

Modular Strategies  
for  
Automated Storage & Retrieval

John Morin, Associate Director,  
High Throughput Screening,  
Wyeth Research, Pearl River, NY

# Outline

- Wyeth Research HTS
- Why automate storage & retrieval?
- Vendors & Systems
- Decisions
- Descriptions

# Wyeth Research HTS, 1999

- Core technology serving 6 therapeutic areas at 5 sites
- Diverse mix of assay methods & libraries
- Primary & confirmation screens in 96 & 384
- Millions of results per year to the corporate database
- HTS prepares plates for internal & external use
- 2 HTS laboratories, 75 miles apart

# Why Automate Storage & Retrieval?

- 50% of screeners time in 1999 spent on sample prep.
- $10^6$  samples in 96-well plates & more on the way
- 15 to 20 copies, each, of thousands of working plates
- Aging fleet of more than 70 obsolete freezers
- Increasing concern about conditions of storage & use
- New CCS PlateTraks enable  $\mu$ l transfers to 384/1536
- New Champion for innovation in senior management

# Request for Proposals, June, 1999

- Automated storage for  $10^6$  samples plates/tubes,  $-20^{\circ}\text{C}$
- Automated retrieval and replication of plates
- Automated sealing/unsealing and bar-coding
- Preferences: disposable pipette tips
  - mechanical plate/tube seals
  - integrated hit-picking from microtubes
  - storage under dry, inert gas
  - modular system to serve remote sites

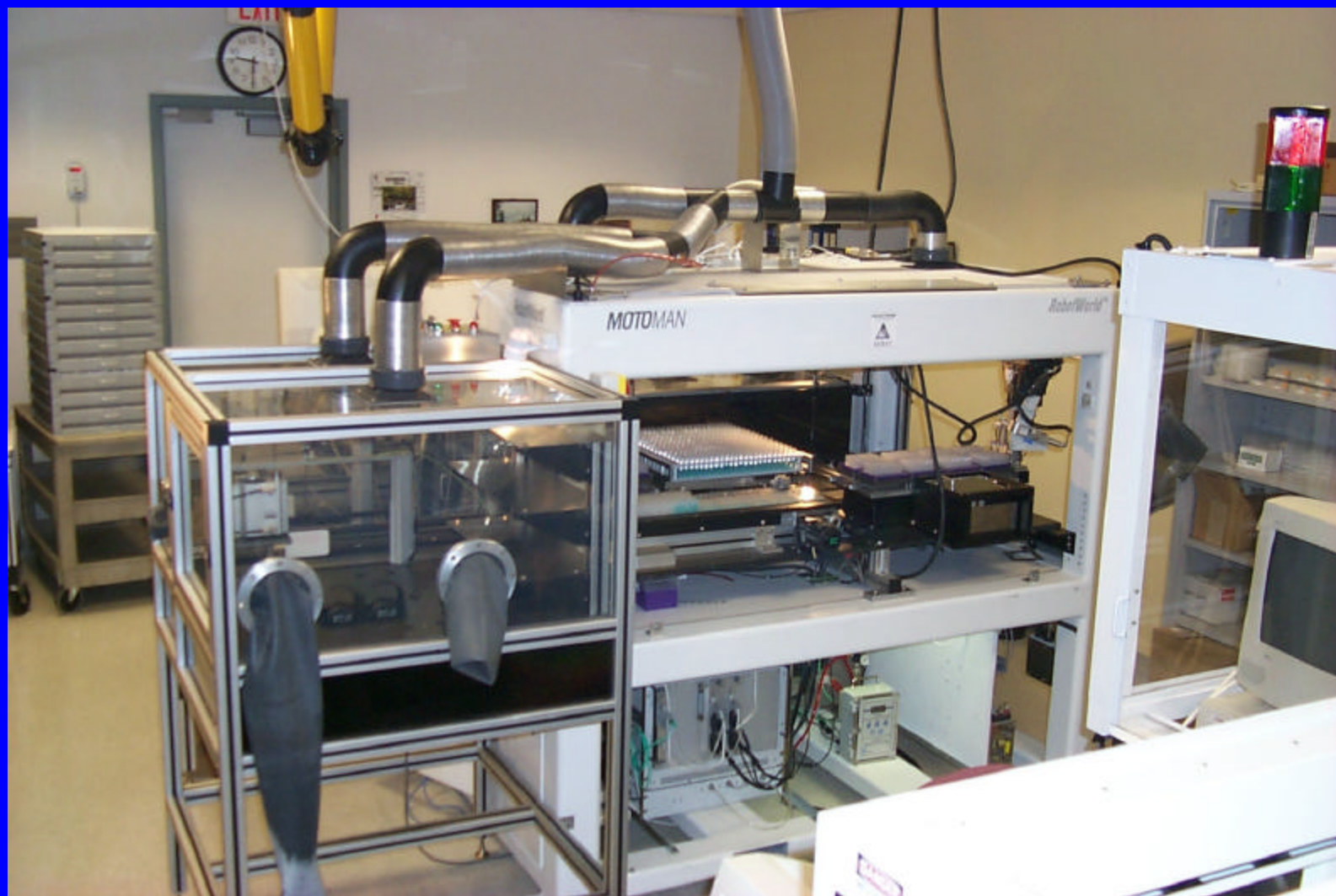
# The Vendors, 1999

- TAP, [www.automationpartnership.com](http://www.automationpartnership.com)
- REMP, [www.remp-ch.com](http://www.remp-ch.com)
- RTS Thurnall, [www.rts-group.com](http://www.rts-group.com)
- Hudson Control, [www.hudsoncontrol.com](http://www.hudsoncontrol.com)
- Scitec/Zymark, [www.zymark.com](http://www.zymark.com)
- TomTec, [www.tomtec.com](http://www.tomtec.com)
- TekCel, [www.tekcel.com](http://www.tekcel.com)

# The Systems, 1999

Vendor	Sites	Design	Inert	Copy Plates	Seals	Delivery
TAP	many	fixed variable	No	very robust	heat caps	9-12 mo
REMP	many	fixed large	Yes	okay	heat caps	15 mo
RTS Thurnall	few	fixed custom	No	robust	heat septum	18 mo
Hudson Control	few	fixed tall	Yes	okay	lids	11 mo
Zymark/Scitec	few	fixed small	No	weak	heat adhesive	9 mo
Tomtec	none	modular Plates/Tape	No	weak	none	?
TekCel	none	modular Plates Only	Yes	weak	SealTite	?

# Committed to Inert Conditions





# Inside the Advent Design Automated System



# In Decision Mode, 1999

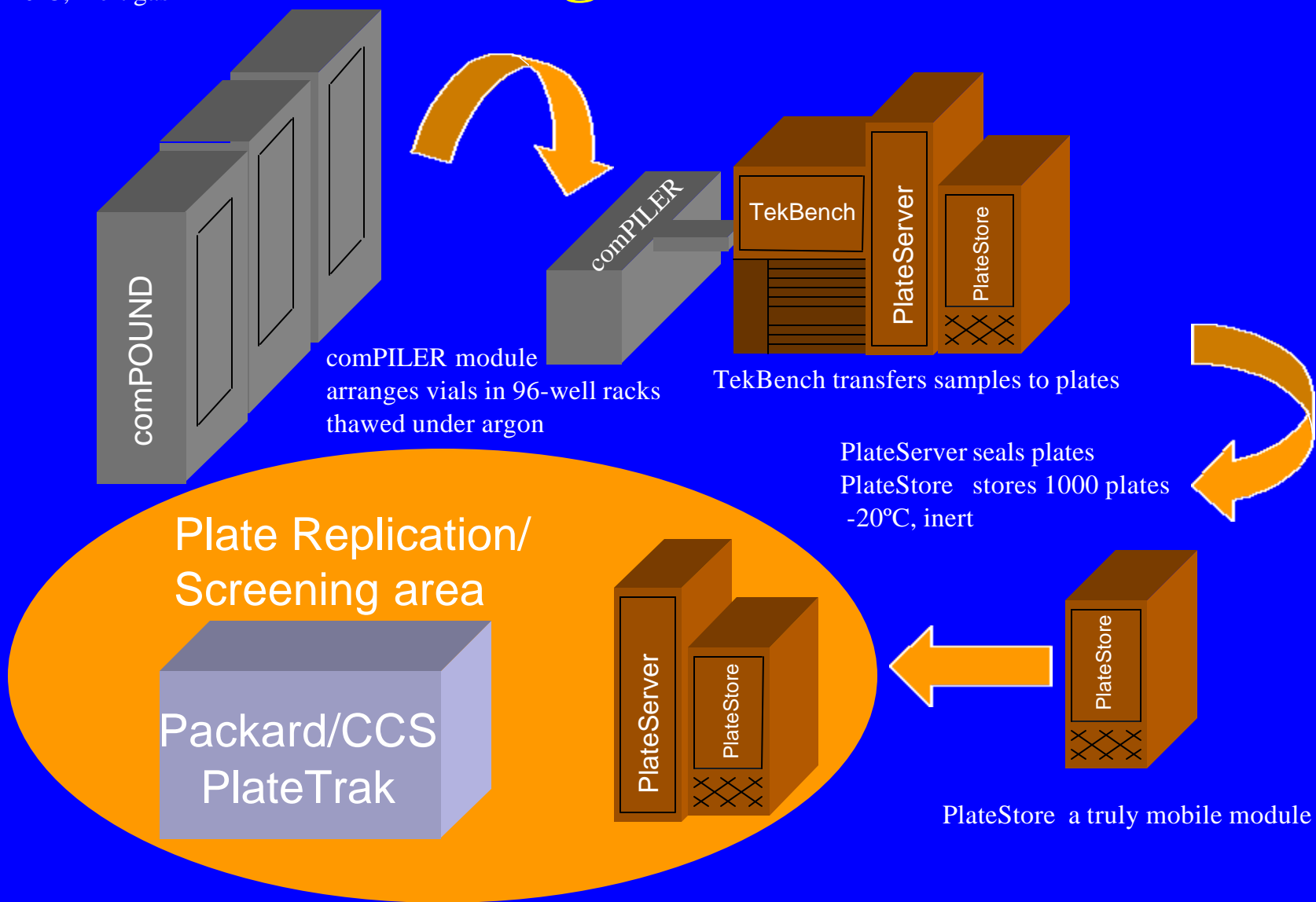
- Inert TAP for main store & fluid handling
- TekCel for remote site plate storage
- Still unhappy with heat sealed plates
- Unenthusiastic about hit-picking options
- Massive system seems inflexible and vulnerable
- Reversal of fortune imposes strict fiscal restraints
- Winter/Spring/Summer of our discontent

# Modularity <sup>2</sup>

- “What we really want is a TekCel for tubes!”
- TTP introduces comPOUND in 2000
- Novel application of robust engineering principles
- Microtubes stored cold & inert with auto-decapping
- TekCel & TTP agree to collaborate on hybrid system
- Senior management accepts challenge to innovate
- It still takes 6 months to approve the purchase

comPOUND modules  
100,000 microtubes each  
20°C, inert gas

# Diagrammatic Overview



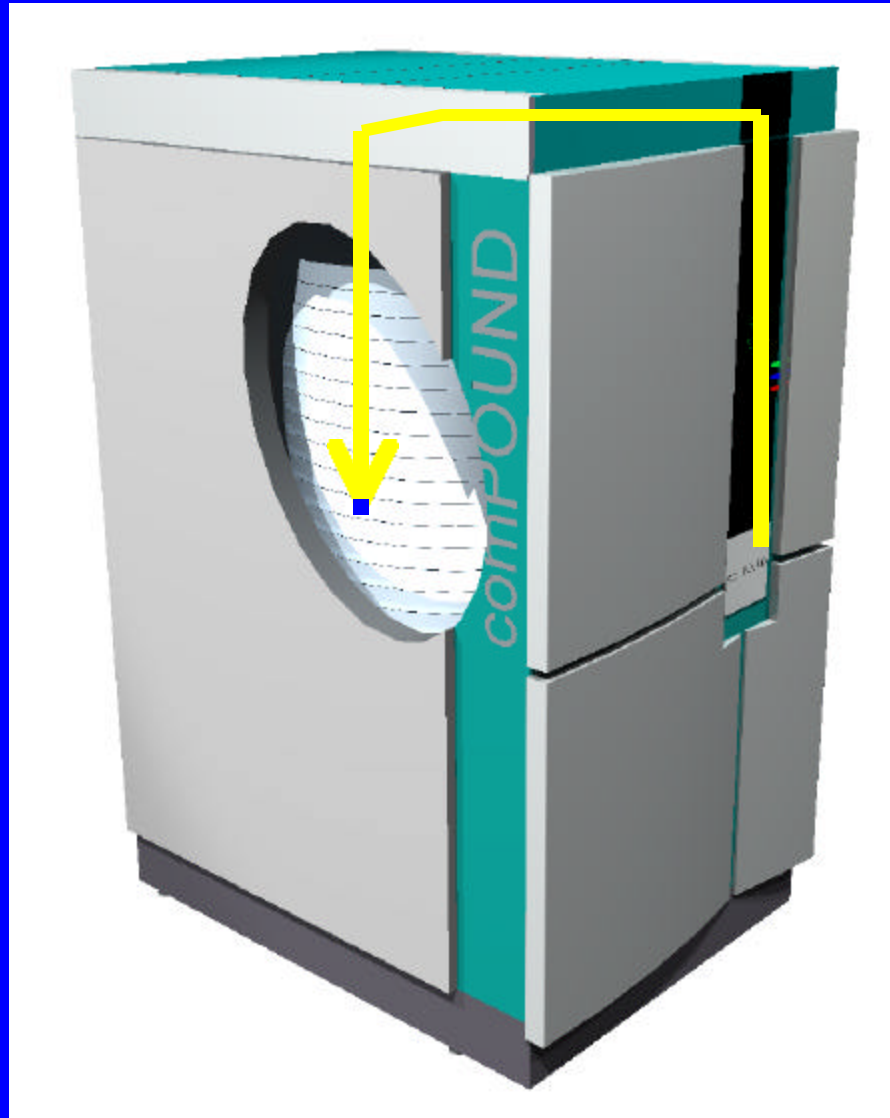
# TTP comPOUND Prototype



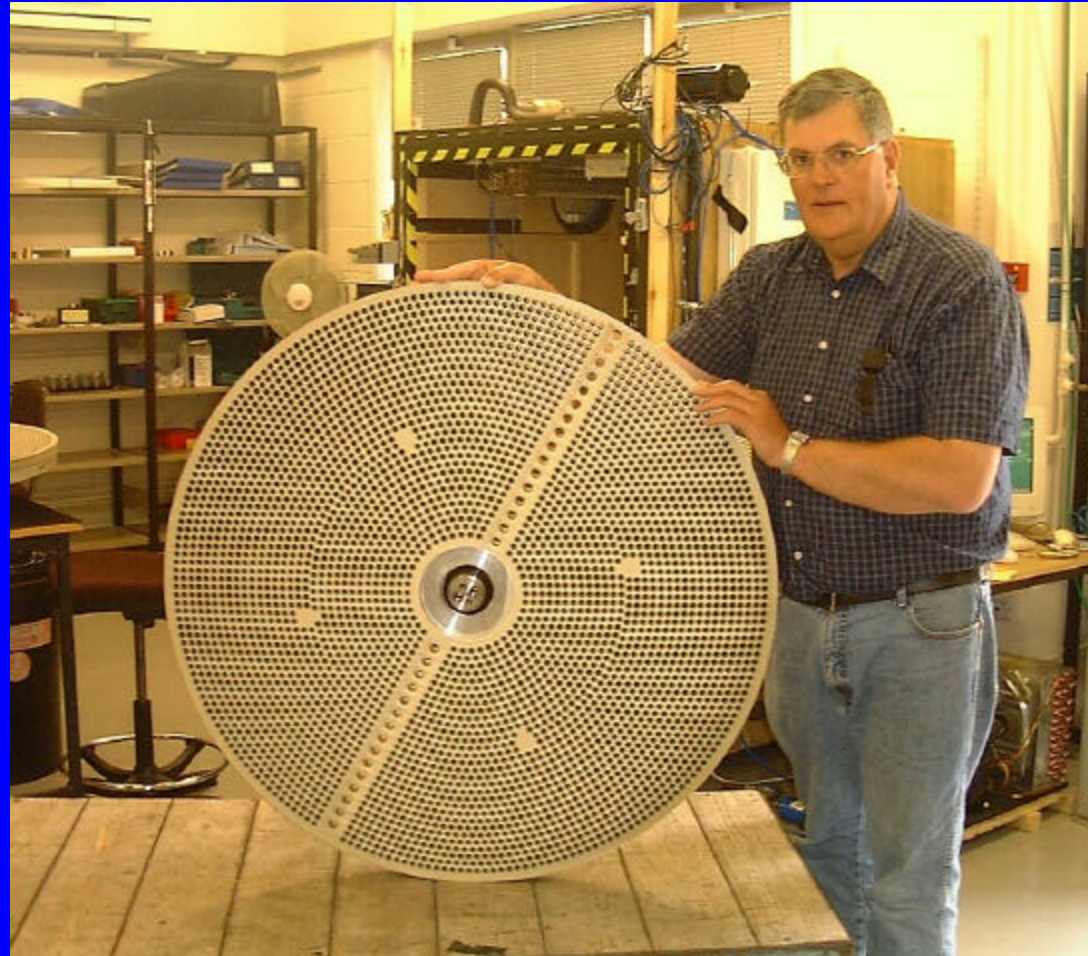
# comPOUND Loading/Unloading



# comPOUND Cutaway

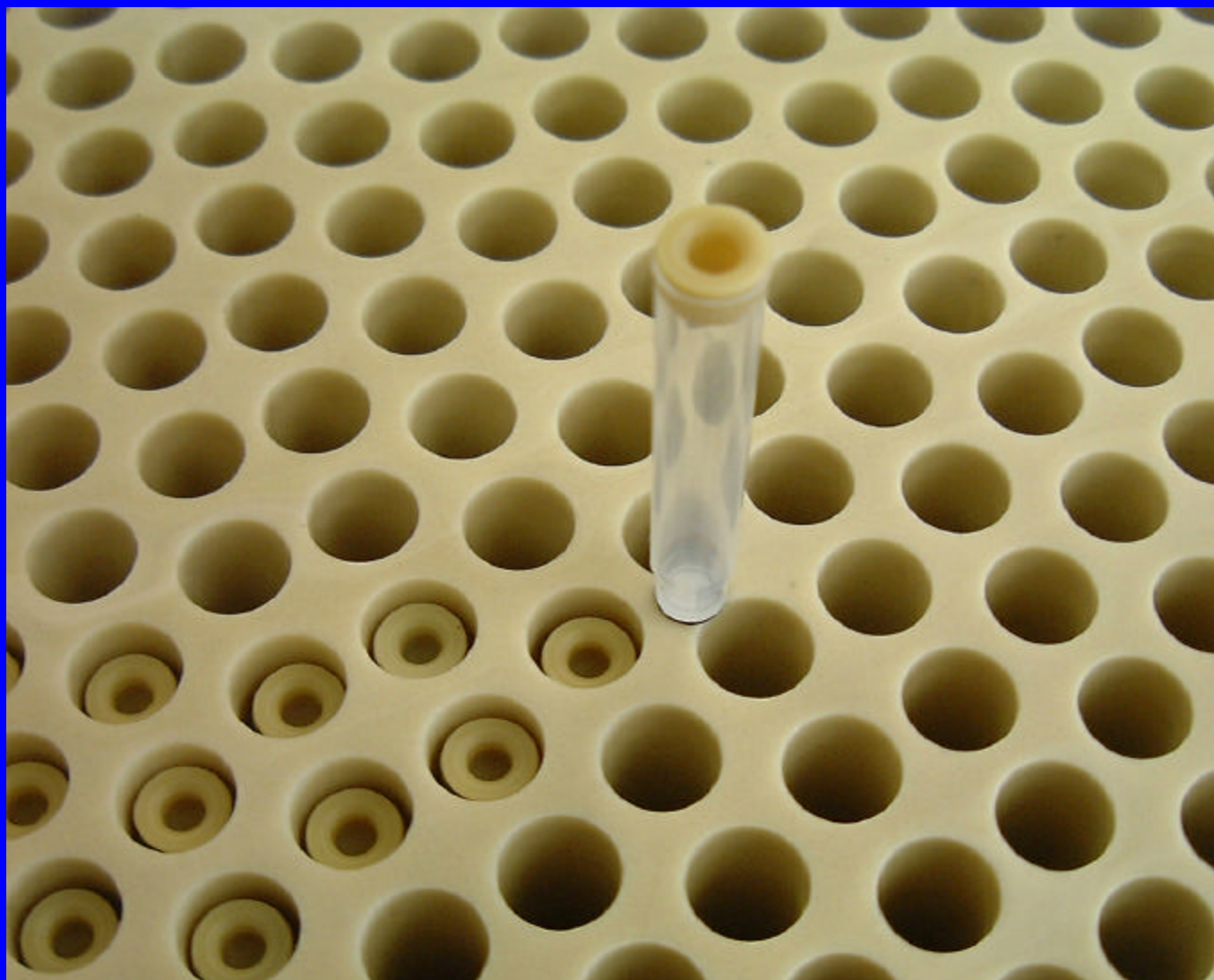


# comPOUND Carousel

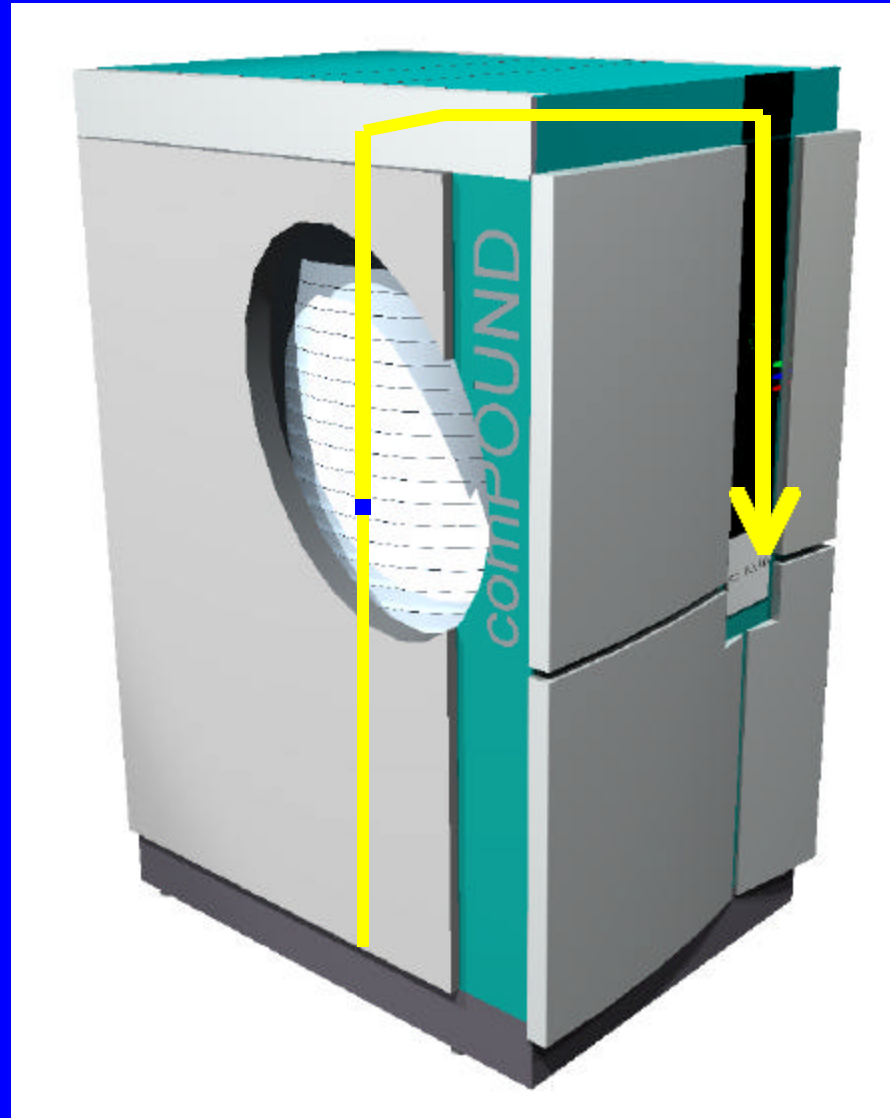




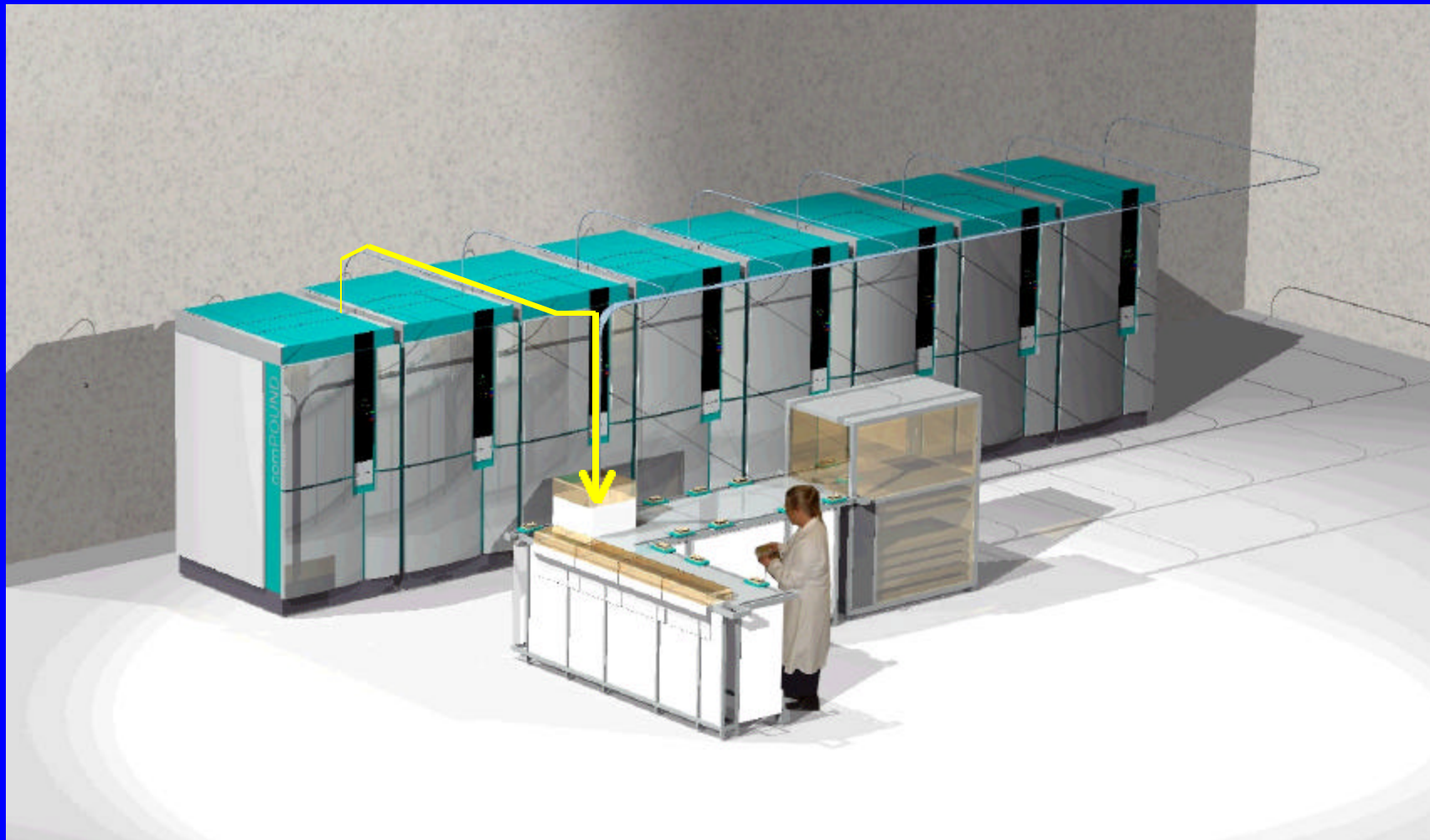
# Microtubes in Carousel



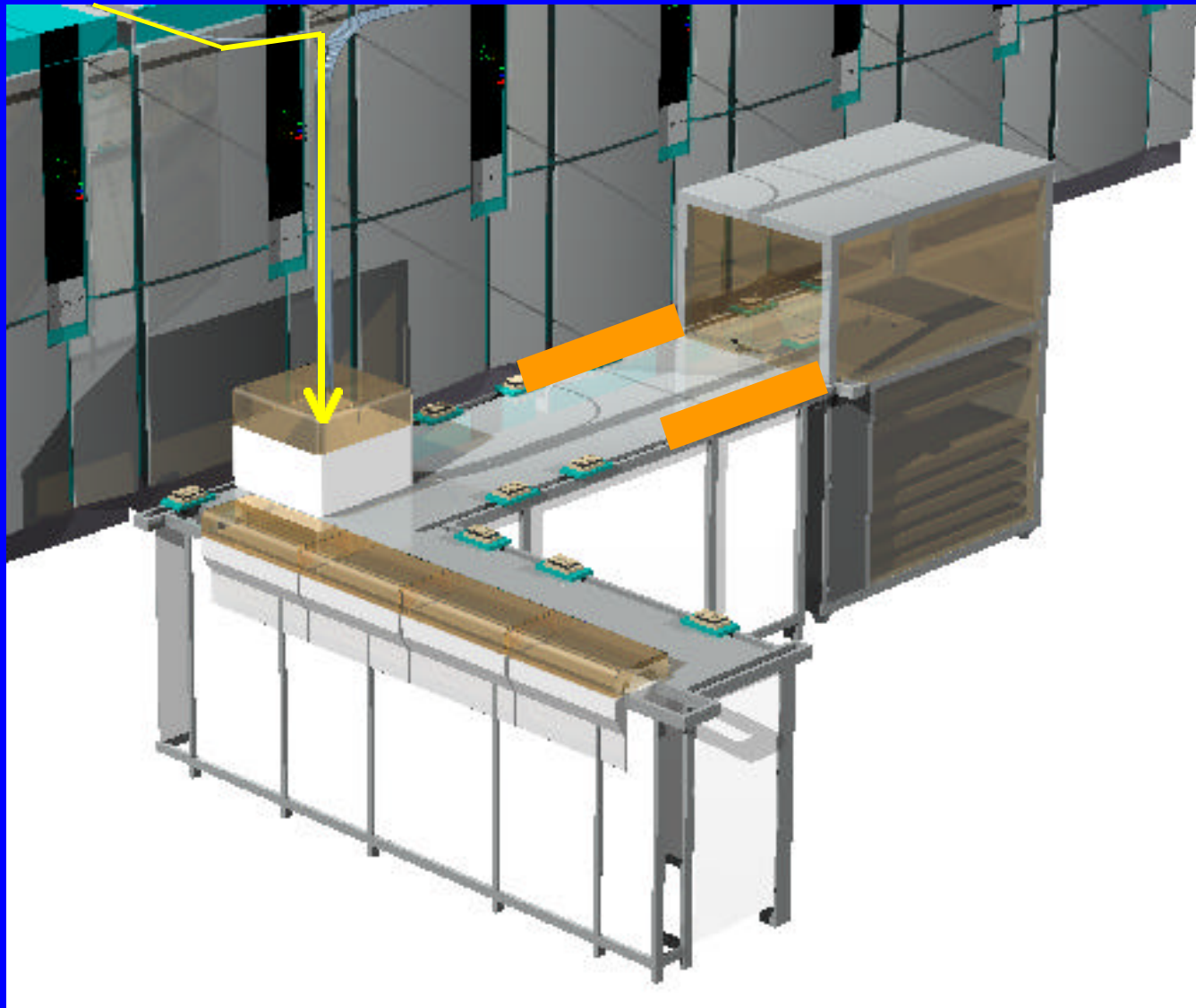
# The Path of Least Resistance



# Virtual Overview



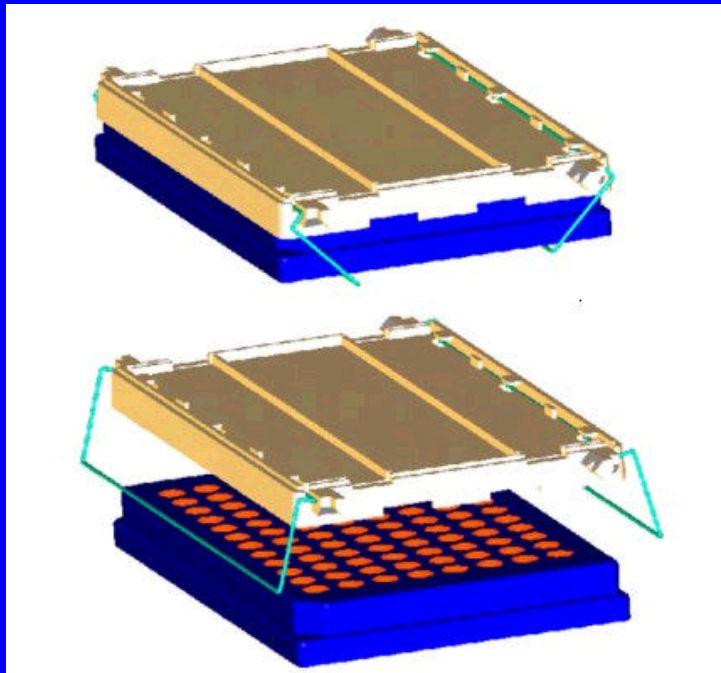
# comPILER & TekBench



# TekCel Modular Solutions



# TekCel SealTite, 1999-2002



# PlateServer with 3 PlateStores



# Access to the Stackers





# Portable Plates



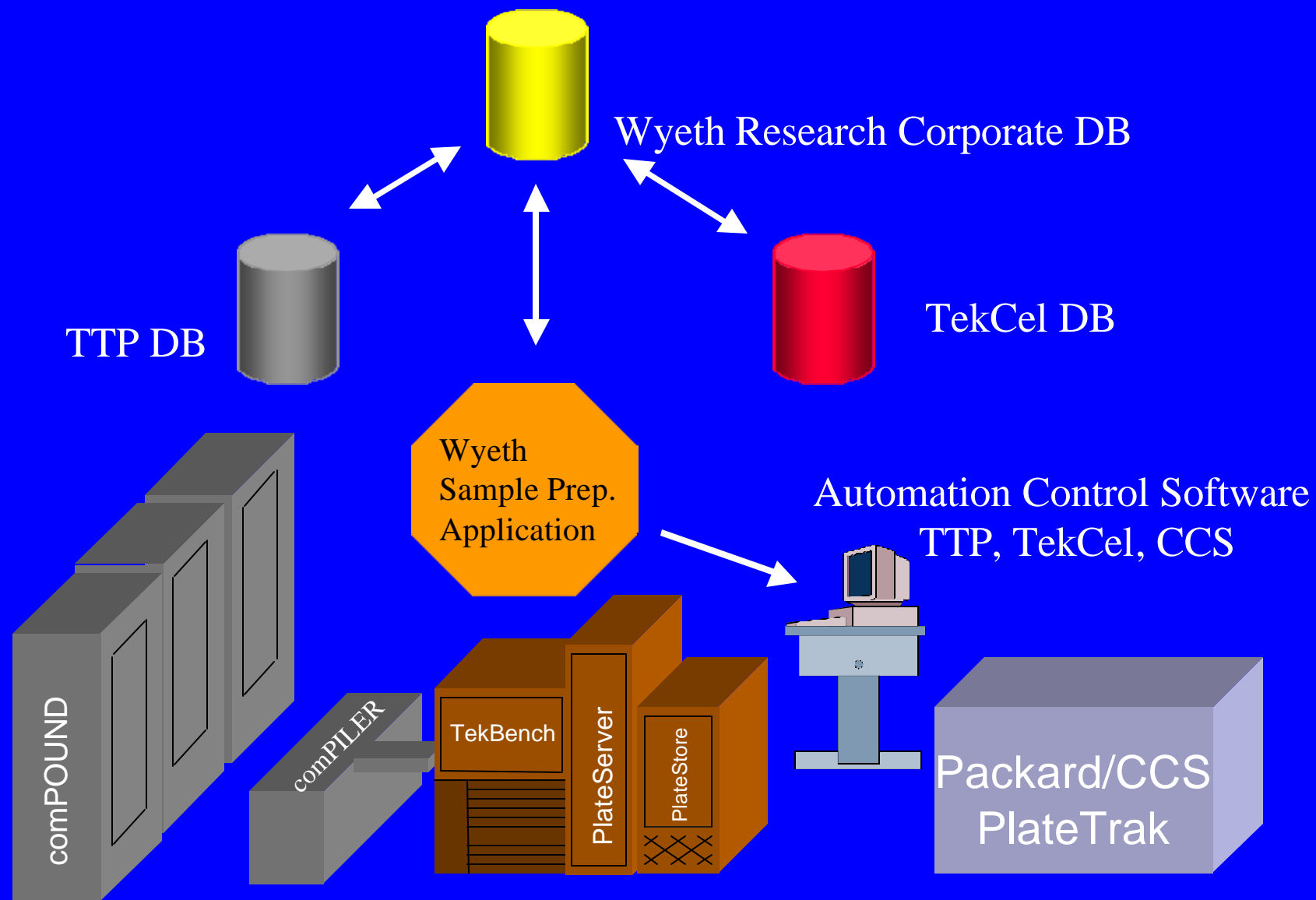
# Satisfaction



# Packard CCS PlateTrak



# Data Flow



# Wyeth Sample Prep Application Screenshot 1

Sample Plate Order Tracking System (SPOTS) - [Orders Optimization]

File Assay Order Tools Reports

Select Orders Sort Ascending Sort Descending Optimize Get PlateList From SPMS Pick list (TokCal)

Concentration	Conc. Unit	Plate ID	Assay 4	Assay 3	Assay 2	Assay 1	Total	SPMS PLATE LABEL
1	MGML	11512	1	1	1		3	11512-701
1	MGML	11513	1	1	1		3	11513-701
1	MGML	11514	1	1	1		3	11514-701
1	MGML	11515	1	1	1		3	11515-701
1	MGML	11516	1	1	1		3	11516-701
1	MGML	11517	1	1	1		3	11517-701
1	MGML	11511	1	1	1		3	11511-701
1	MGML	11519	1	1	1		3	11519-701
1	MGML	11518	1	1	1		3	11518-701
1	MGML	11510	1	1	1		3	11510-701
1	MGML	11500		1	1		2	11500-701
1	MGML	11508		1	1		2	11508-701
1	MGML	11509		1	1		2	11509-701
1	MGML	11502		1	1		2	11502-701
1	MGML	11501		1	1		2	11501-701
1	MGML	11504		1	1		2	11504-701
1	MGML	11503		1	1		2	11503-701
1	MGML	11506		1	1		2	11506-701
1	MGML	11507		1	1		2	11507-701
1	MGML	11505		1	1		2	11505-701
1	MGML	11527	1				1	11527-701
1	MGML	11529	1				1	11529-701
1	MGML	11526	1				1	11526-701
1	MGML	11528	1				1	11528-701
1	MGML	11525	1				1	11525-701
1	MGML	11524	1				1	11524-701
1	MGML	11523	1				1	11523-701
1	MGML	11521	1				1	11521-701
1	MGML	11520	1				1	11520-701
1	MGML	11522	1				1	11522-701
1	MGML	11568				1	1	11568-701
1	MGML	11567				1	1	11567-701
1	MGML	11569				1	1	11569-701
1	MGML	11571				1	1	11571-701
1	MGML	11566				1	1	11566-701
1	MGML	11570				1	1	11570-701
1	MGML	11573				1	1	11573-701
1	MGML	11572				1	1	11572-701
1	MGML	11565				1	1	11565-701
1	MGML	11563				1	1	11563-701
1	MGML	11574				1	1	11574-701
1	MGML	11556				1	1	11556-701

# Wyeth Sample Prep Application Screenshot 2

The screenshot displays a software window titled "PickList (TekCel)". At the top, there are three buttons: "Print Pick list (TekCel)", "Export Pick list To MS Excel", and "Send Picklist to TekCel Server". Below the buttons is a table with three columns: "Common", "Assay 1", and "Assay 2". The table contains 20 rows of sample IDs. The "Assay 1" column is empty for the last 10 rows of the table.

Common	Assay 1	Assay 2
11512-701	11529-701	11567-701
11513-701	11526-701	11569-701
11514-701	11528-701	11571-701
11515-701	11525-701	11566-701
11516-701	11524-701	11570-701
11517-701	11523-701	11573-701
11511-701	11521-701	11572-701
11519-701	11520-701	11565-701
11518-701	11522-701	11563-701
11510-701		11574-701
11500-701		11556-701
11506-701		11557-701
11509-701		11558-701
11502-701		11559-701
11501-701		11560-701
11504-701		11564-701
11503-701		11562-701
11506-701		11561-701
11507-701		11575-701
11505-701		

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- TAP: Tod Blewett, Peter Woods
- Trigyn: Bharat Salokhe