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The J. Paul Getty Museum
The Getty Conservation Institute

Nitrogen Treatment

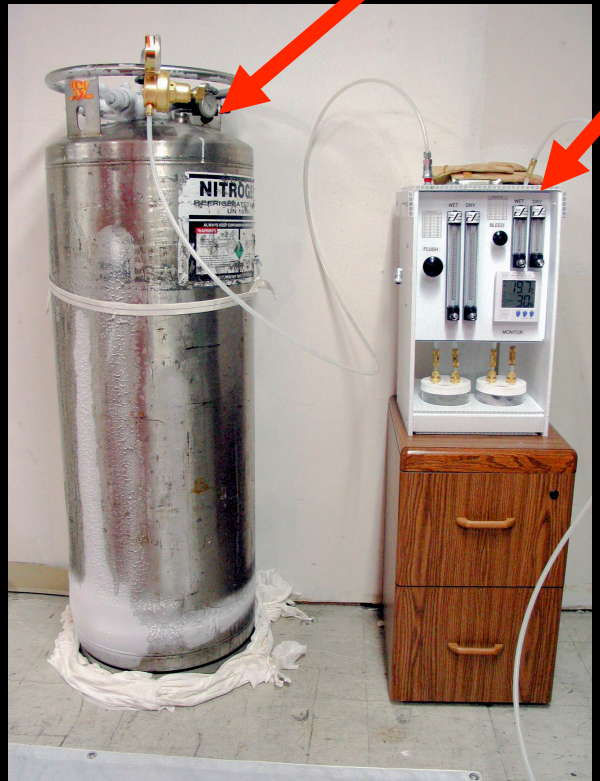
Nitrogen Set Up – Large Scale

Liquid Nitrogen Dewar:
~ 110,000 liters of gas

Home made "bubbler" for humidification with high flow and low flow meter sets

Teledyne Portable Oxygen Sensor

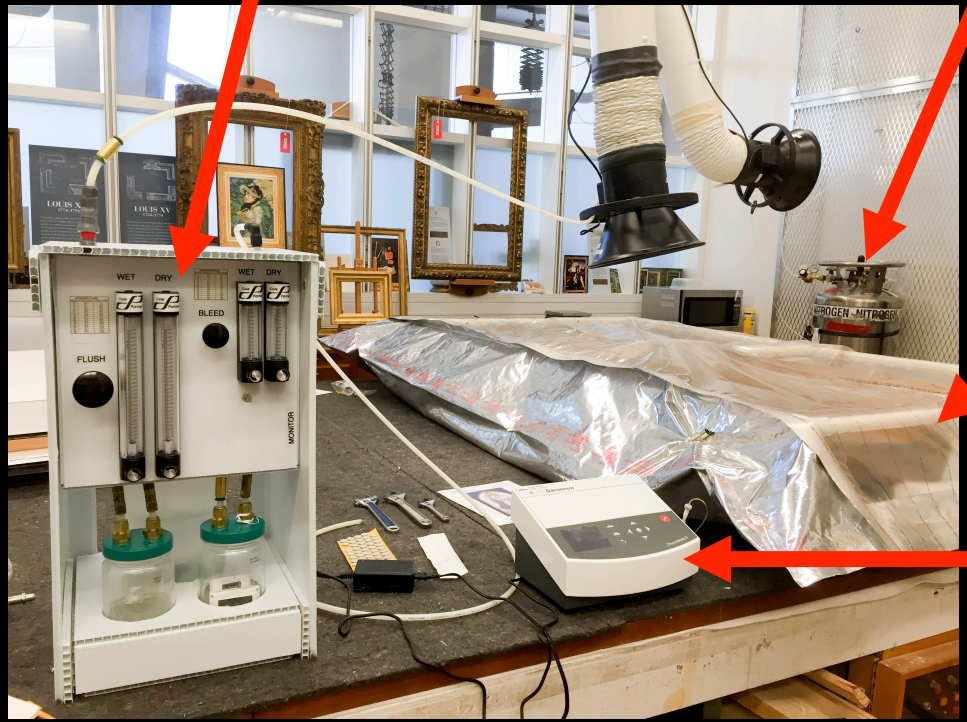
Rentokil 6 m^3 PVC reusable bubble



Nitrogen Set Up – Medium Scale

Home made “bubbler” for humidification with high flow and low flow meter sets

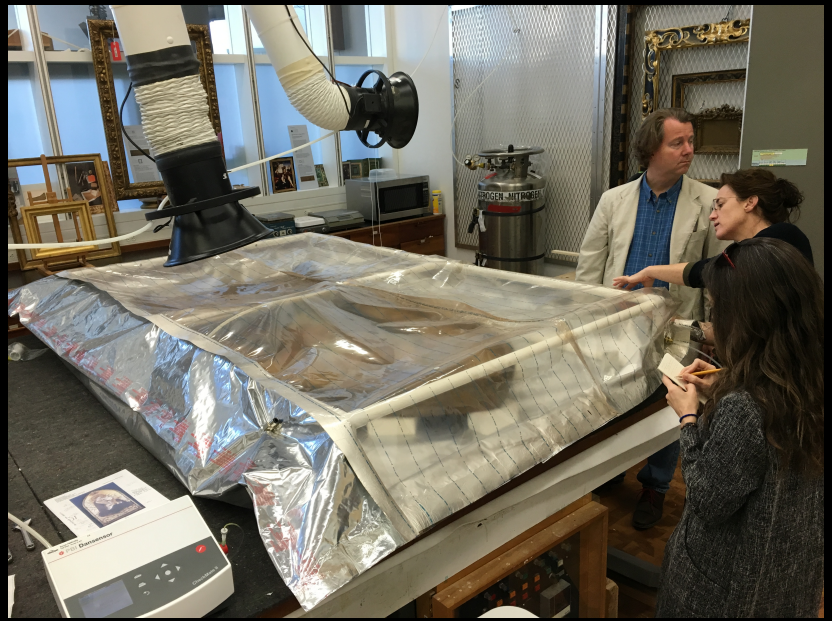
Liquid Nitrogen Dewar: ~ 110,000 liters of gas



Heat sealed Aclar and Marvelseal bubble

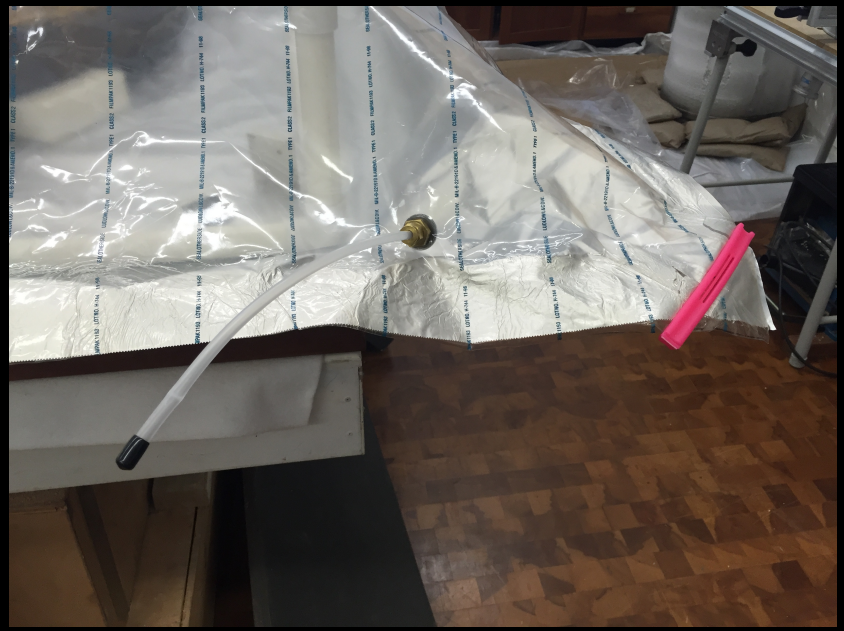
PBI Dansensor Checkmate 2 Oxygen sensor (syringe sampling)

PVC tubing frame



Controllable Vent

Continuous 2 lpm flow during treatment

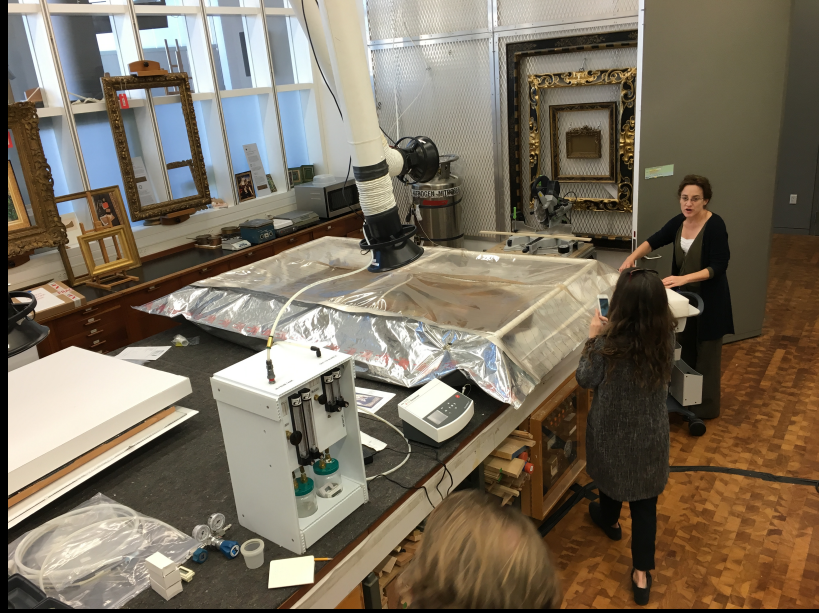


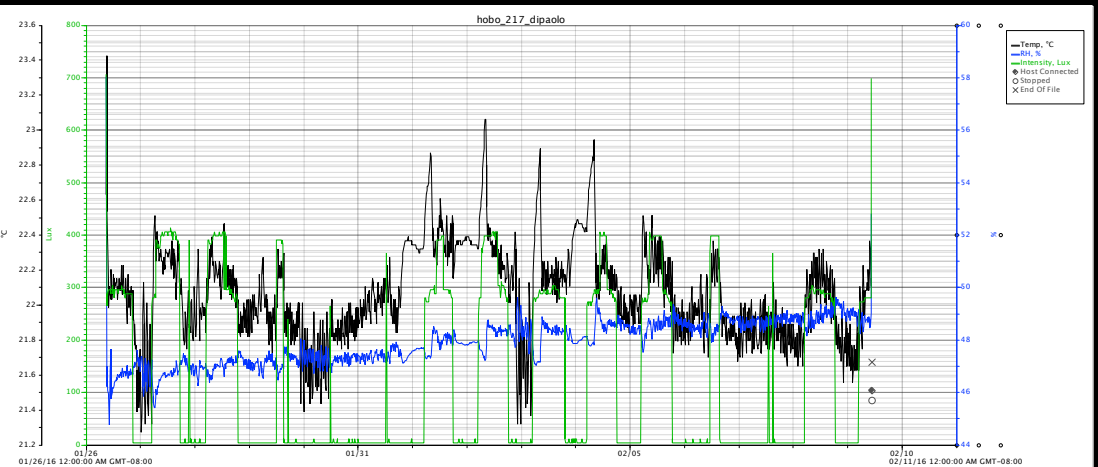
Liquid Nitrogen Dewar

- High flow possible 125 lpm – fast flush
- High capacity - (have never used more than one tank)
- Icing does occur during initial flush!

HOBO monitoring

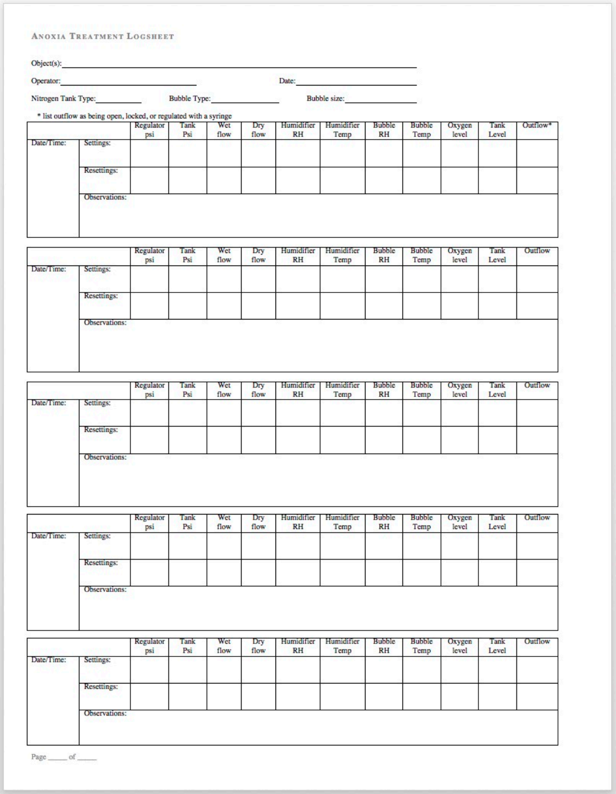
- 46- 49% RH
- 21.4°- 23.4°C.





Monitoring Routine

Handy checklist for monitoring.



ANOXIA TREATMENT LOGSHEET

Object(s):______________________________

Operator:________________ Date:________________

Nitrogen Tank Type:________ Bubble Type:________ Bubble size:________

* list outflow as being open, locked, or regulated with a syringe

		Regulator psi	Tank Psi	Wet flow	Dry flow	Humidifier RH	Humidifier Temp	Bubble RH	Bubble Temp	Oxygen level	Tank Level	Outflow*
Date/Time:	Settings:											
	Resettings:											
	Observations:											

		Regulator psi	Tank Psi	Wet flow	Dry flow	Humidifier RH	Humidifier Temp	Bubble RH	Bubble Temp	Oxygen level	Tank Level	Outflow
Date/Time:	Settings:											
	Resettings:											
	Observations:											

		Regulator psi	Tank Psi	Wet flow	Dry flow	Humidifier RH	Humidifier Temp	Bubble RH	Bubble Temp	Oxygen level	Tank Level	Outflow
Date/Time:	Settings:											
	Resettings:											
	Observations:											

		Regulator psi	Tank Psi	Wet flow	Dry flow	Humidifier RH	Humidifier Temp	Bubble RH	Bubble Temp	Oxygen level	Tank Level	Outflow
Date/Time:	Settings:											
	Resettings:											
	Observations:											

		Regulator psi	Tank Psi	Wet flow	Dry flow	Humidifier RH	Humidifier Temp	Bubble RH	Bubble Temp	Oxygen level	Tank Level	Outflow
Date/Time:	Settings:											
	Resettings:											
	Observations:											

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Dansensor Headspace Analyzer

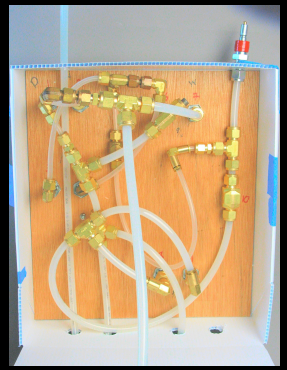
Fast, accurate, precise.

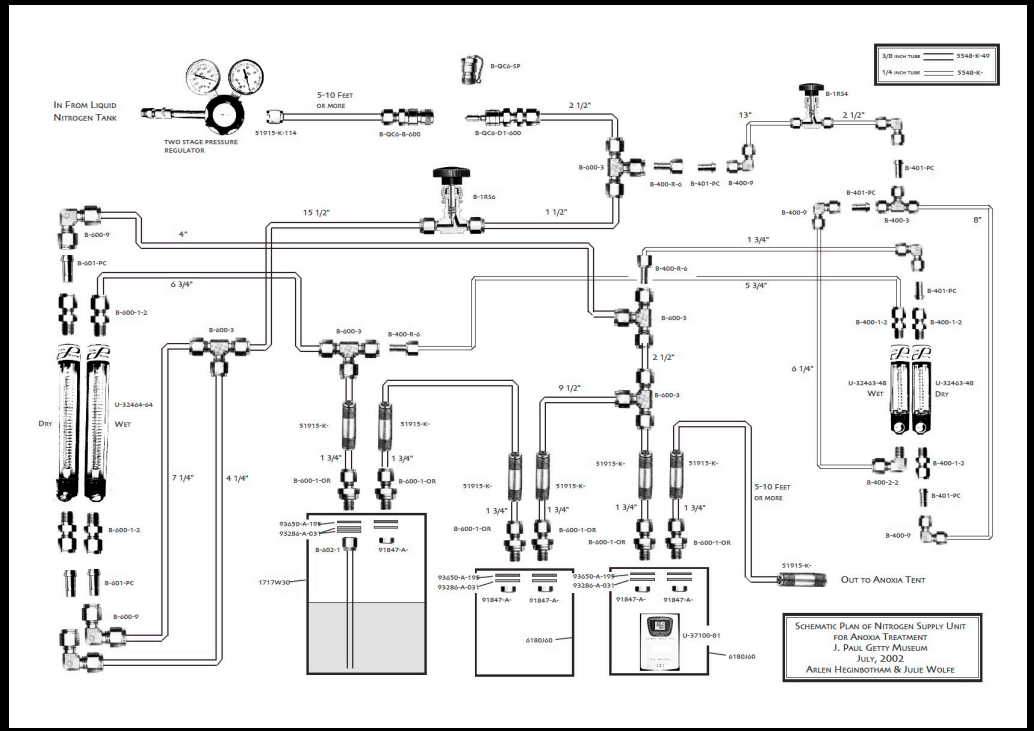
But… $7,500.00

No consumables

Build Time

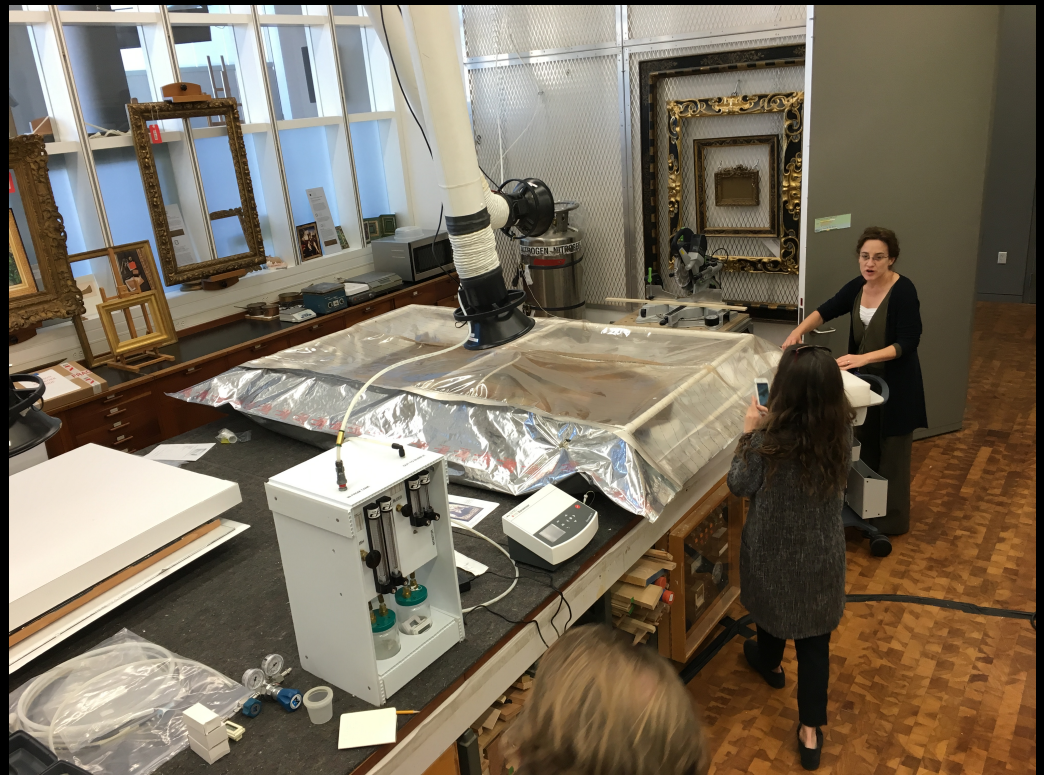
About a week to build our bubbler and order equipment.





Set Up Time

Normally 1-2 days to set up because we don’t do it often!



Flush Time

2-5 hours to 0.05% with periodic vacuum assist

Up to 125 liters per minute

Nitrogen Flush Worksheet Date:_____

Approx Bubble Size									
Height (cm)	x	Width (cm)	x	Length (cm)	=				Volume in Liters
50	x	150	x	250	=	1875000	divided by 1000	=	1875

Flush Flow				
Dry flow (Lpm)	+	Wet flow (Lpm)	=	Total Flow
50	+	50	=	100

Time to Flush Bubble										
Volume in Liters	divided by		Total flow		Time to change air one time	x	6	=	Approx. flush time (min)	Approx. flush time (hours)
1875	divided by		100	=	19	x	6	=	113	1.9

Nitrogen Flush Worksheet Date:_____

Approx Bubble Size									
Height (cm)	x	Width (cm)	x	Length (cm)	=				Volume in Liters
200	x	200	x	200	=	8000000	divided by 1000	=	8000

Flush Flow				
Dry flow (Lpm)	+	Wet flow (Lpm)	=	Total Flow
50	+	50	=	100

Time to Flush Bubble										
Volume in Liters	divided by		Total flow		Time to change air one time	x	6	=	Approx. flush time (min)	Approx. flush time (hours)
8000	divided by		150	=	53	x	6	=	320	5.3

Kill Time

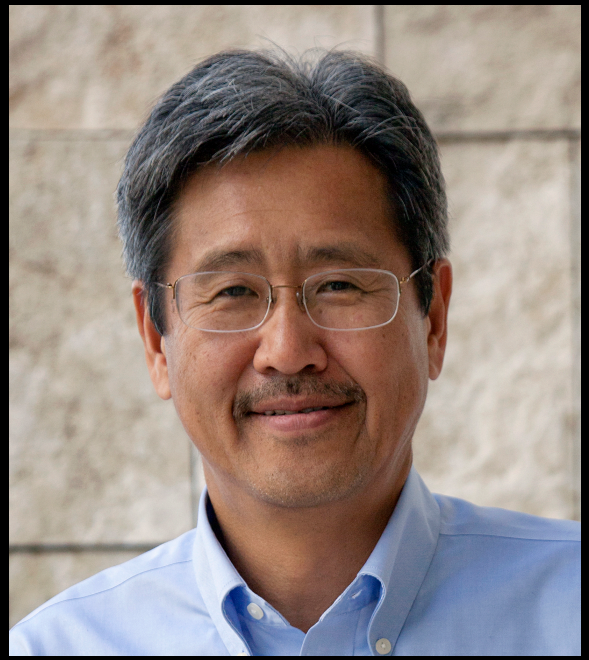
Wood Boring Insects Our Normal Target
2 weeks above 21° C

Euvrilletta sp.

Anobium sp.

Acknowledgements:

Shin Maekawa
Gordon Hanlon
Brian Considine




YSD