



Danson Technology

Professional SAP supplier

Fluffless Diapers

Will the World Follow China' s Lead?

Dr. Jayden Liu (Danson) & Ian Davenport

Hygienix, Orlando Fl. 6th November 2018

- 1 Fluffless baby diapers in China
- 2 Comparison test of diapers from US and CN
- 3 Fluffless diapers in US
- 4 Conclusion



1 Fluffless baby diapers in China

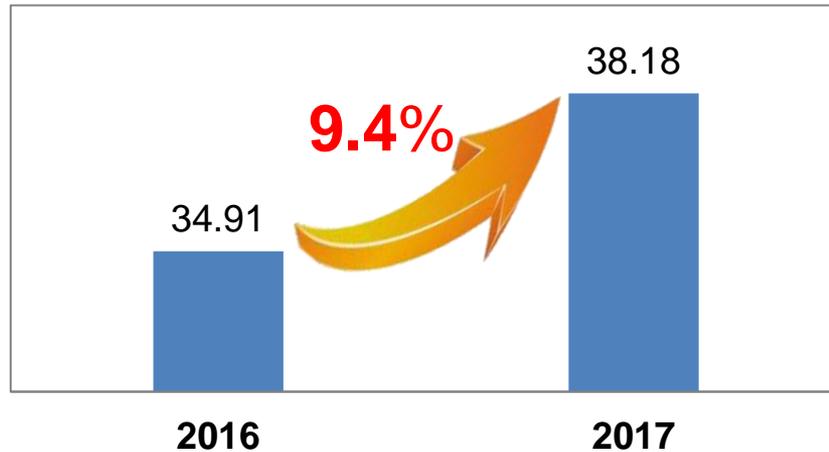
2 Comparison test of diapers from US and CN

3 Fluffless diapers in US

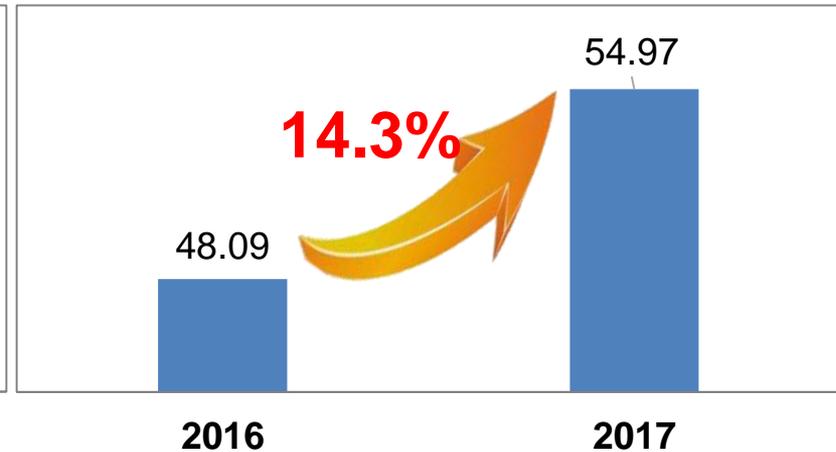
4 Conclusion



Consumption of baby diapers (billion piece)



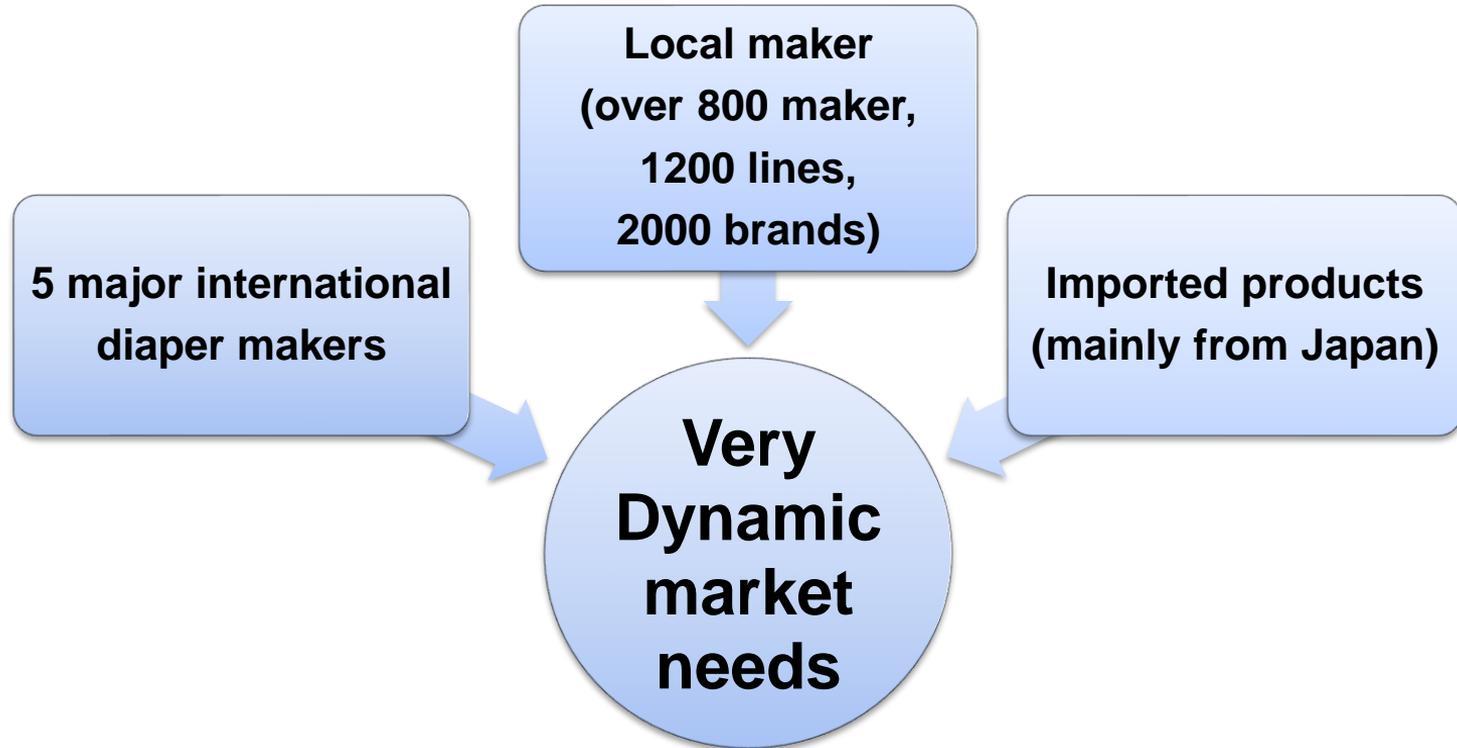
Sales amount of baby diapers (billion RMB)



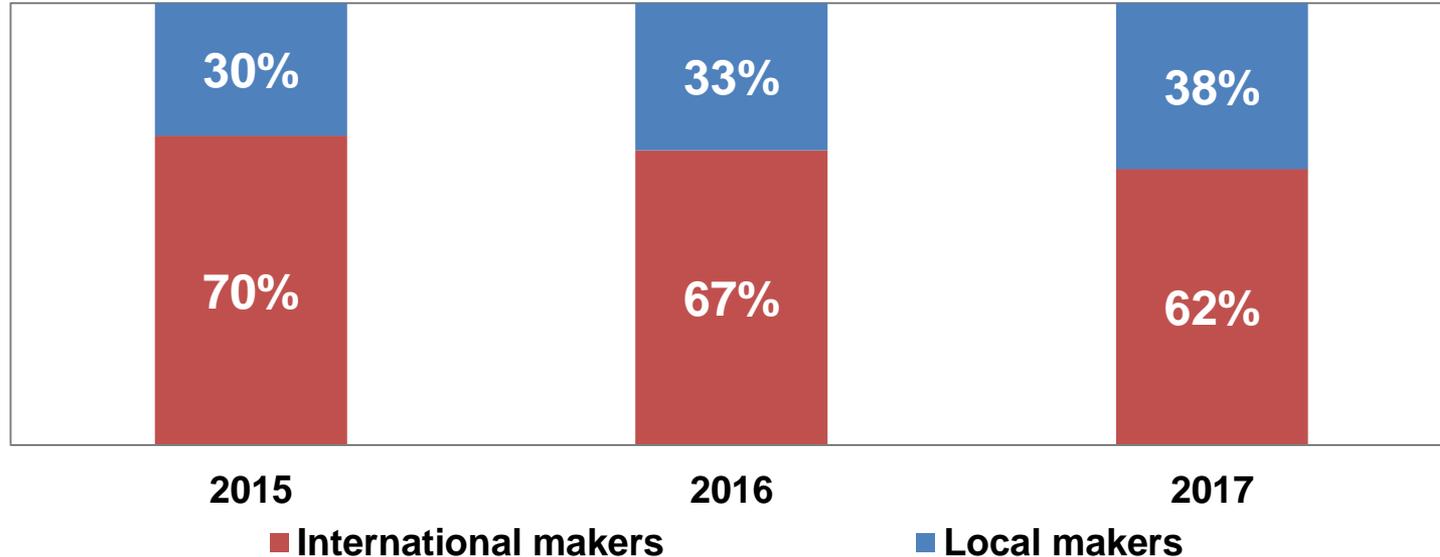
• **\$ 8 billion market growing over 10%!**

* Exchange rate of USD/RMB =6.9 on 20181016

Data from CNHPIA



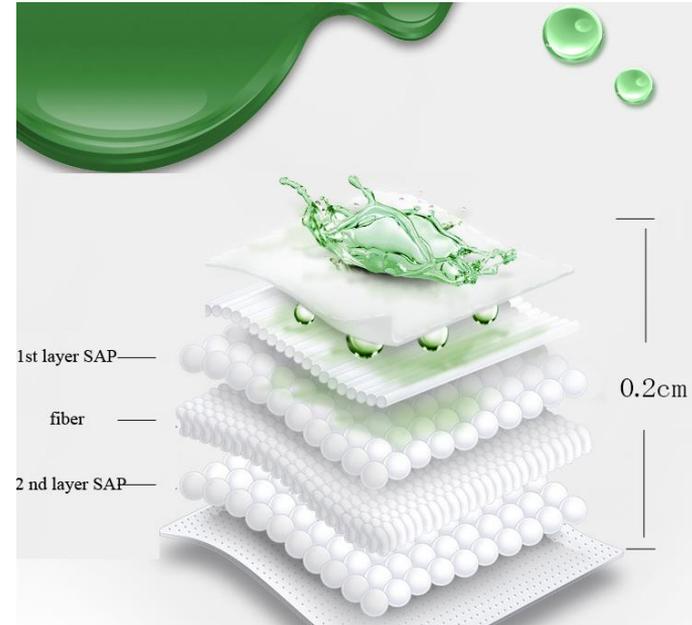
Market share International v. local brands



- **International brands are losing market share to local brands.**



**Traditional diaper core:
fluff+SAP**



**Chinese Fluffless diaper core:
SAP A+ fiber + SAP B**

Why has the China market moved to fluffless?

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Better product

Thinner

Softer

Much better core integrity

Bigger market

Fast growing market from high base

Different Price Points for Diapers

Low penetration rate* (estimated ~60%)

Multiple Sales channels*

Easier manufacture

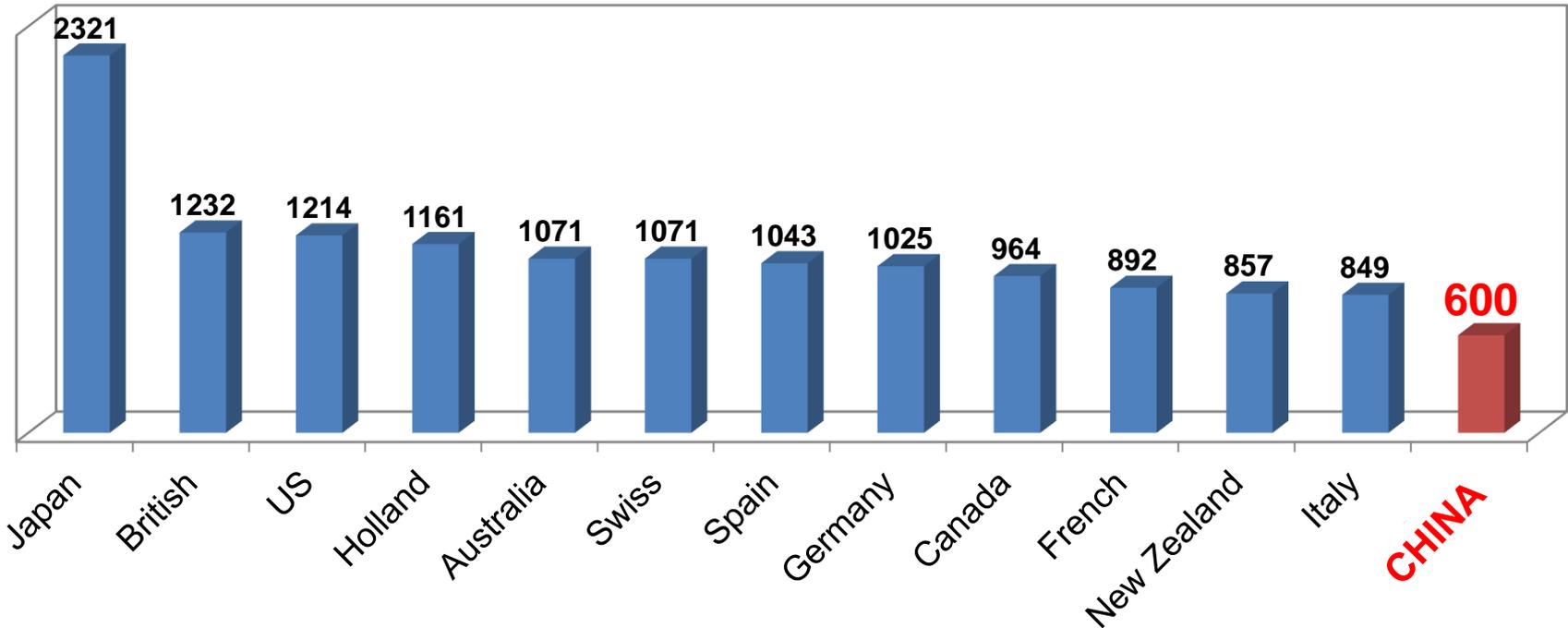
Much lower equipment cost

Cores/ diapers made separately = lower investment

Reduced manpower

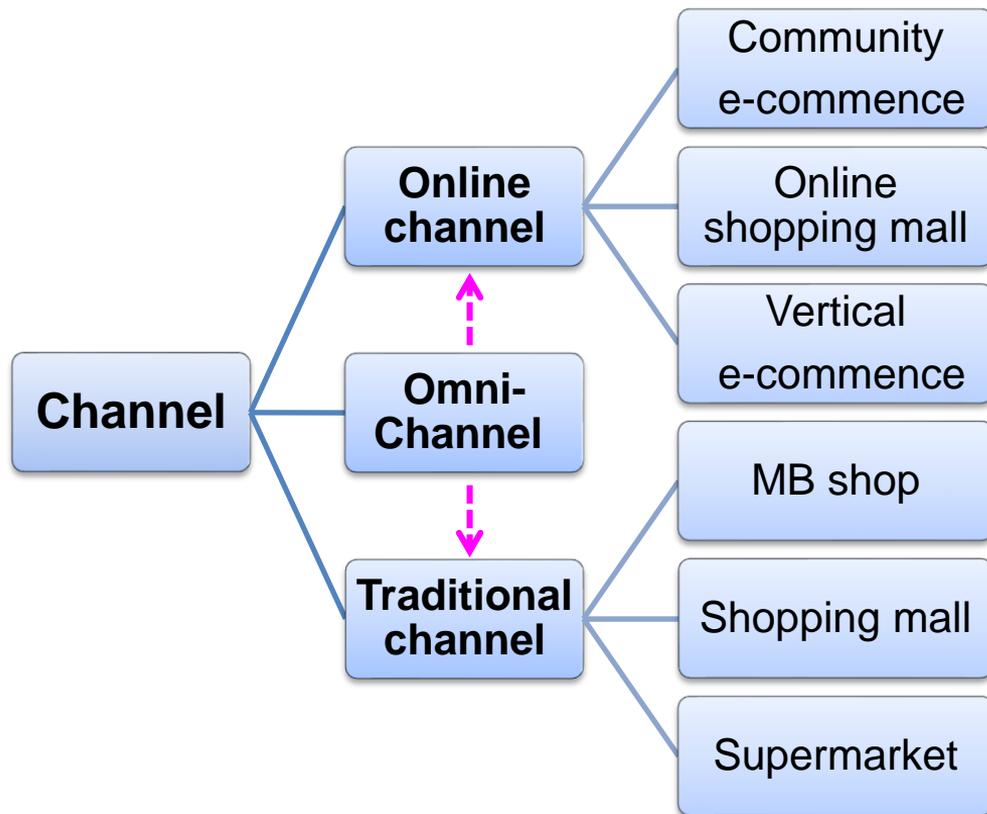
*Relatively Low Penetration Rate

Average annual diaper consumption amount per baby (0 to 3 years old) in 2017



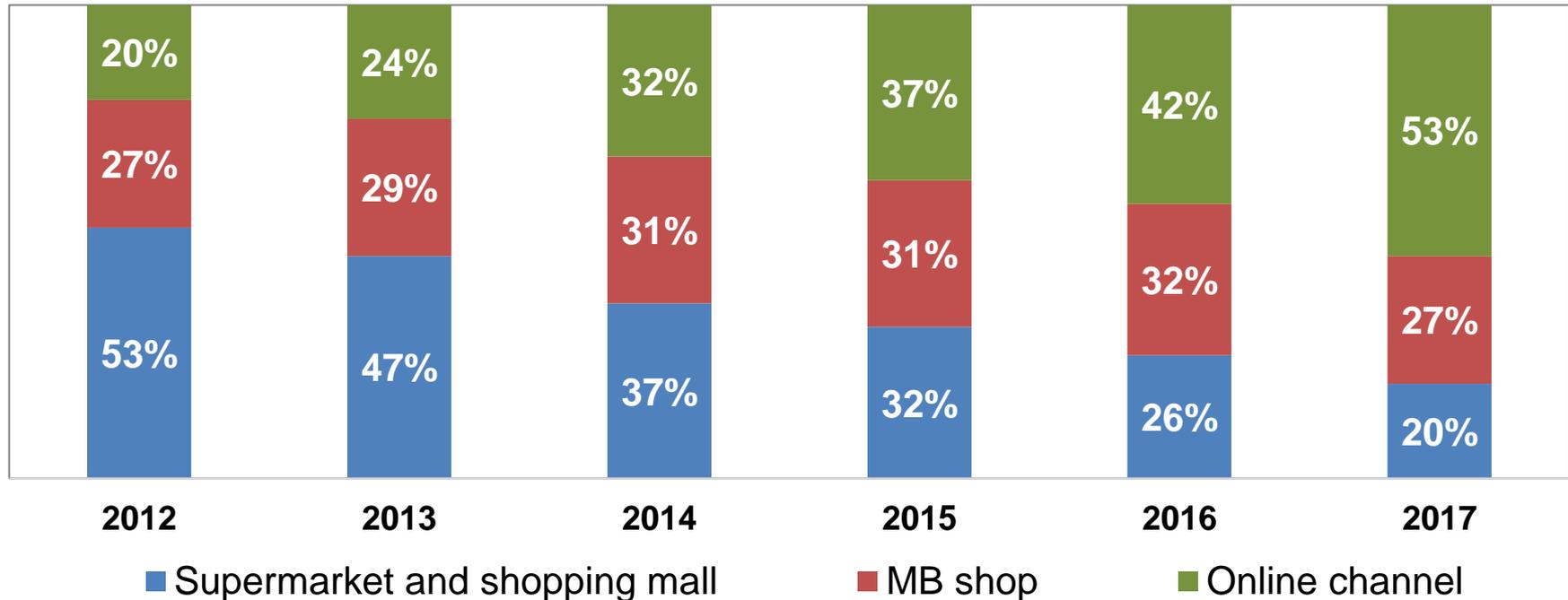
Data from CNHPIA

*Multiple Channels to Market

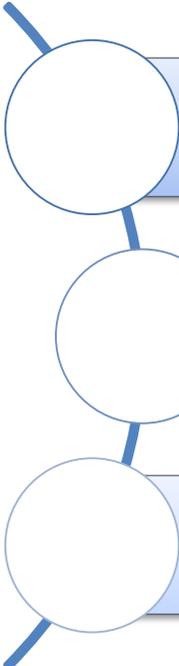


*Multiple Channels to Market

Sales amount of different channels from 2012 to 2017



Data from AC Nielsen



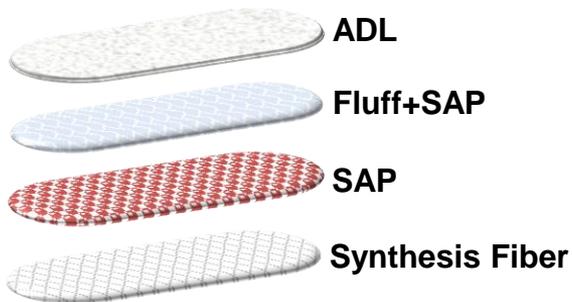
Higher leakage risk

HSE concerns (low quality substitution)

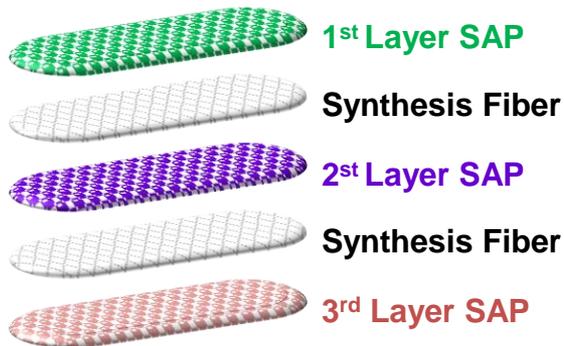
Low differentiation of cores

Latest Trends of Fluffless Diapers in China?

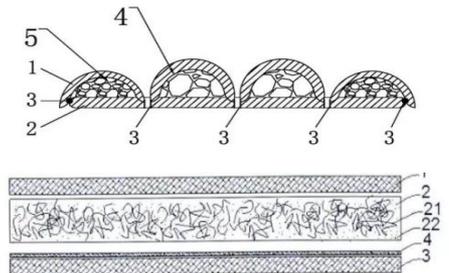
Online lamination



3 layers SAP in core



Cell segmented



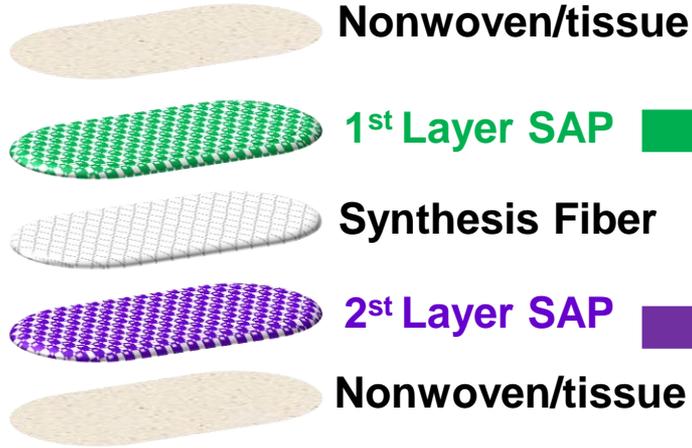
Design concept

*技术专利号: ZL 2016 2 1115988.7



- In order to reduce leakage risk & improve dryness, new designs of fluff less core are popping up...

China fluffless core



Nonwoven/tissue

1st Layer SAP

Synthesis Fiber

2nd Layer SAP

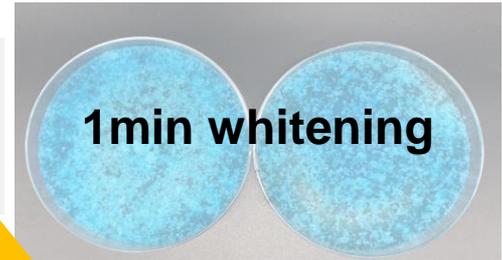
Nonwoven/tissue

SAP requirement

- Fast speed
- Low ex%
- Medium Permeability

- Faster than 1st layer
- Low ex%
- High CRC

Simple Test Methods



- Different layers need different SAP

Top Layer

DSorb@8930

- **Fast absorption speed**
- **Good permeability**
- **Low extractables%**
- **Good AUP**

Bottom Layer

DSorb@8060

- **Even Faster absorption speed**
- **Low extractables%**
- **Higher CRC**
- **Good AUP**

- 1 Fluffless baby diapers in China

- 2 Comparison test of diapers from US and CN**

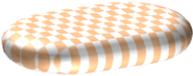
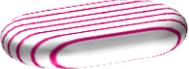
- 3 Fluffless diapers in US

- 4 Conclusion

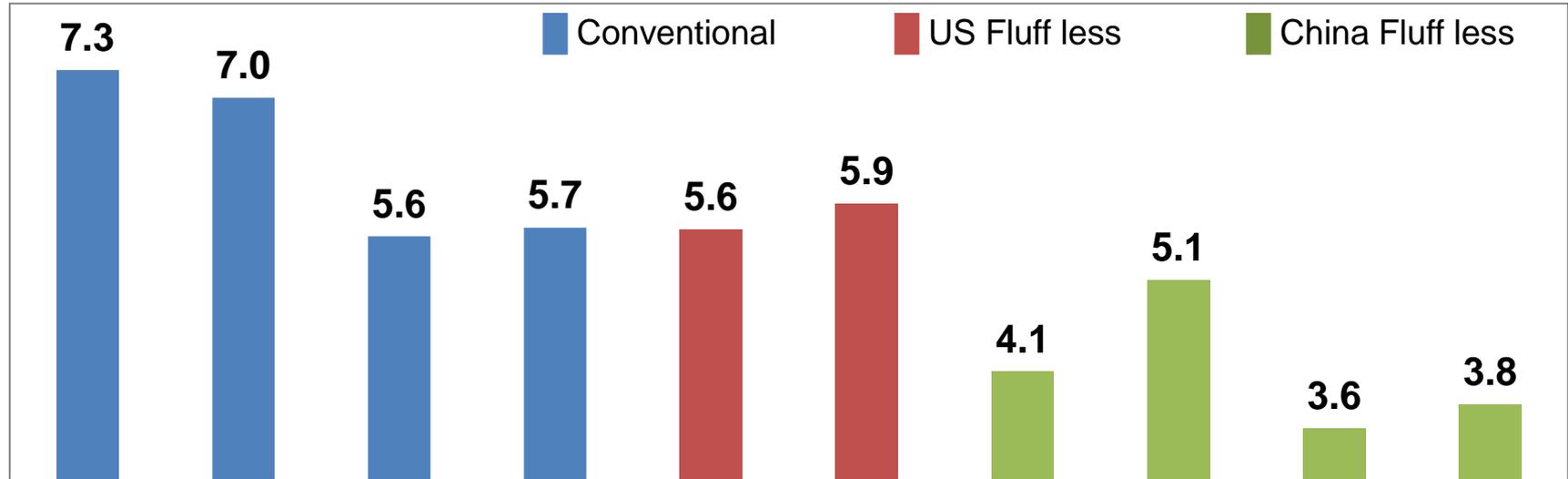


Comparison test of diapers from US and CN

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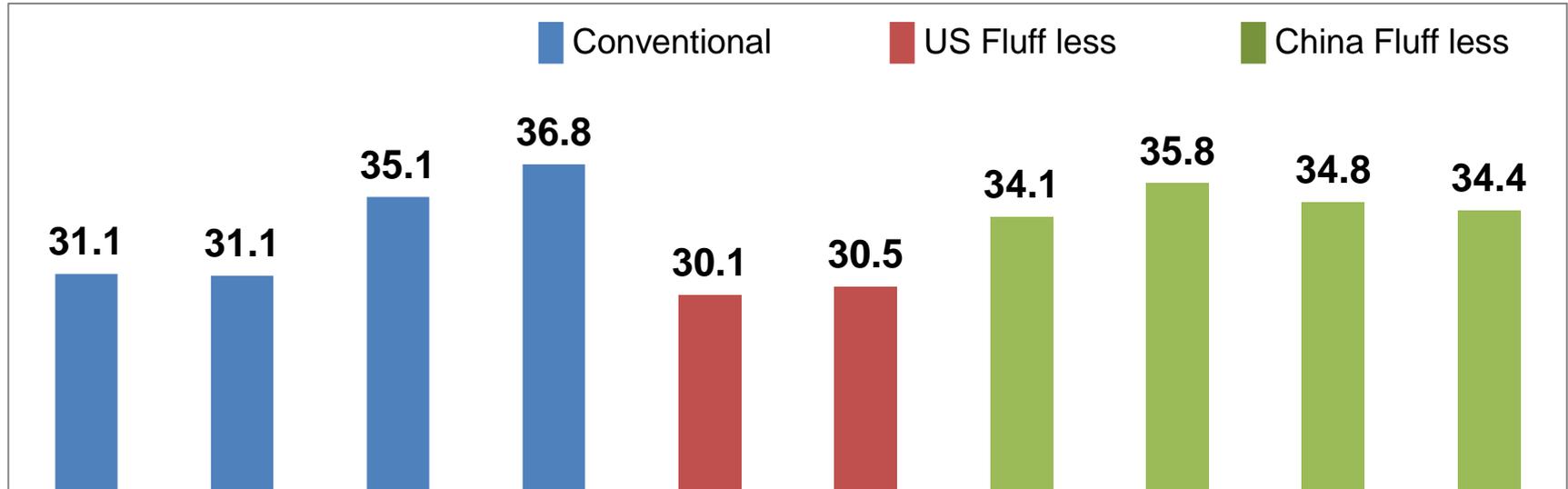
Diaper	Conventional	US fluff less	China fluff less	
Type	Fluff core	3D-print core	China AP core	Combination core
Structure	 ADL  Fluff + SAP	 ADL  Curly fiber  SAP sheet (diffusion groove)	 1 st Layer SAP  Synthesis Fiber  2 st Layer SAP	 ADL  China AP core  Fluff + SAP
Example	Kimberly-Clark Huggies OverNites	P&G Pampers Swaddlers	MD Bear FuJian, China	Suitsky HuNan, China
Photo				

Thickness of diaper/mm



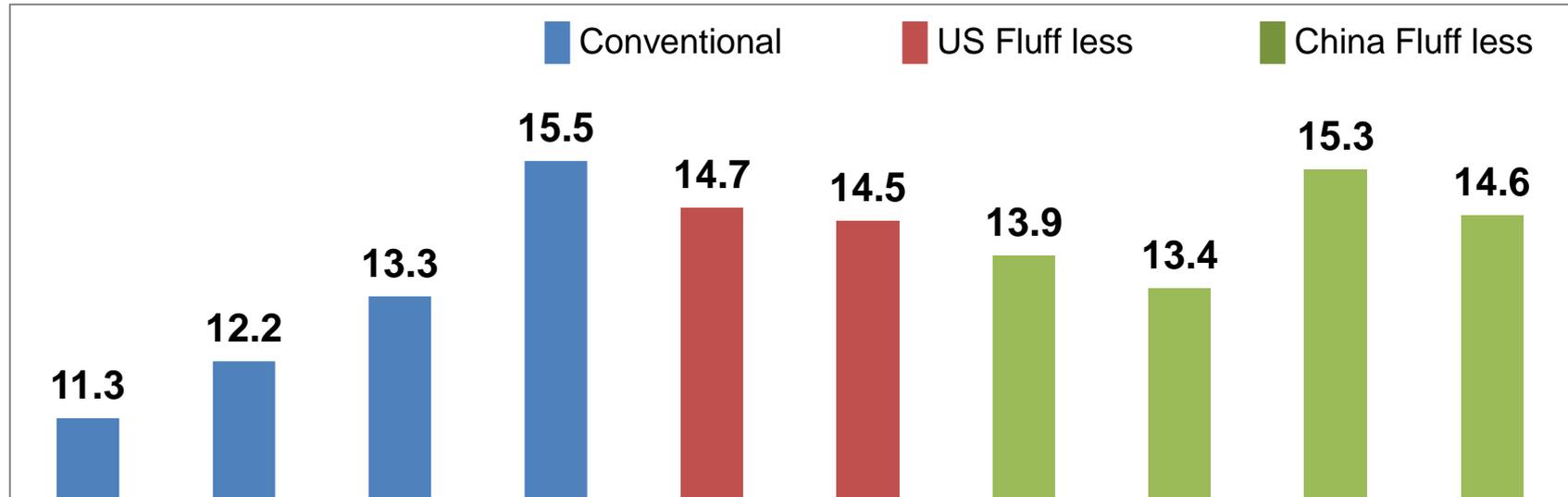
- China fluff less diaper is **2-3mm, 40-50%** thinner than conventional diaper.

Average diaper weight/g



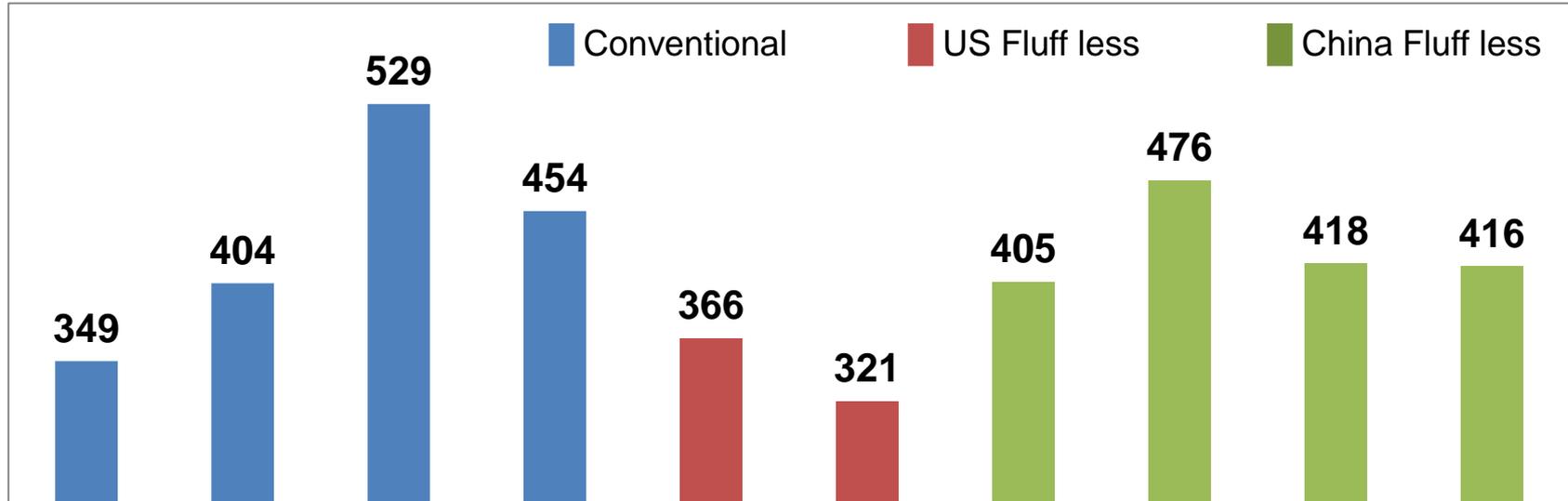
- China fluff less is similar weight to conventional diaper.

SAP content of diaper/g



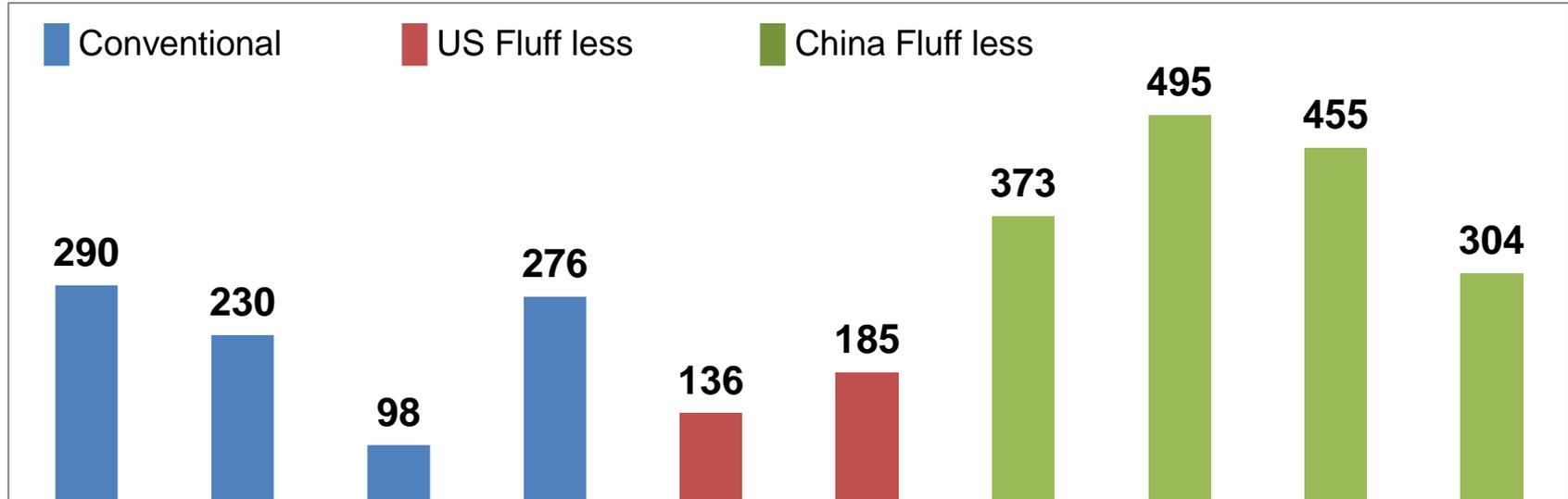
- Fluff less is typically **2-3g, 15-20%** higher SAP dosage than conventional diaper.

Maximum retention capacity of diaper/g



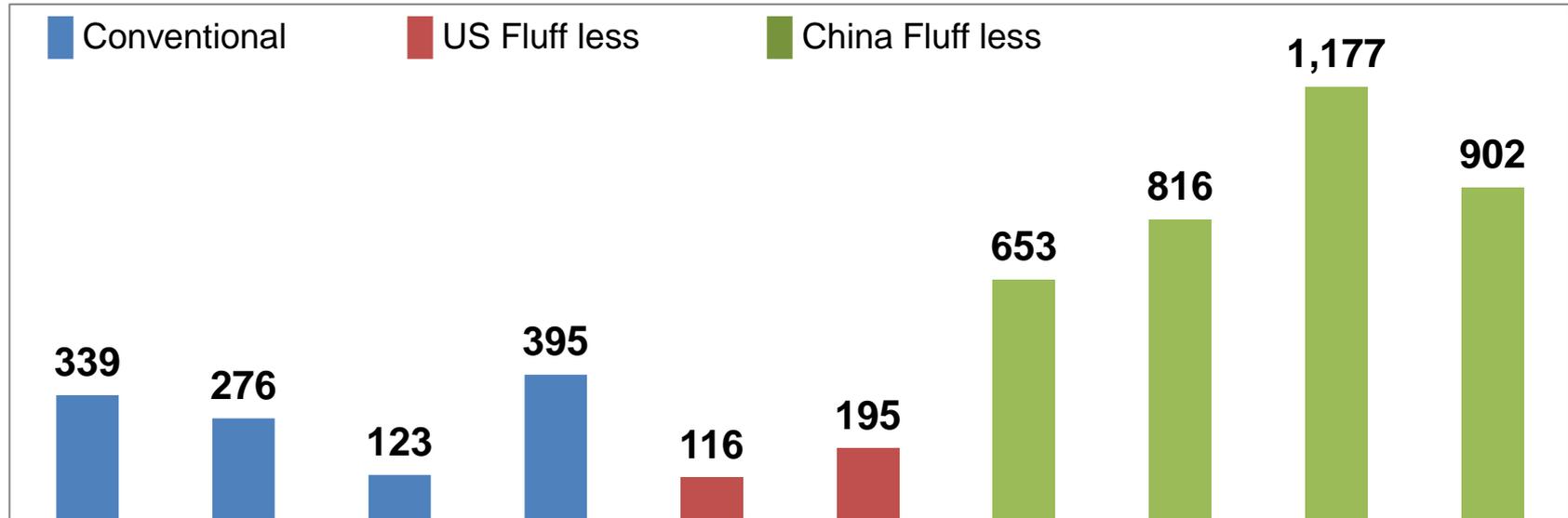
- China fluff less diaper has high retention capacity.

Acquisition time, SUM (5 times of insulting)/s



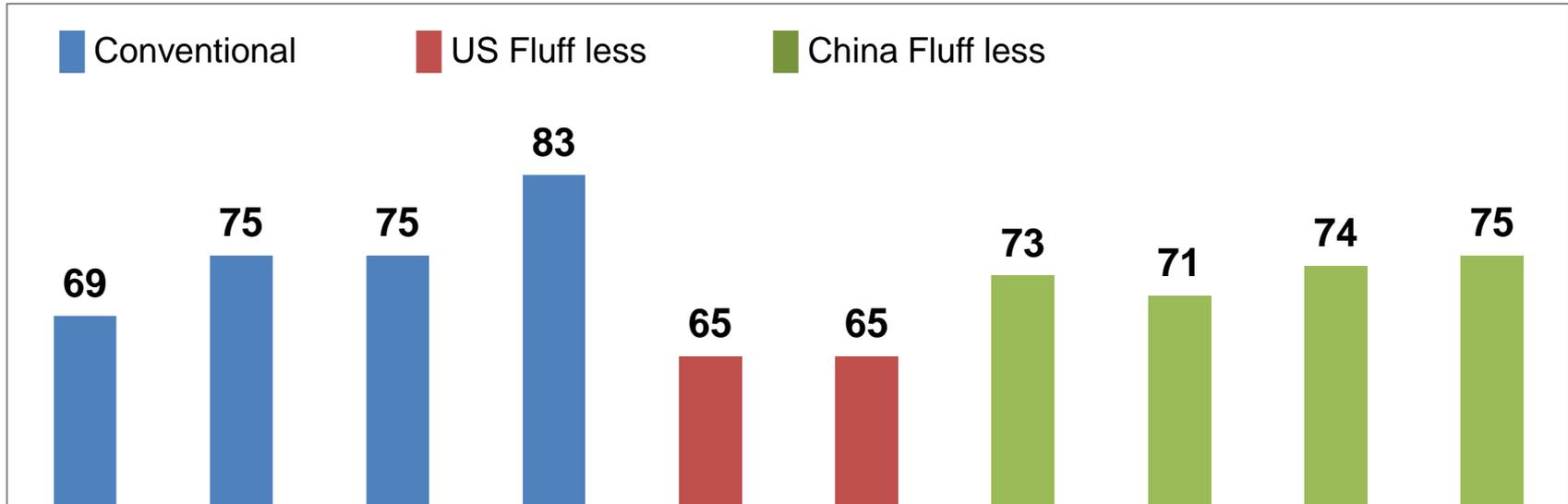
- US diapers show faster acquisition time.

Acquisition time under load, 0.9psi SUM (5 times of insulting)/s



- US diapers show much faster acquisition time under high pressure.

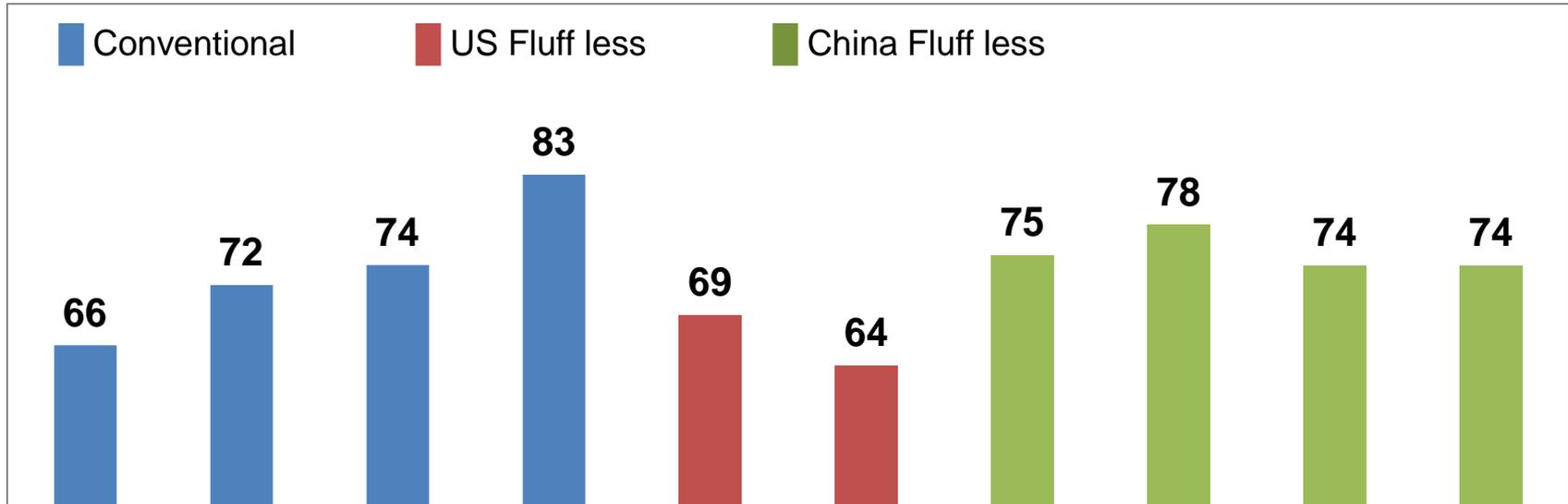
Liquid diffusion area/%



- Conventional diaper gives relatively wider diffusion area.

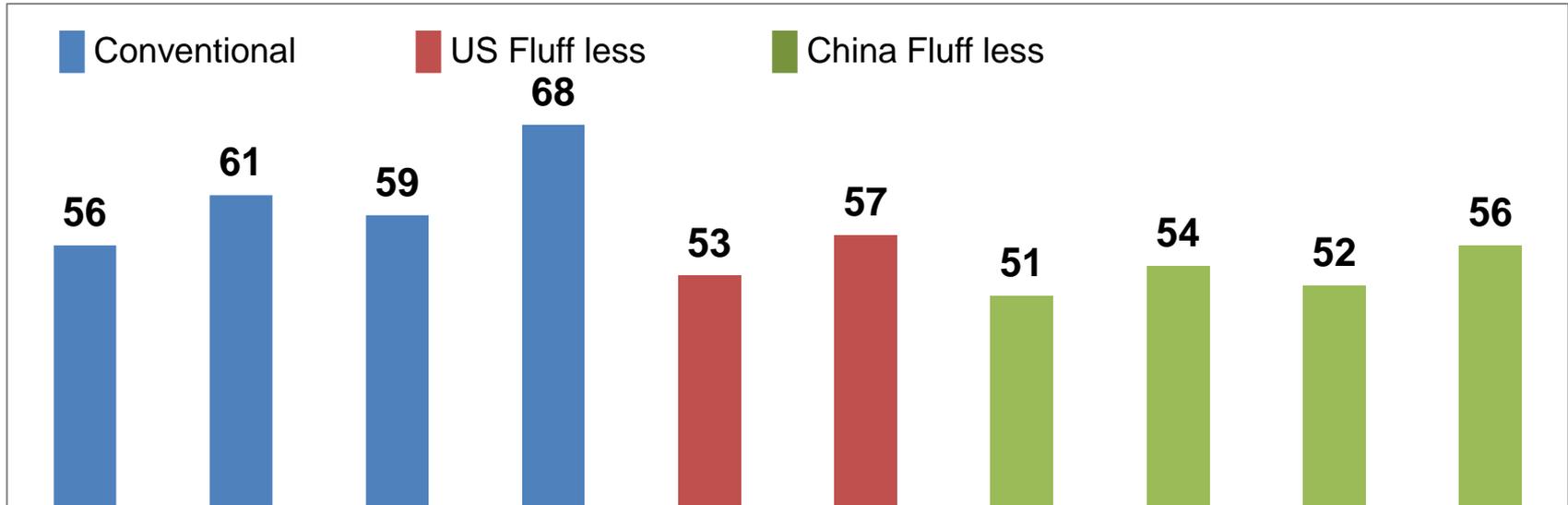
Diapers Comparison-Liquid Diffusion Area Under Load **Danson**

Liquid diffusion area under load, 0.9psi/%

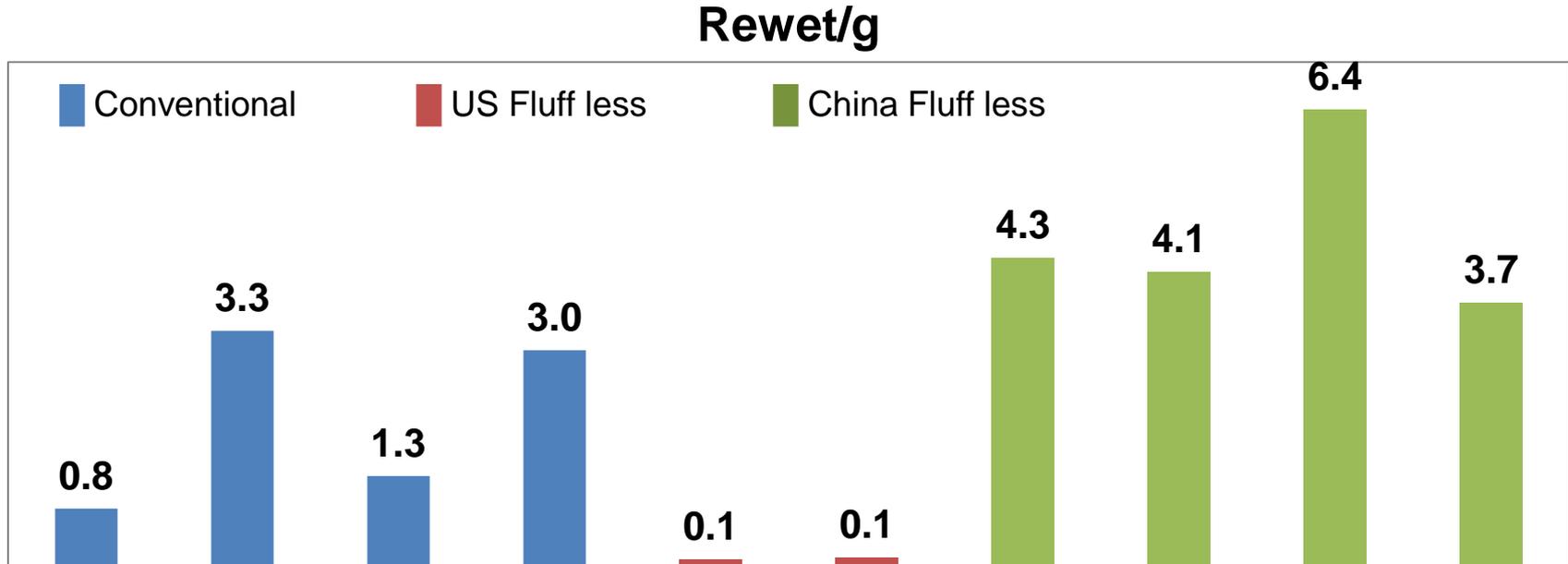


- **China fluff less diaper shows similar diffusion area to conventional under high pressure.**

Liquid diffusion area, U-shape/%

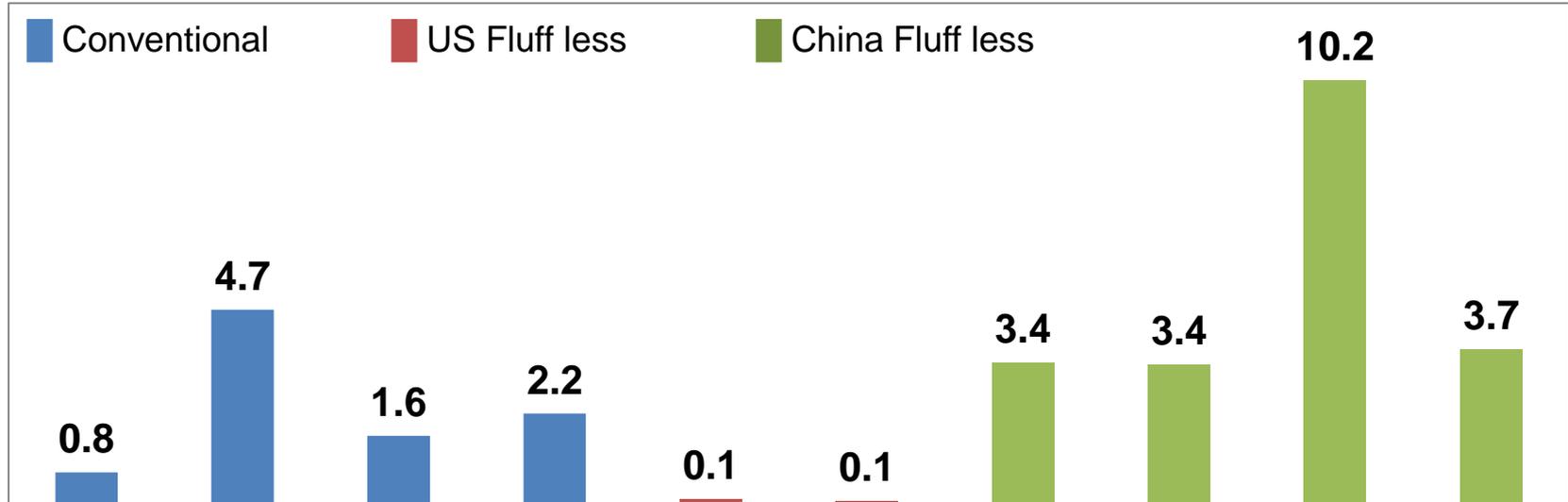


- Conventional diaper gives relatively wider diffusion area.



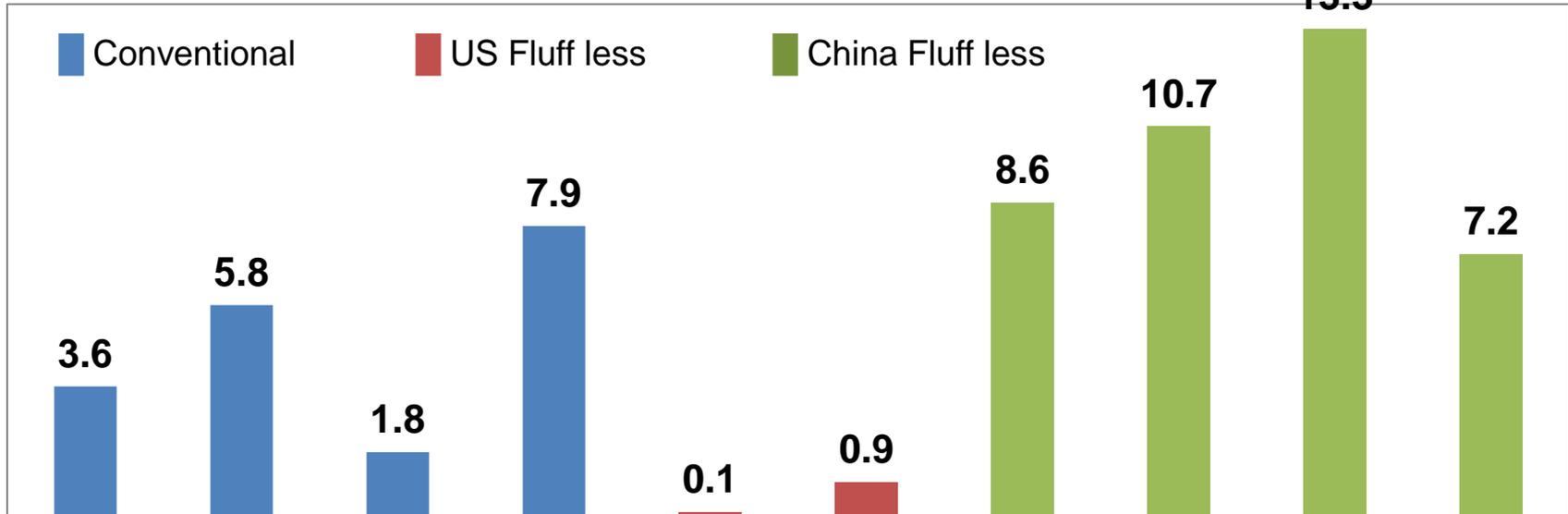
- US diapers give better surface dryness.

Rewet under load, 0.9psi/g



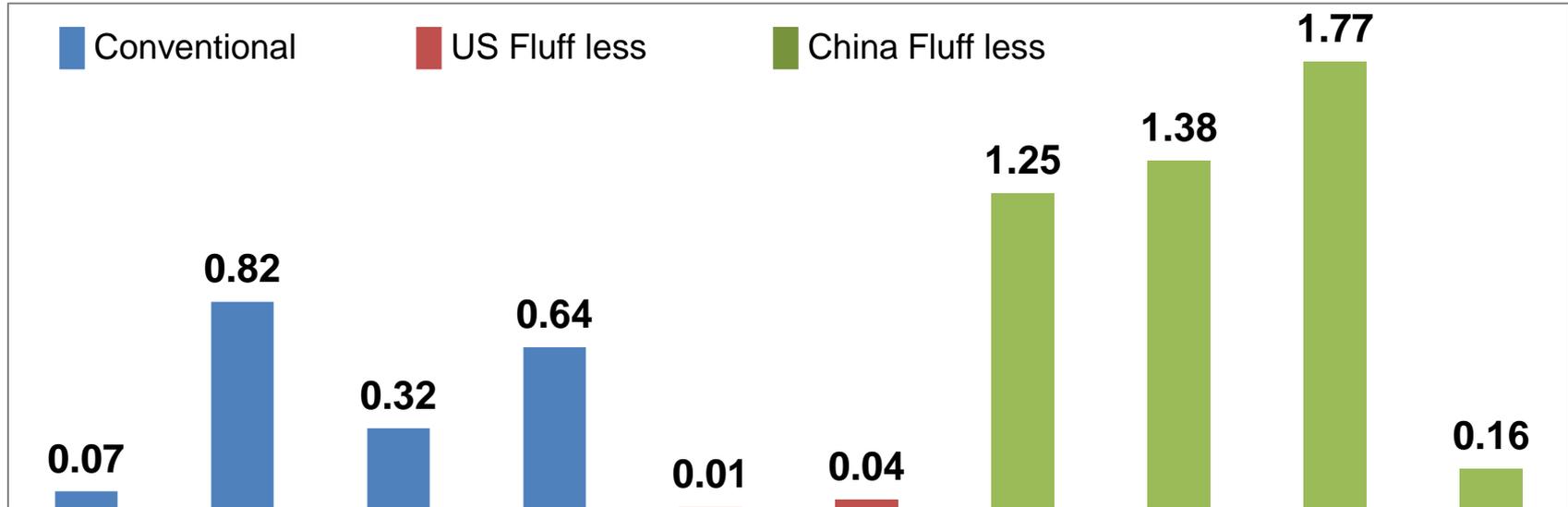
- US diapers give better surface dryness.

Rewet, U-shape/g



- US diapers give better surface dryness.

Rewet, Chinese standard method/g



- US diapers have relatively lower rewet.

Diapers Comparison-Performance Summary

Diaper	Conventional	US, Fluff free	China Fluff-less
Pros	✓ Large diffusion area	✓ Faster acquisition	✓ High retention capacity
	✓ Fast acquisition	✓ Extremely low rewet	✓ Ultra thin, good core integrity
		✓ Low diaper weight	✓ Soft
Cons	• Thick	• Low absorption capacity	• Slow acquisition
	• Not as soft	• Narrow diffusion area	• High rewet

SAP properties comparison-SAP from US diapers

Diaper type	Conventional			Fluff free		
Product	Pampers, baby dry	Parents choice, panales	Honest overnights	Huggies, OverNites	Pampers, Swaddlers overnights	Pampers, Cruisers
Photo						
CRC, g/g	25.8	30.5	39.9	26.4	25.4	22.6
AUP,0.9psi	20.4	14.0	8.6	15.3	20.9	17.6
Vortex speed, s	32	34	44	28	22	20
Permeability, K (e ⁻⁸ cm ²)	5.4	10.5	0.6	26.2	5.9	9.2

- US concern about DRY BABY SKIN and NO LEAKAGE leads to SAP with good AUP & AS – “Honest” performs well, with different SAP profile.

SAP properties comparison-SAP from China diapers

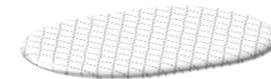
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Typical Combinations	Example 1		Example 2		Example 3		Example 4	
SAP properties	1 st layer	2 nd layer						
CRC, g/g	27.4	33.3	31.3	32.2	37.1	33.3	33	33
AUP,0.9psi, g/g	14	12.1	15	10.6	13.2	12.1	10.7	10.7
Vortex speed, s	24	33	22	19	51	33	20	20
Permeability, K (e ⁻⁸ cm ²)	9	0.6	7.7	5.8	10.7	0.6	12.4	12.4
1min absorption, g/g	30.7	34.6	25	38.2	18.2	34.6	34.3	34.3
4h Extractables%	3.8	1.8	4.6	3.8	6.9	1.8	4.9	4.9

- **1st Layer SAP: FAST absorption speed and low EX% .**
- **2nd Layer SAP: FASTER absorption, low EX% and Higher CRC.**
- **China prefers FAST SURFACE DRYNESS and LONG TIME DRY HAND FEEL.**



1st Layer SAP



Synthesis Fiber



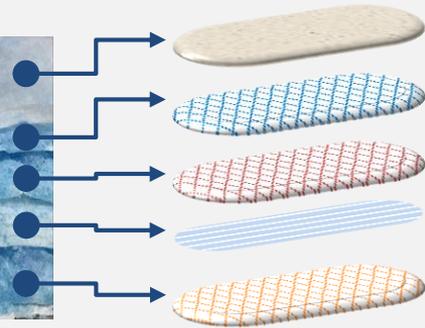
2nd Layer SAP

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Novel fluff less adult diapers in US

- **Alyne adult diaper**



Fabric-like material

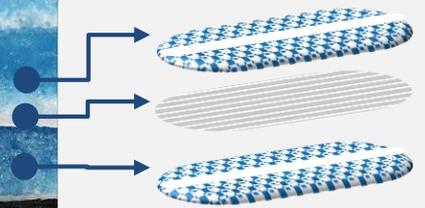
1st Layer SAP sheet/diamond-quilt

2st Layer SAP sheet/diamond-quilt

Absorbent strip layer/Tissue

3rd Layer SAP sheet/diamond-quilt

- **Willow adult diaper**

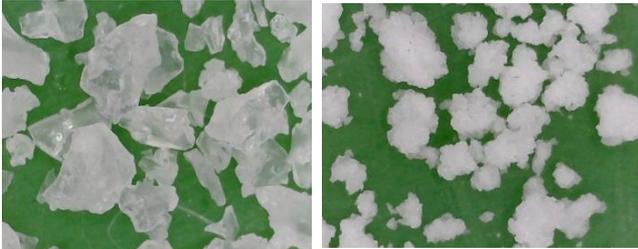


1st Layer SAP sheet (Middle groove)

Tissue

2st Layer SAP sheet (Middle groove)

- Alyne adult diaper**

SAP properties	1 st /2 nd Layer	3 rd Layer
CRC, g/g	31.1	16.9
AUP, 0.9psi, g/g	16.9	16.8
AS, s	52	4
Permeability, K (e ⁻⁸ cm ²)	21.8	15.2
SAP Appearance		

- Willow adult diaper**

SAP properties	1 st /2 nd Layer
CRC, g/g	30.8
AUP, 0.9psi, g/g	13.9
AS, s	38
Permeability, K (e ⁻⁸ cm ²)	1.3
SAP Appearance	

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What are the obstacles to US following China core?

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Comparative performance of different diaper types

Existing investments in diaper machines

Potential loss of control of design by diaper maker

Concentrated market in US – few major diaper producers

Likely Market acceptance

US and China markets target different diaper properties

China fluff less current designs are not well suited to meet US Mums needs

Success for US fluff less AI designs may encourage further fluff less baby diaper development in US

China experience & design knowledge will be very useful if the US market moves in this direction

- **A very big thank you to all the Danson applications lab staff**
- **Thank you Ivy Zhu for drafting much of the presentation**
- **CNHPIA**
- **Bostik web site**
- **AC Nielsen**

Thanks

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