.

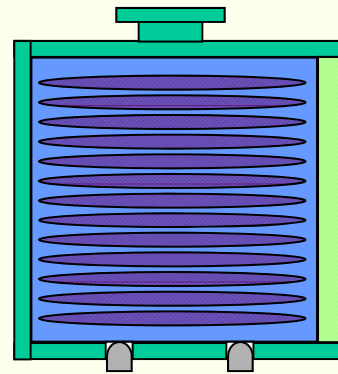
Current Method (2)








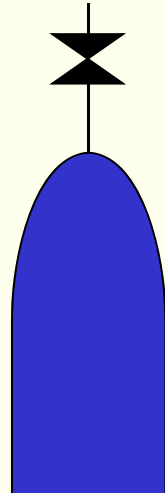
-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

**Open N2 gas inlet valve, inject N2 gas, and simultaneously purge the inside air through the other port.
i.d. Conduct N2 purge.**

Current Method (3)



-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

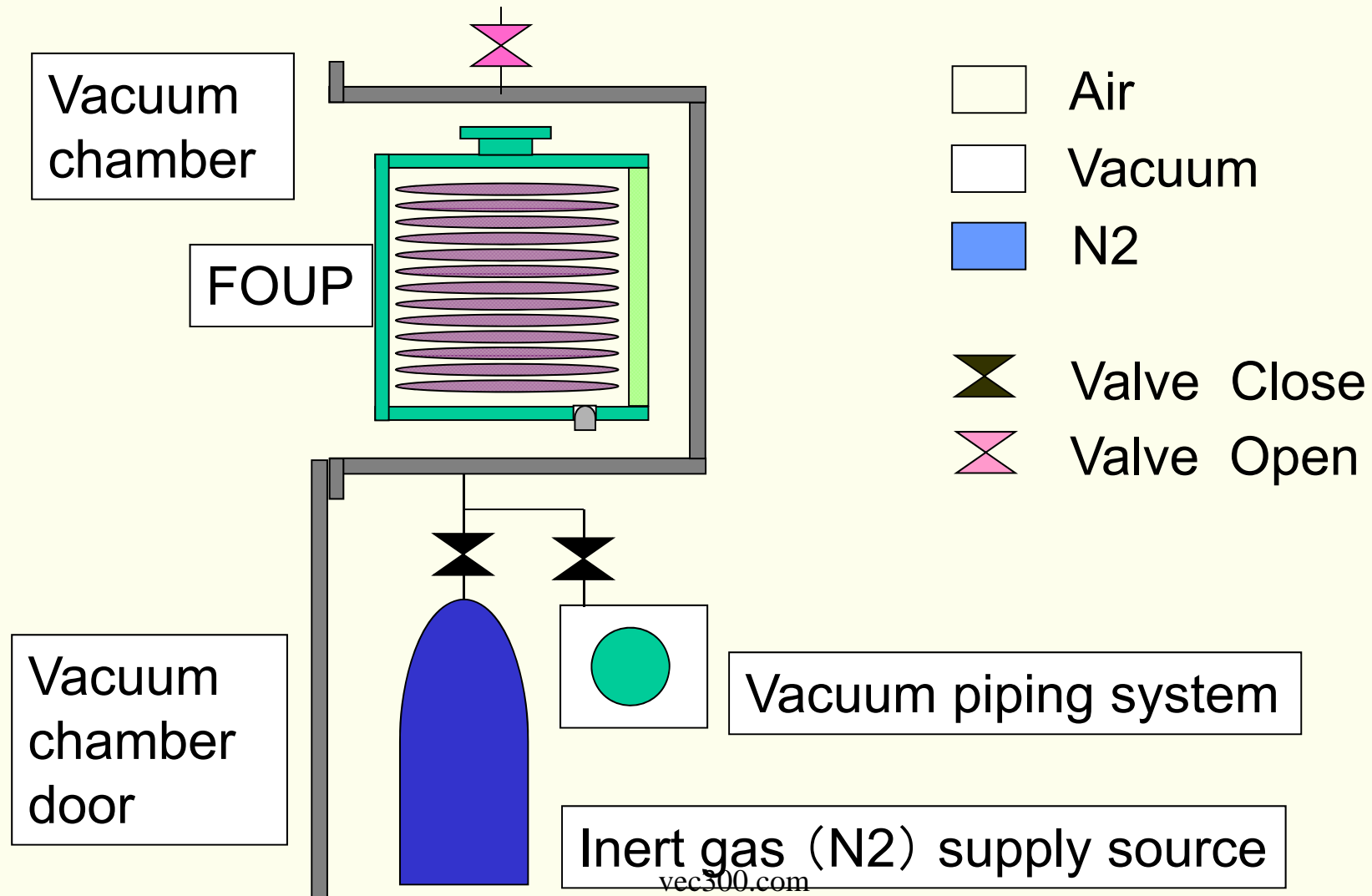


When the O2 level in FOUP is lowered enough, stop N2 injection and plug the port.

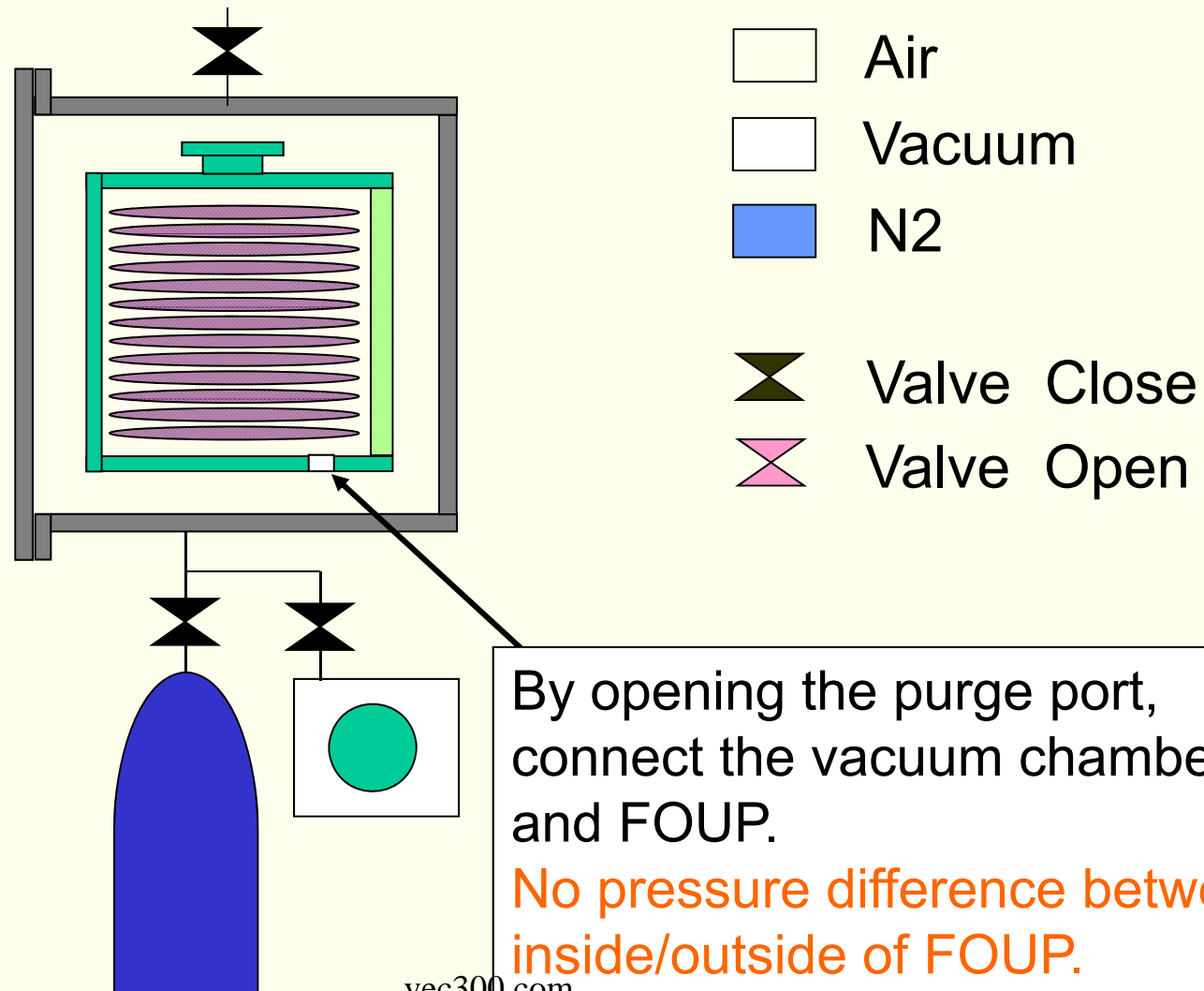
Problems in the Current Method

- **It takes long time to lower the O₂ level in FOUP.**
→ Considered to the required time, acquiring O₂ level is not the satisfactory level.
- **N₂ consumption level is high.**
→ Running cost increases, and it is against resource saving.
- **Internal surface of FOUP and wafer surface can not be de-gassed.**
→ When wafers are stored for a long time, problems may occur.

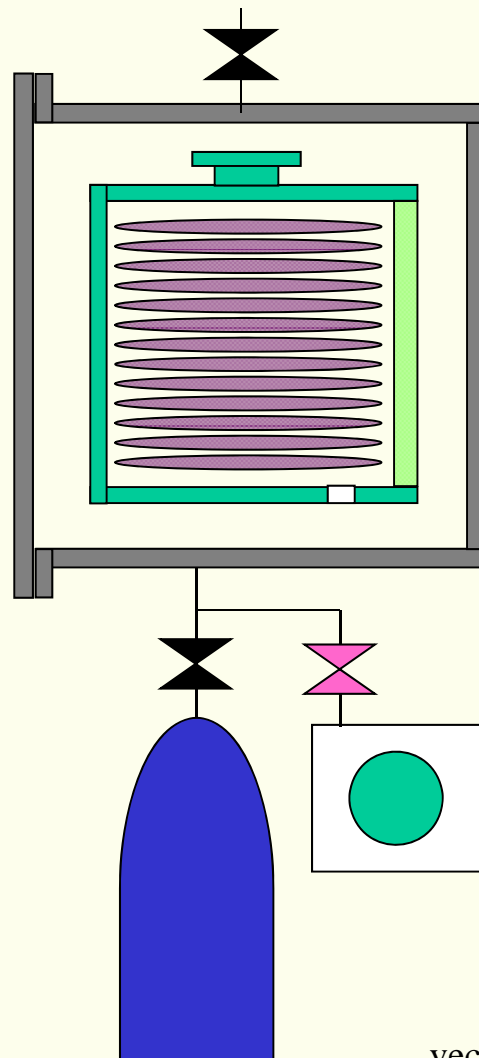
VGX-system(1)








VGX-system (2)



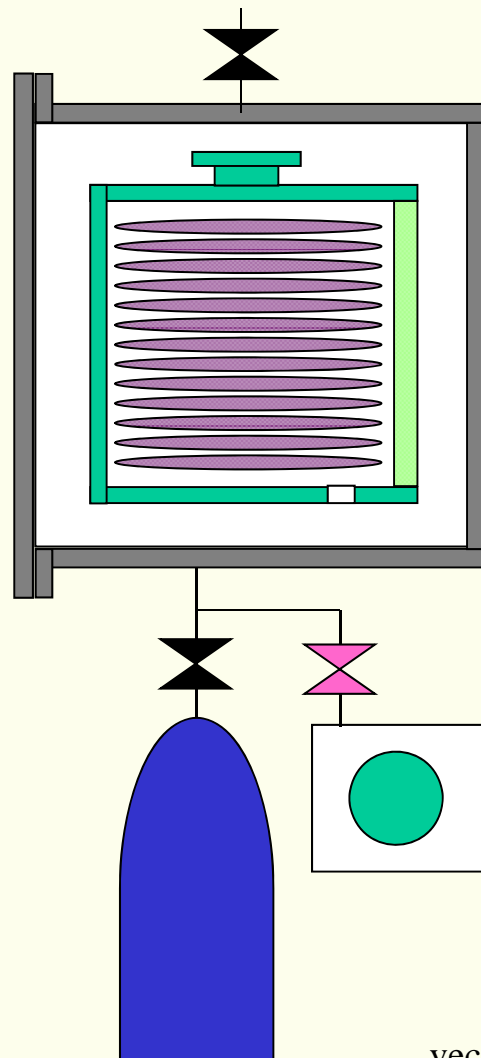
VGX-system (3)








-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

Open the vacuum evacuation valve, and evacuate the vacuum chamber and FOUP.

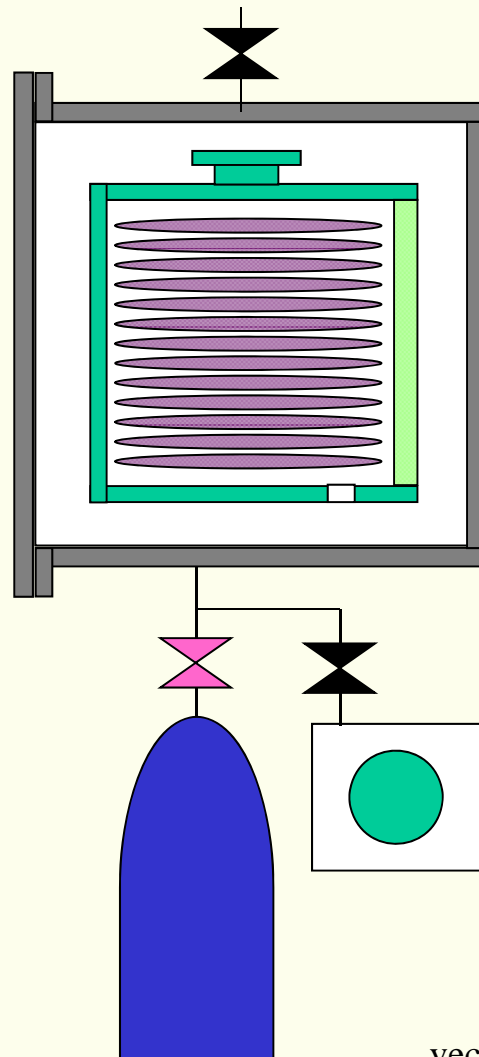
VGX-system (4)








-  Air
-  Vacuum
-  N₂
-  Valve Close
-  Valve Open

Vacuum chamber and FOUF become vacuum condition.
De-gas effect For H₂O

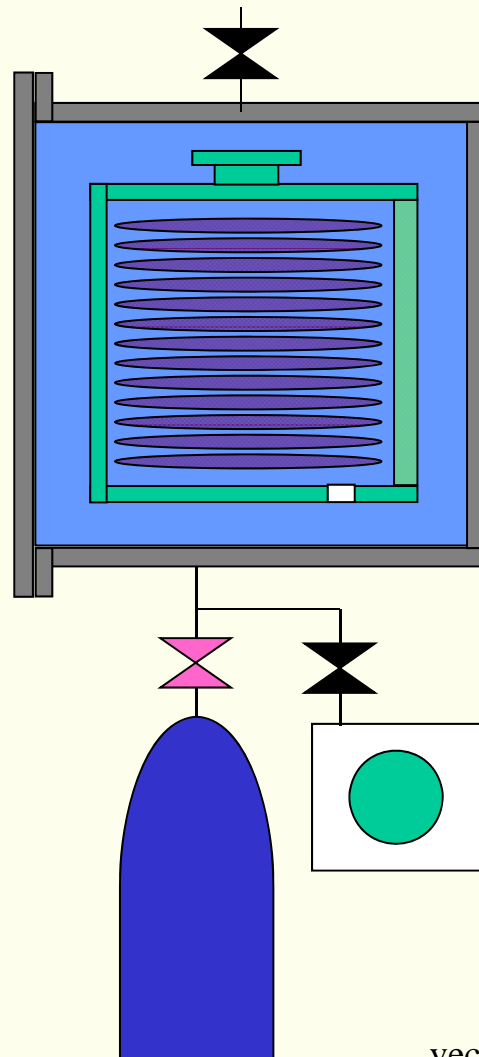
VGX-system (5)








-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

Close the vacuum
evacuation valve, and open
the gas inlet valve.

VGX-system (6)

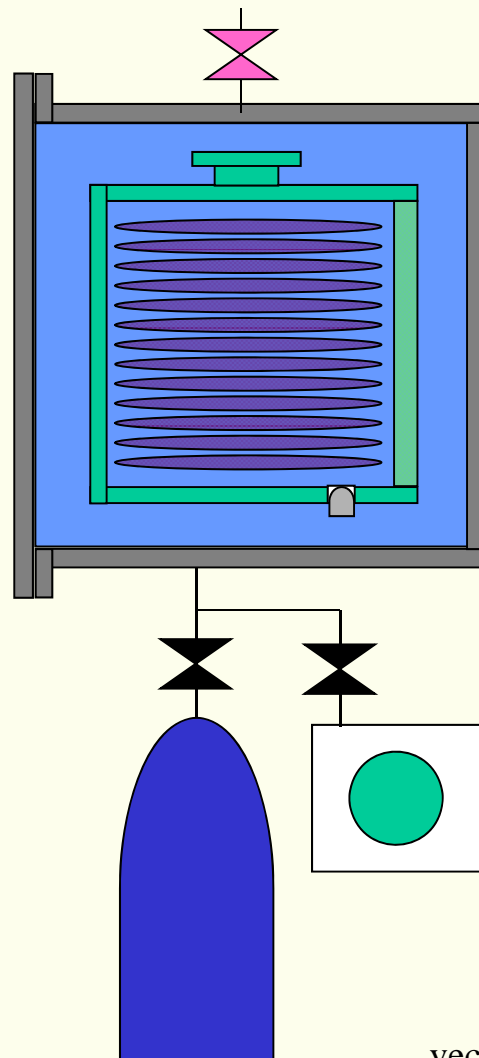







-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

Inject N2 gas into the vacuum chamber and FOUP.

Gas consumption amount \dot{V}
Capacity of vacuum chamber

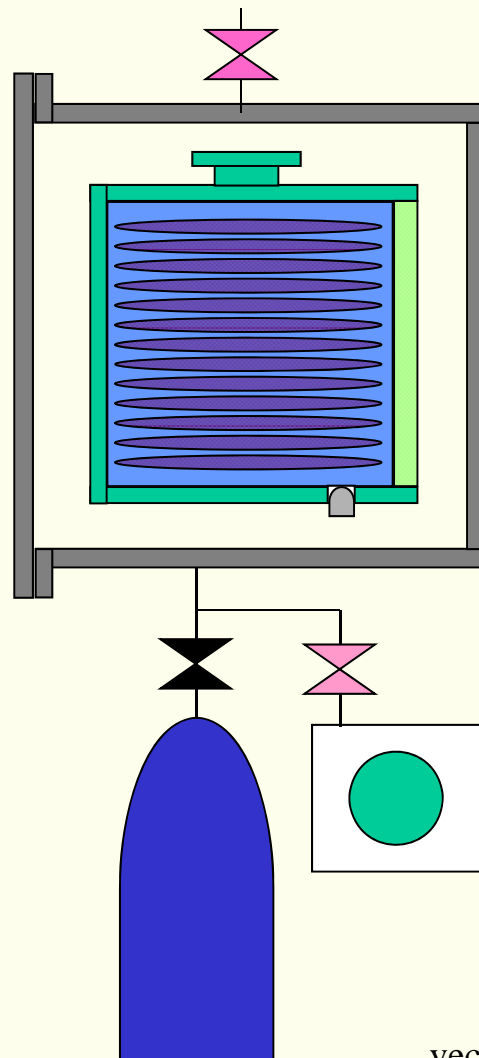
VGX-system (7)








-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

When the pressure is around ATM, close the gas inlet valve. Then, close the purge port.

VGX-system (8)

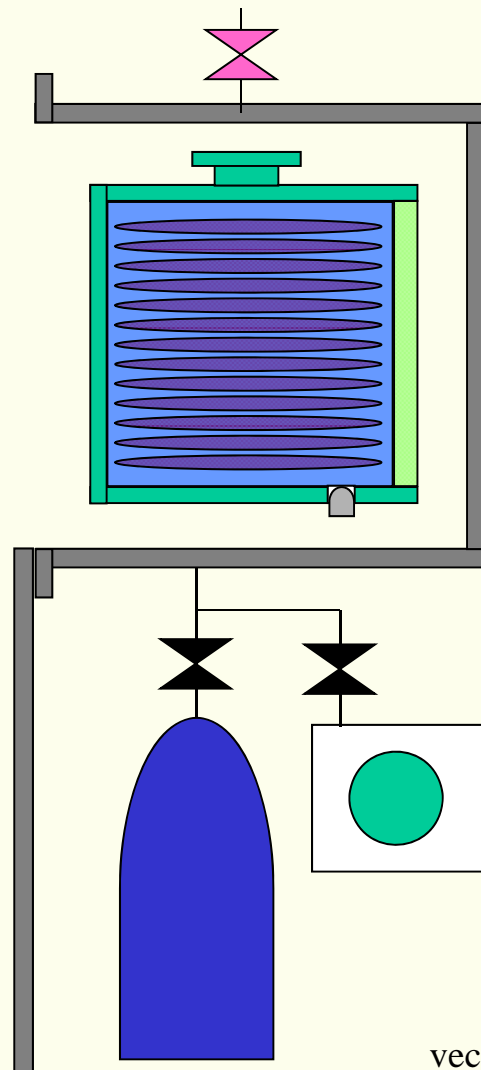







-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

Open the vacuum evacuation valve and air release valve for a few second, and eject N2 inside of the vacuum chamber.

Evacuation for the safety measure

VGX-system (9)



-  Air
-  Vacuum
-  N2
-  Valve Close
-  Valve Open

Gas exchange in FOUP is completed.

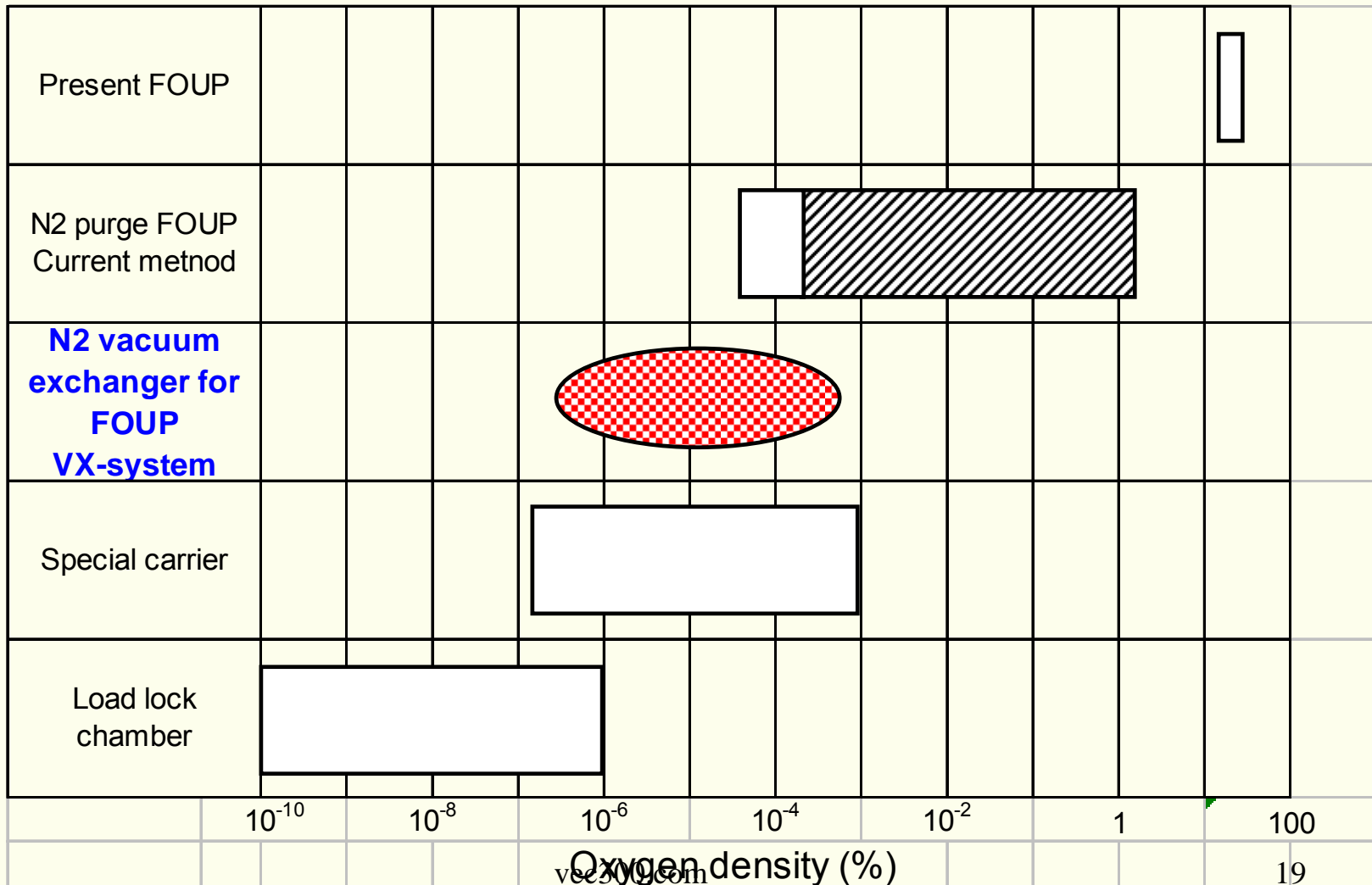
Features of VGX-system (1/2)

- Lower O₂ density level in FOUP can be expected. When the FOUP is vacuum evacuated to 0.01Torr, O₂ density level becomes around $1/10^5$.
O₂ density in air, 20%, can be lowered to $2 \cdot 10^{-4}\%$.
- By conducting vacuum evacuation, de-gas effects for FOUP internal surface and wafer surface exist.
In ordinary gas purging method, water absorbed in FOUP and wafers cannot be removed!
- O₂ density control after gas exchange is available.
It becomes available by attaching the sensor head of the oxygen meter to the vacuum chamber. (Vacuum chamber and FOUP oxygen level are about the same because they are connected.)

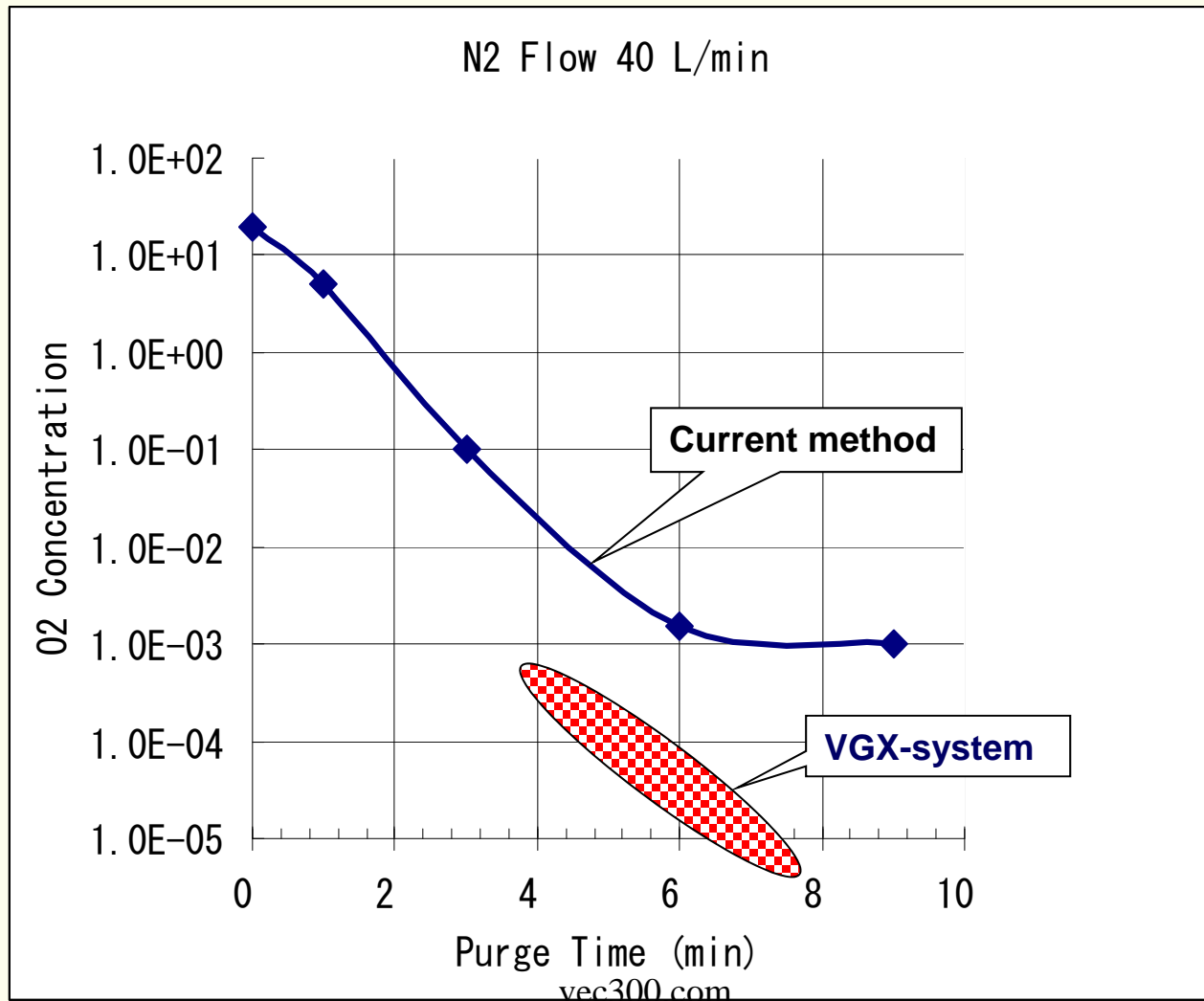
Features of VGX-system (2/2)

- Inert gas consumption is low.
Almost same amount to the capacity of the vacuum chamber (Approx. 80L)
- Time-shortening is available.
It becomes available by using the high-rate evacuation assembly.
Ex.: Evacuation rate of the pump $\dot{V} = 500$ L/min
When capacity of the vacuum chamber is 80L:
Approx. 2 min. from ATM to 0.01Torr
- Corresponding to automatization.

Target O2 Density in FOUP



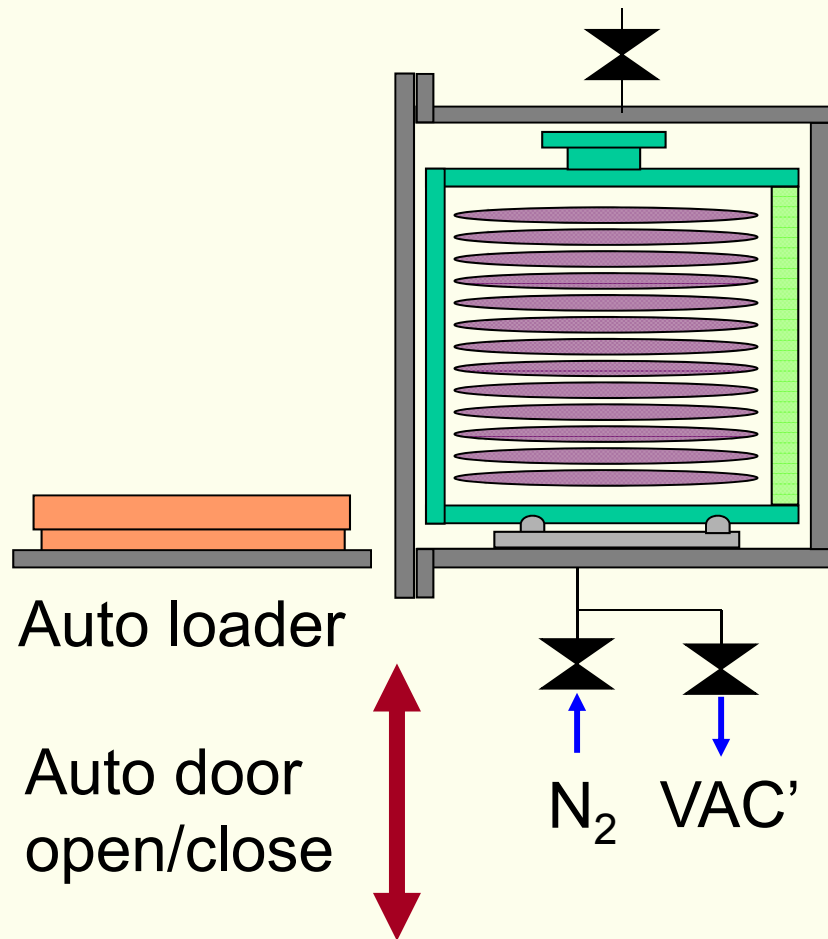
Oxygen density in FOUP



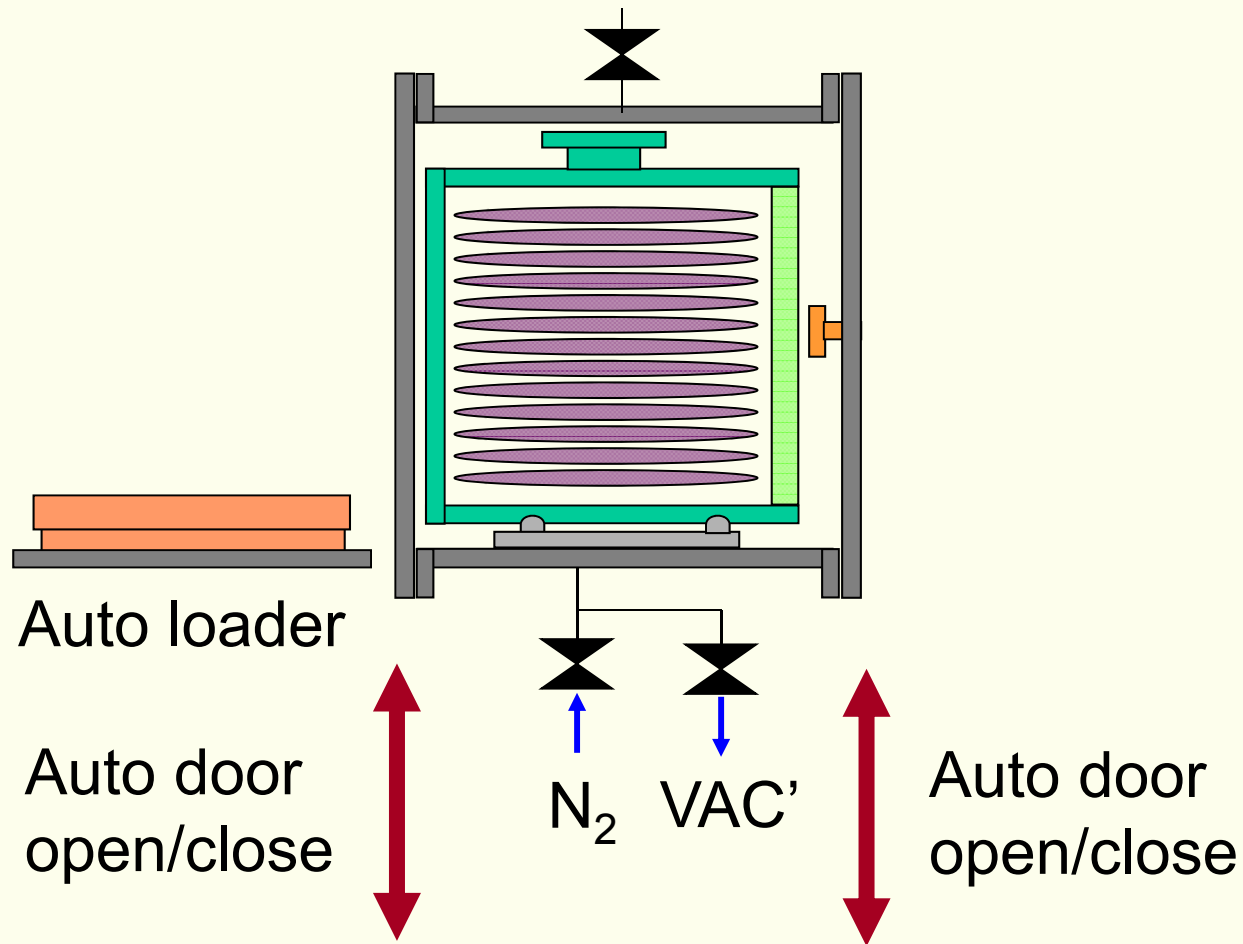
List of comparison in N2 purging

	Current method *)	VGX-system
Oxygen density (%)	0.001	0.0002
Amount of applying gas (L)	360	80
Throughput (min)	9	5
FOUP, Wafer De-gas effect	Not much	Great effect
Density control	Not much	Controllable

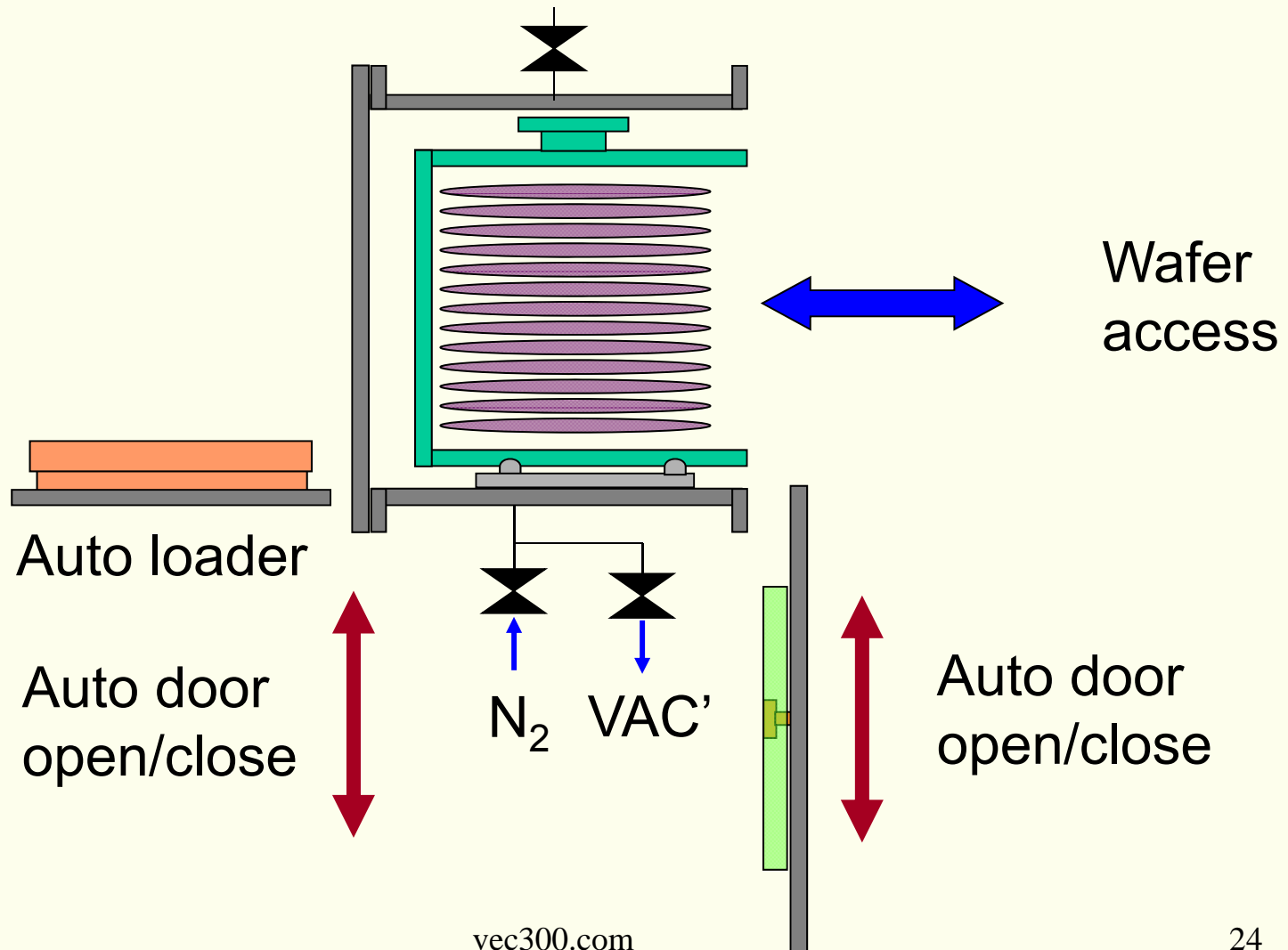
Application 1 Automatic batch type **VGX**



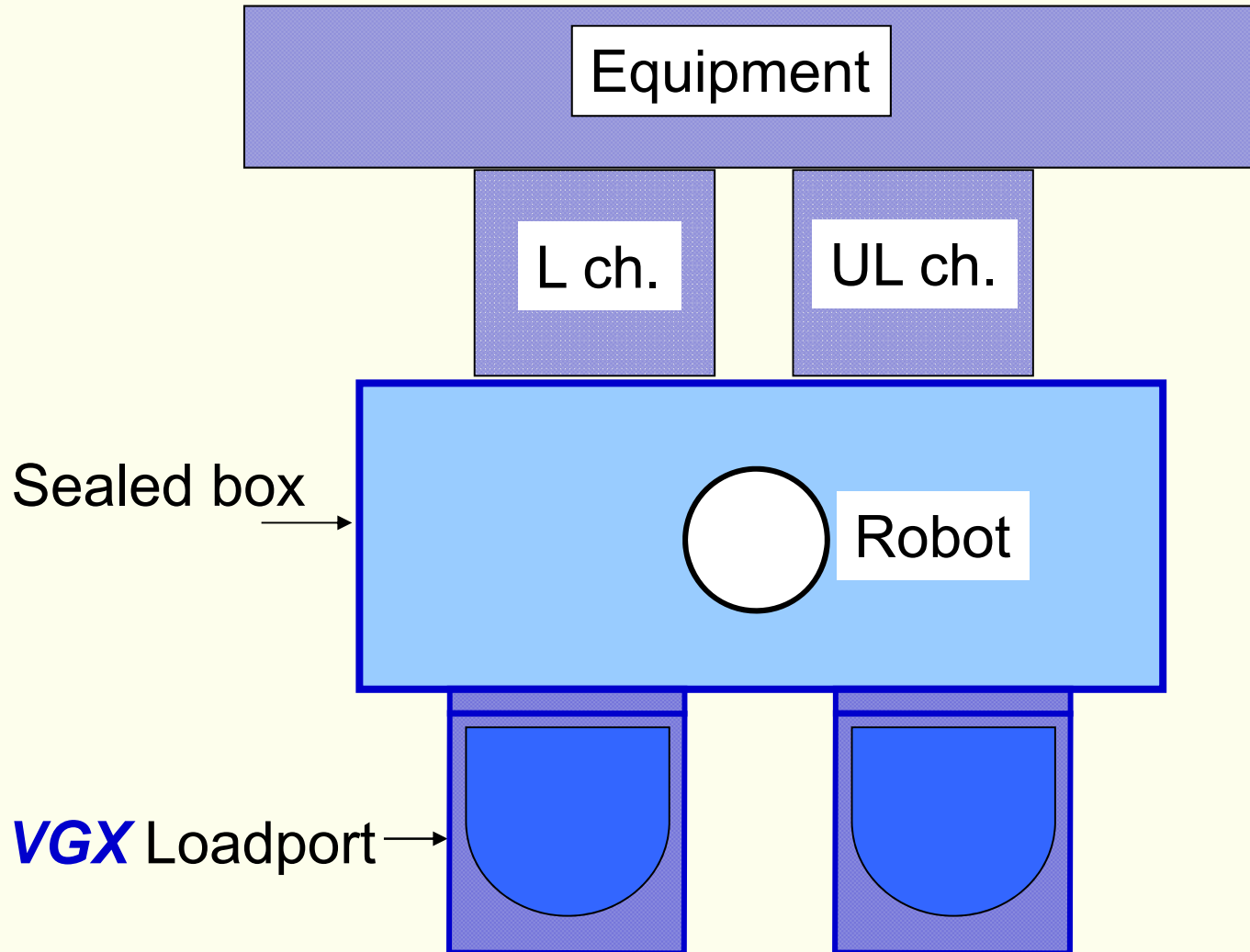
Application2 Loadport type **VGX** (1)



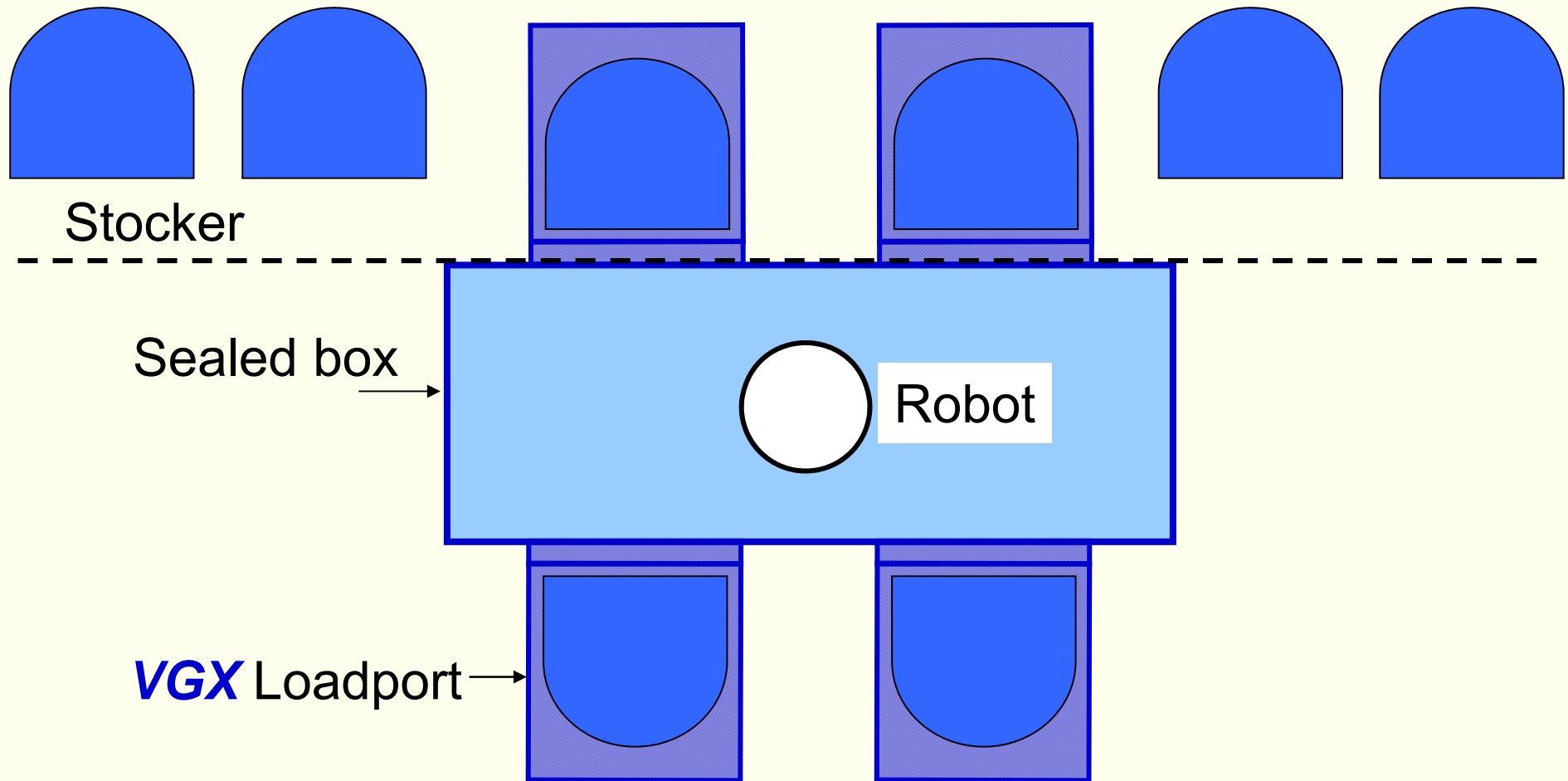
Application2 Loadport type **VGX** (2)



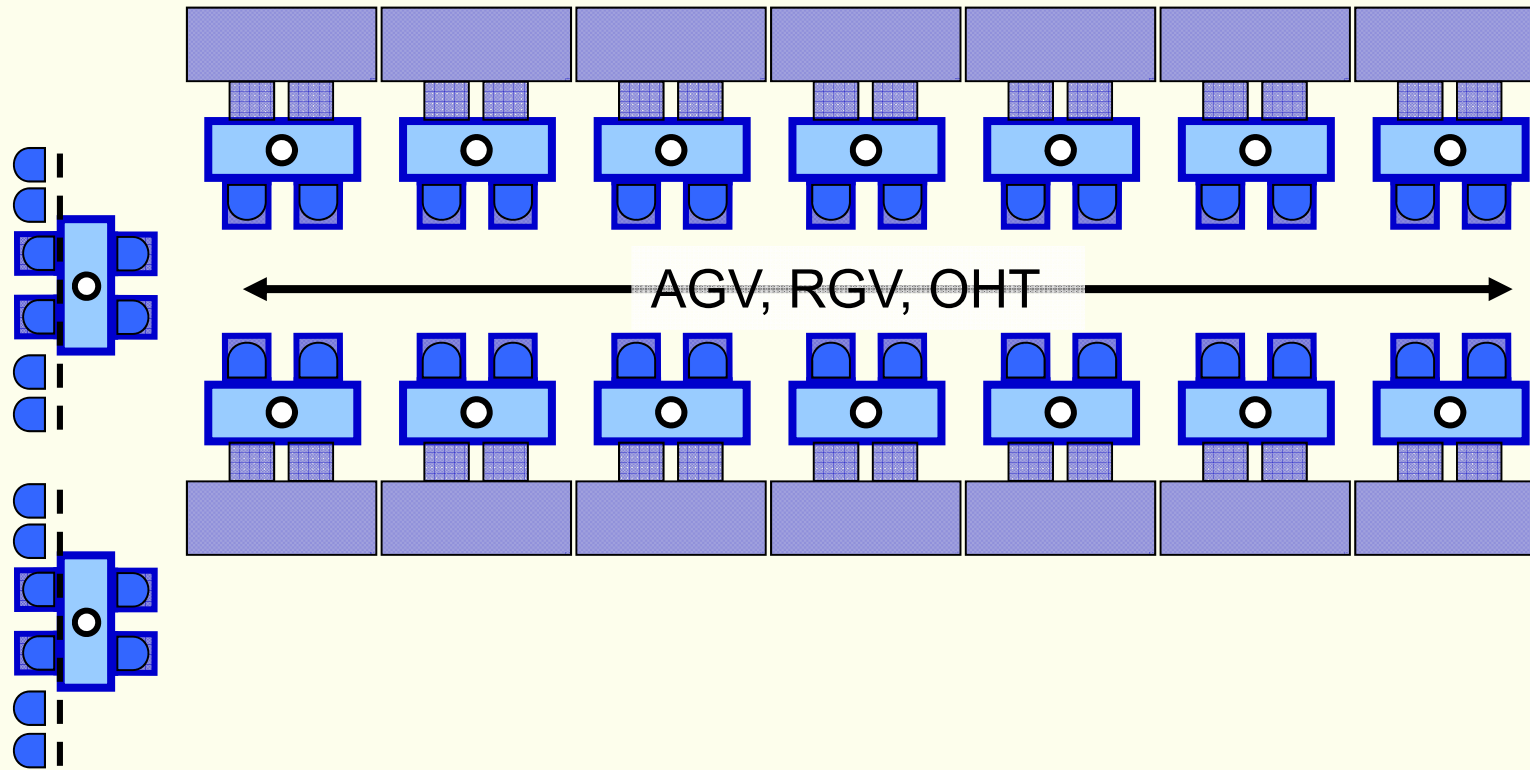
Application3 **VGX** EFEM



Application4 **VGX** Sorter



目標 *Goooooal*
無酸素ファブ Oxygen free FAB



감사합니다 !

Thank you very much !

謝謝光臨 !