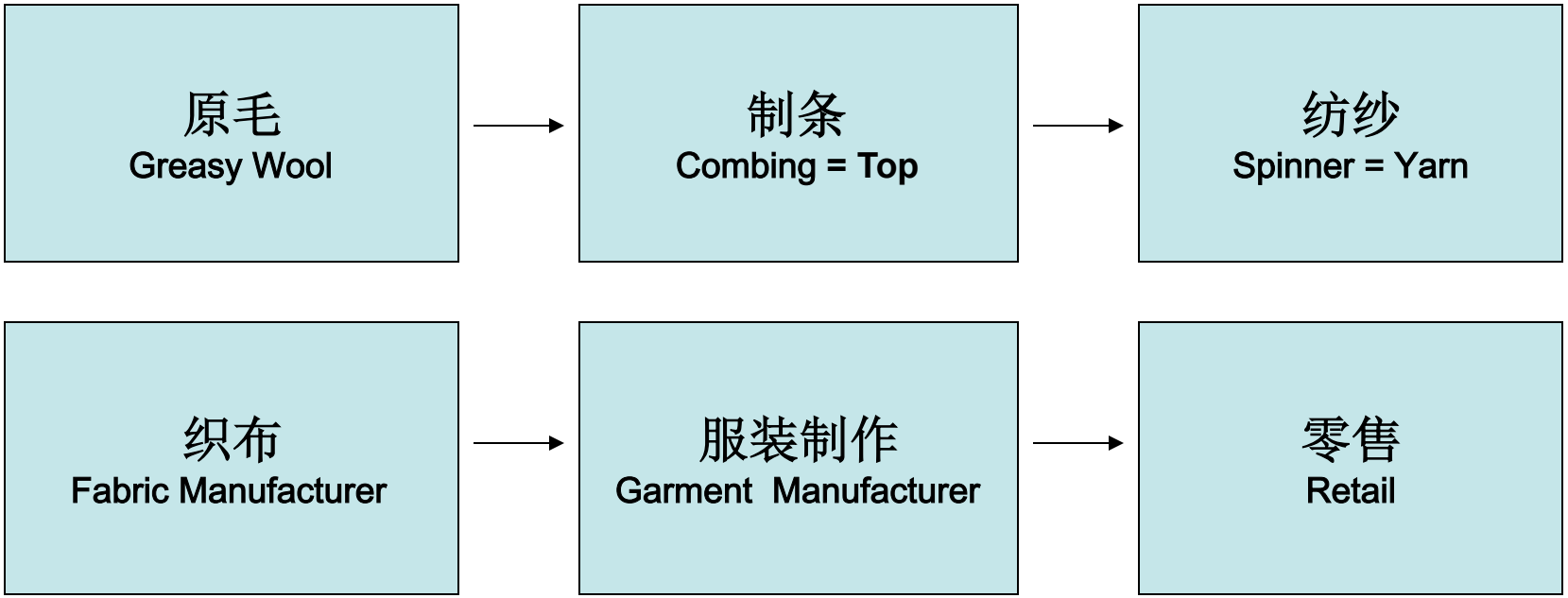
羊毛加工过程中纤维的特性

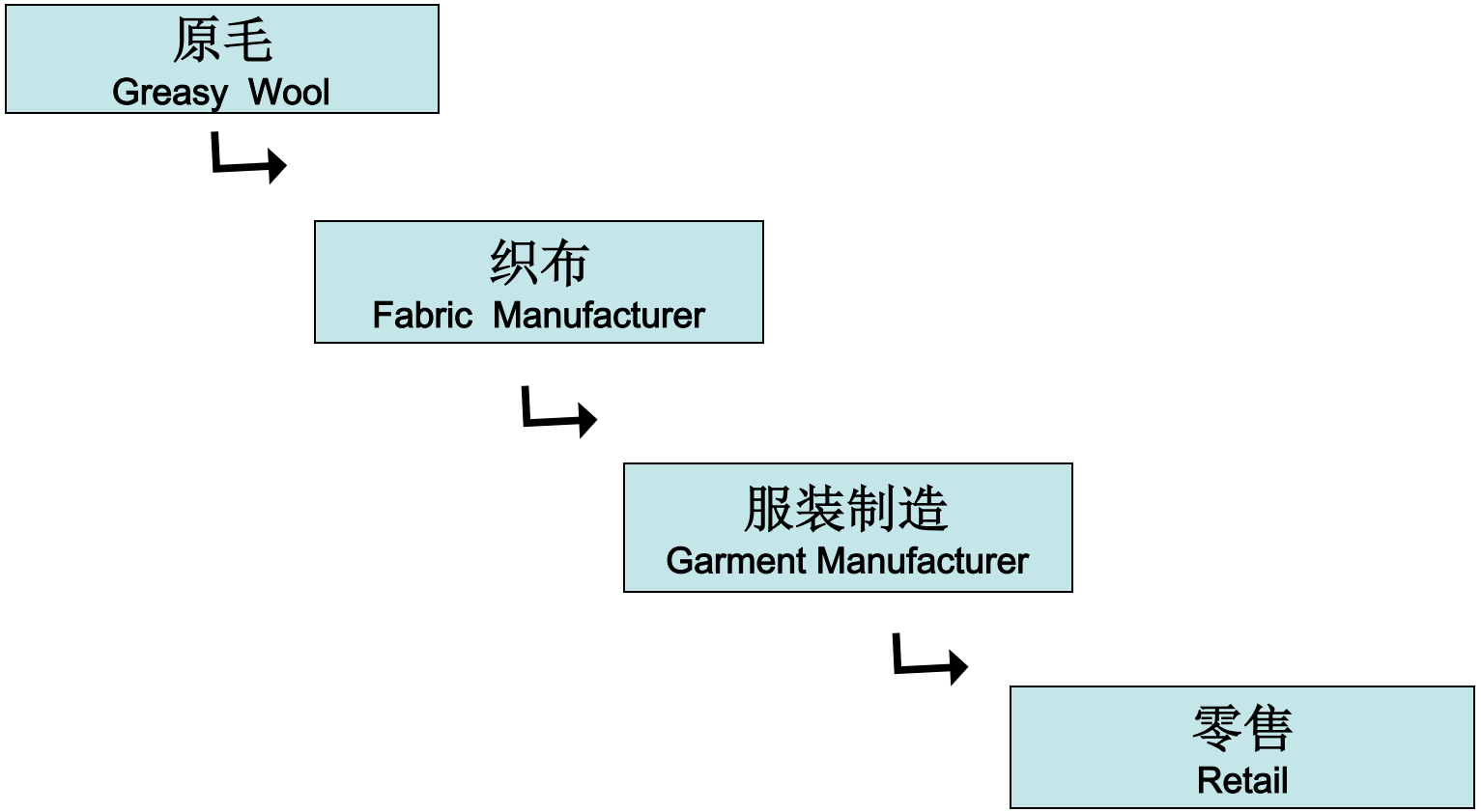
Fibre Properties in Wool Manufacture

加里 罗宾逊
Gary Robinson

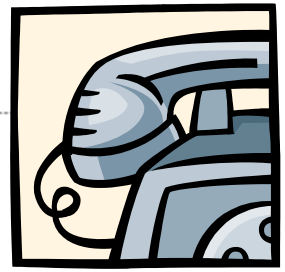
传统的纵向结构
Traditional: Horizontal Structure



近期的发展趋势 – 垂直结构
Recent Trend: Vertical Structure



交流的关键渠道
Communication Gates

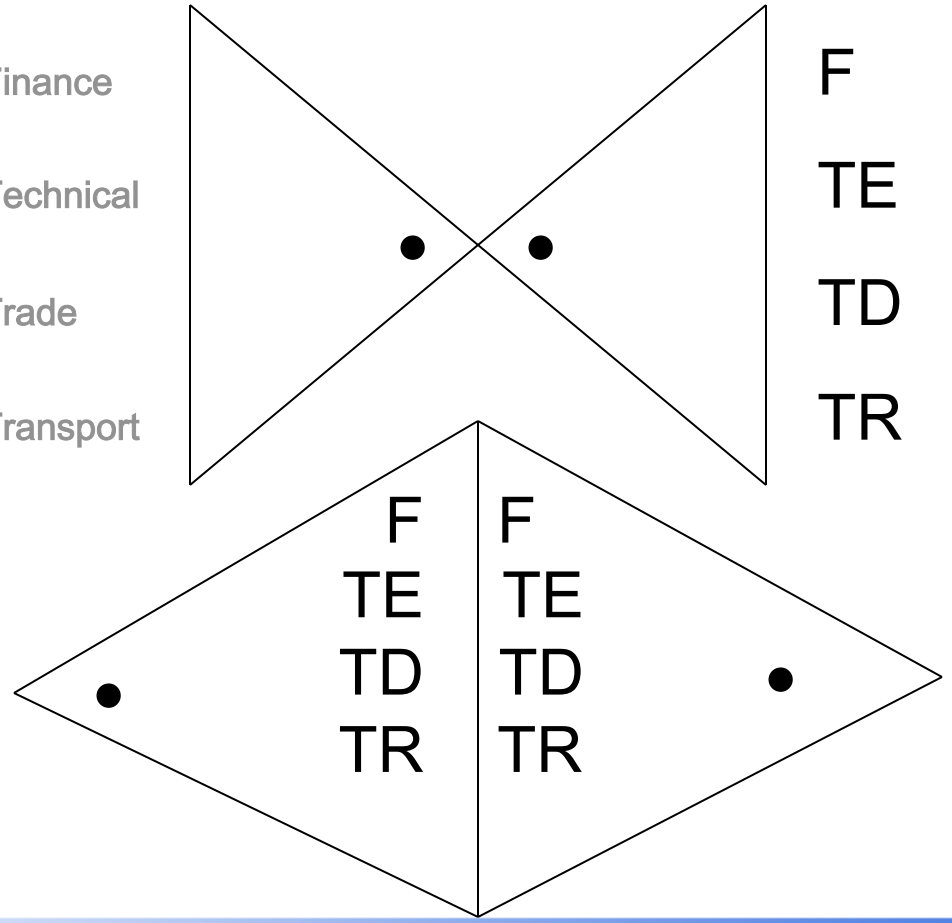


财务 Finance

技术 Technical

贸易 Trade

储运 Transport



- 公司的采购人员
  Company Buyers

- 各部门的经理
  Process Managers

新概念？
New?

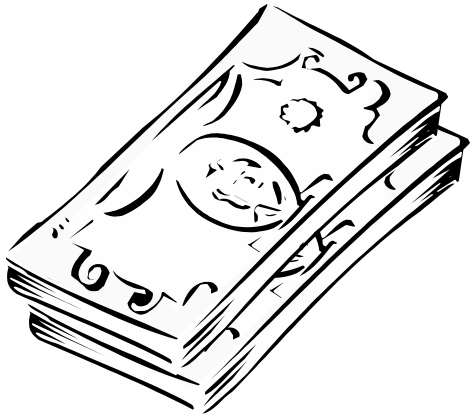
问题是：在各个领域中均需要专业知识与人才

Problem: Expertise in all areas

解决方案：交流（团队精神）

Solution: Communication (Managed Teams)

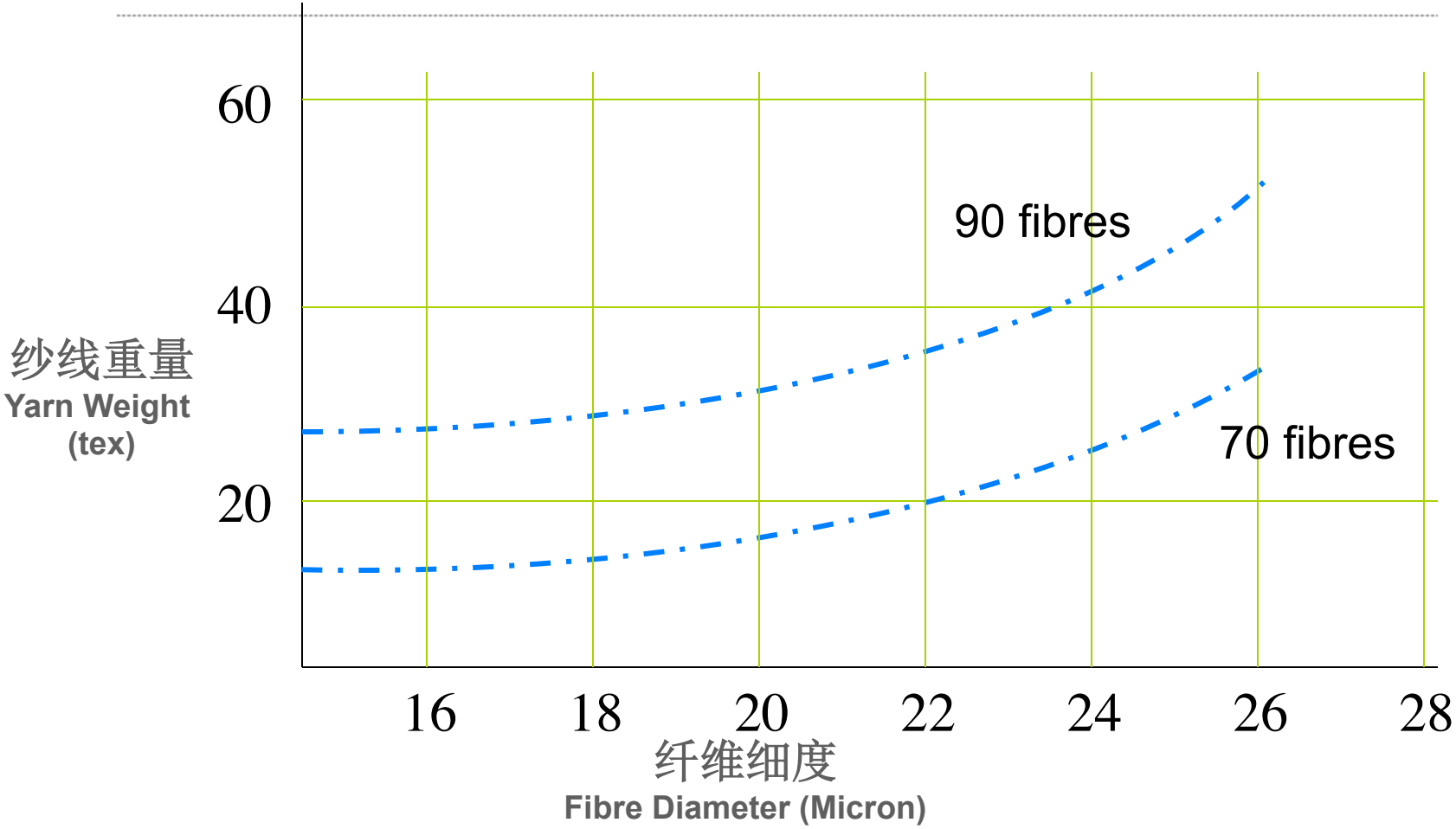
纤维与羊毛的生产
Fibre and Wool Growing



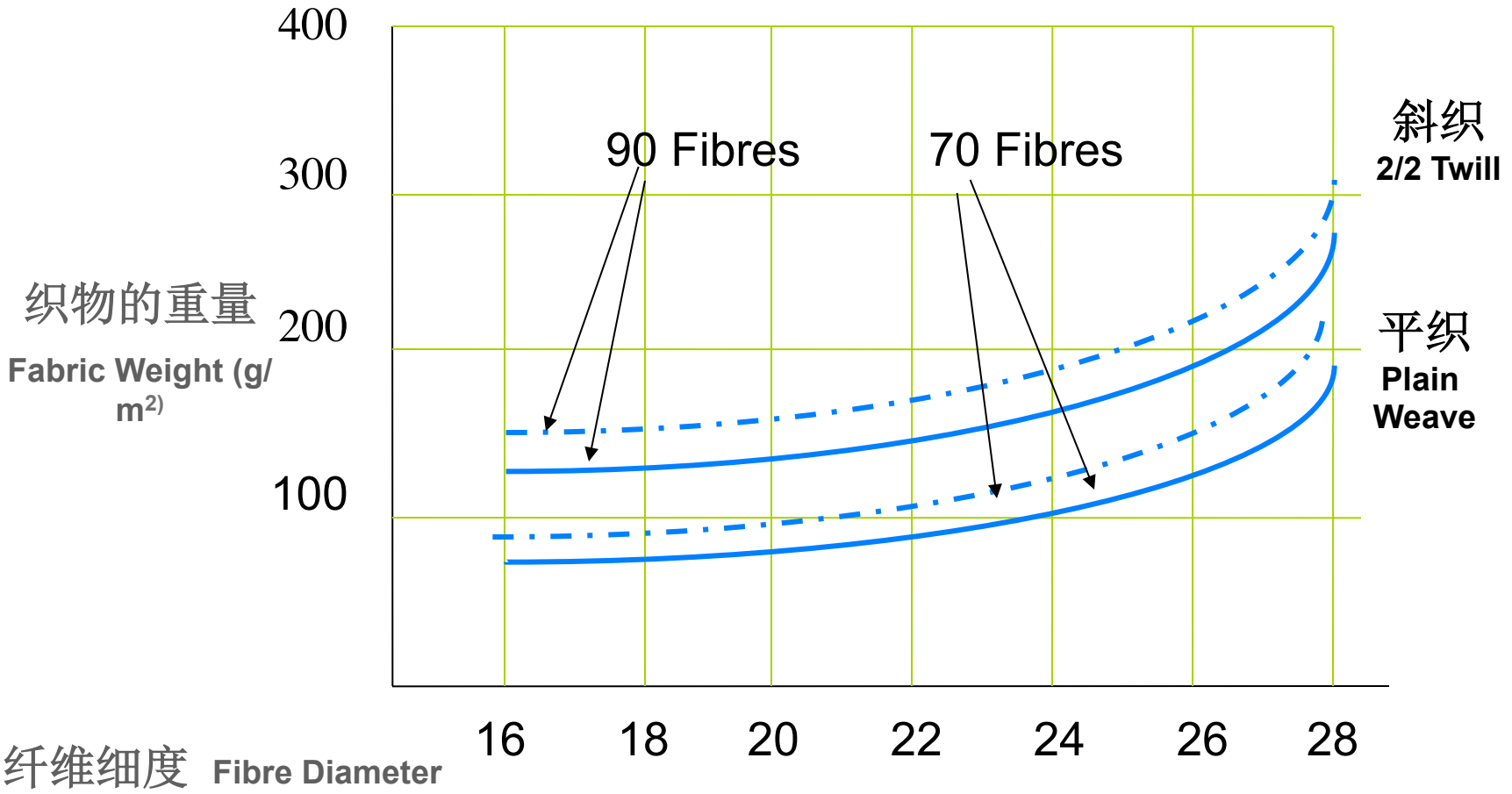
- 赚钱赢利
  Make money
- 细支羊毛可以获取更高的利润
  Finer Wool Make Money
- 增加套毛的重量（变化纤维的卷曲度）
  Increase Fleece Weight (Changes Crimp)

纤维细度
FIBRE DIAMETER

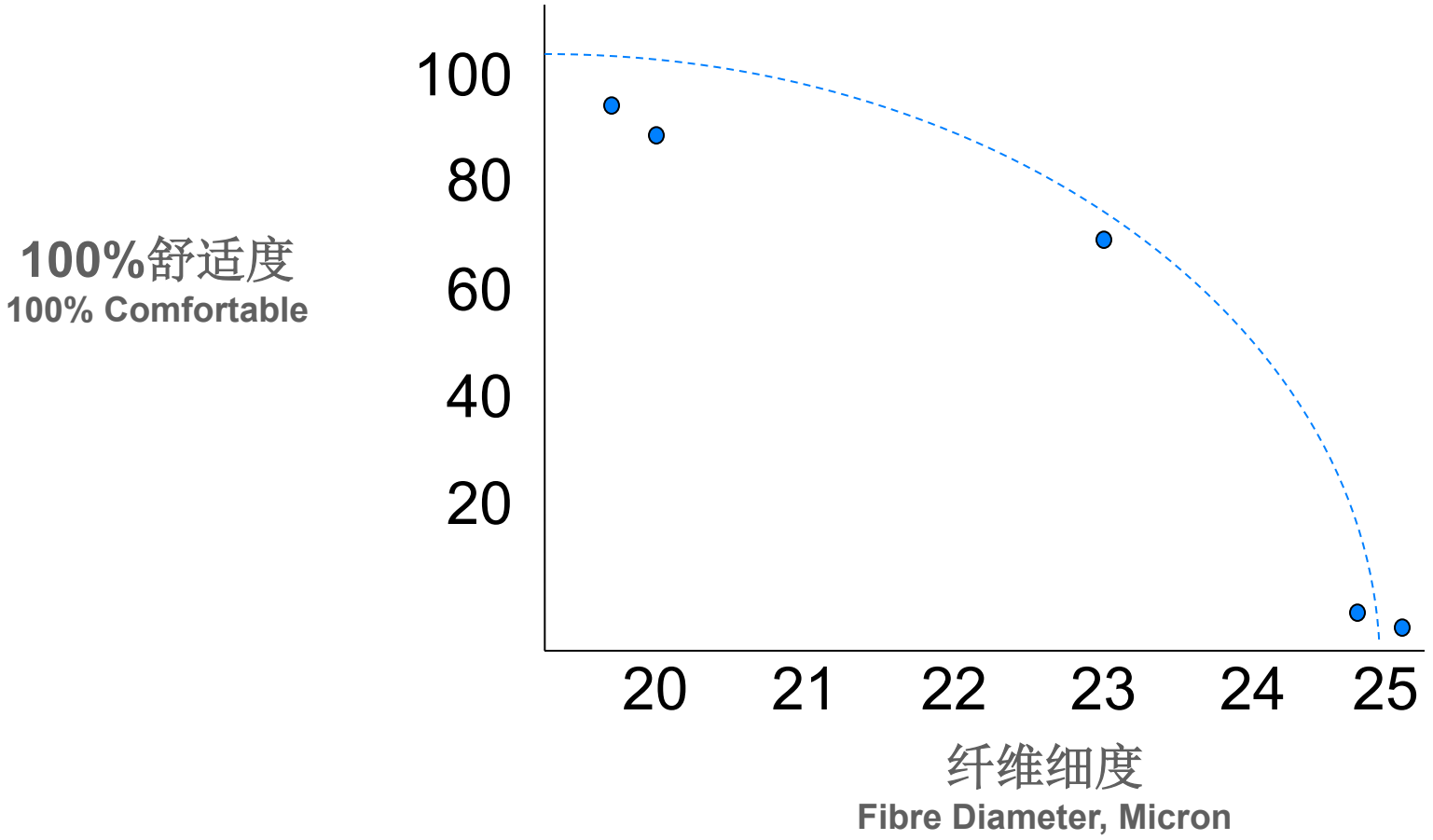
纱线密度与纤维细度
Yarn Linear Density, g/km, and Fibre Diameter



织物的重量、纤维细度与织造
Fabric Weight, Fibre Diameter and Weave

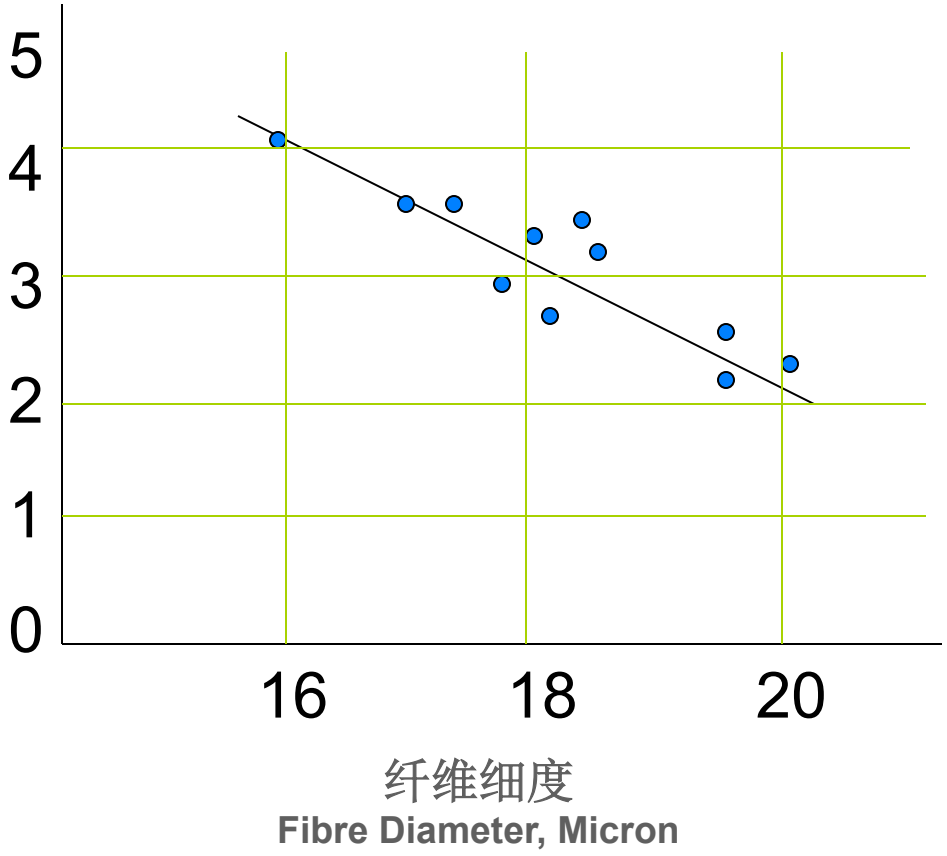


纤维细度与舒适感（针织品）
Fibre Diameter and Comfort (Knitwear)



纤维细度与舒适感（针织品）
Fibre Diameter and Comfort (Knitwear)

柔软度分级
Softness Ranking



纤维细度离散
Coeff of Variation In Fibre Diameter CVD

- 比纤维细度的影响程度小
  Smaller effect than Fibre Diameter

- 在细度离散变化**6%**的情况下**=**手感有细小变化
  Need a change of 6% in CVD = Small Change in Handle

平均纤维细度
Mean Fibre Diameter

- 对织物重量有很大影响
  Significant effect on fabric weight

- 影响加工的稳定性
  Effects process variations

- 对柔软度与手感有很大的影响
  Significant effect on handle/softness

纤维长度
FIBRE LENGTH

纤维长度
FIBRE LENGTH

豪特：数量 **x** 纤维截面积 **=** 目测？
Hauteur: Number x Cross-section Equal Visual

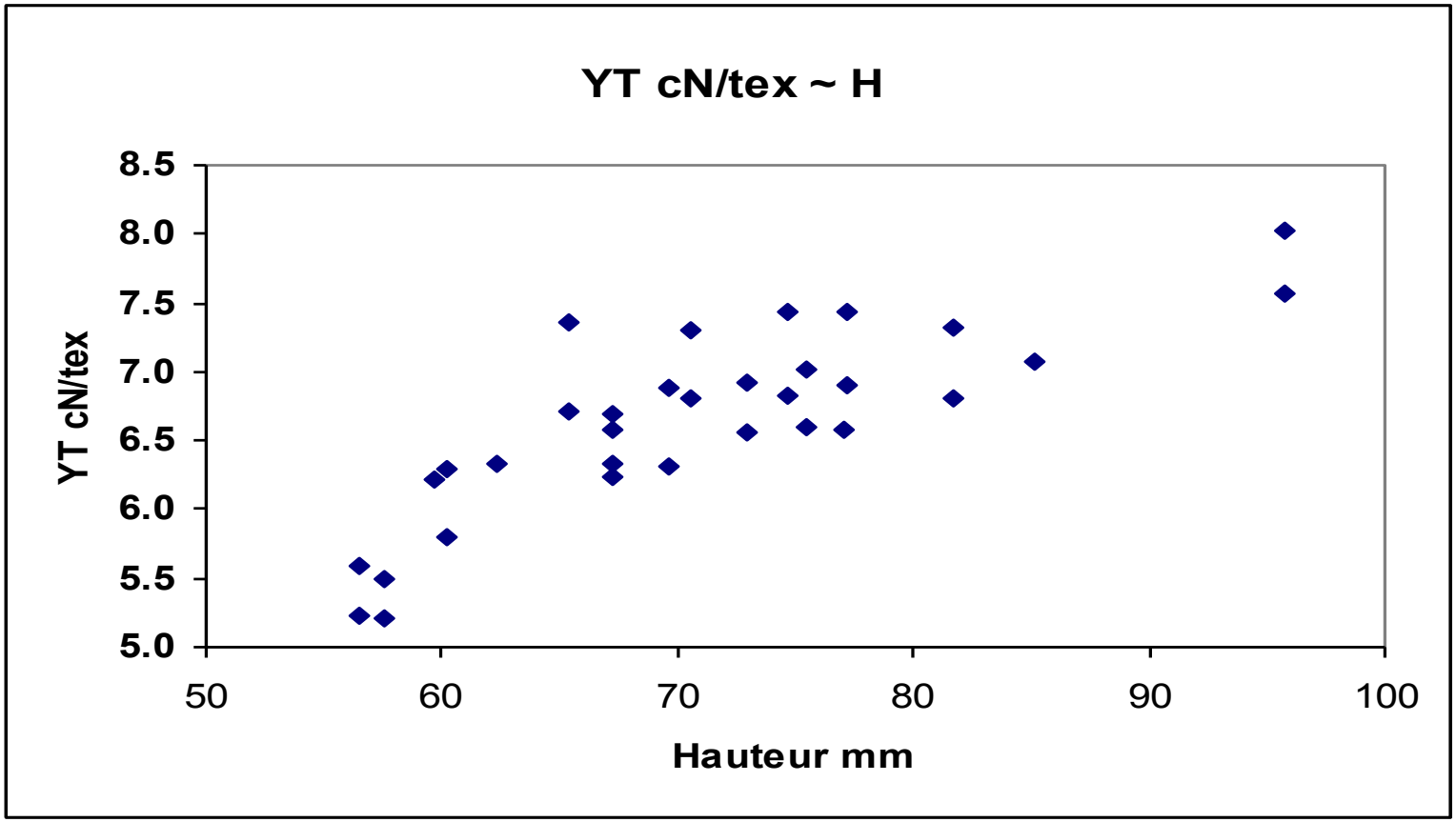
巴布：重量平均加权分部
Barbe: Weight-biased Distribution

巴布长度永远长于豪特长度
Barbe is always greater than Hauteur

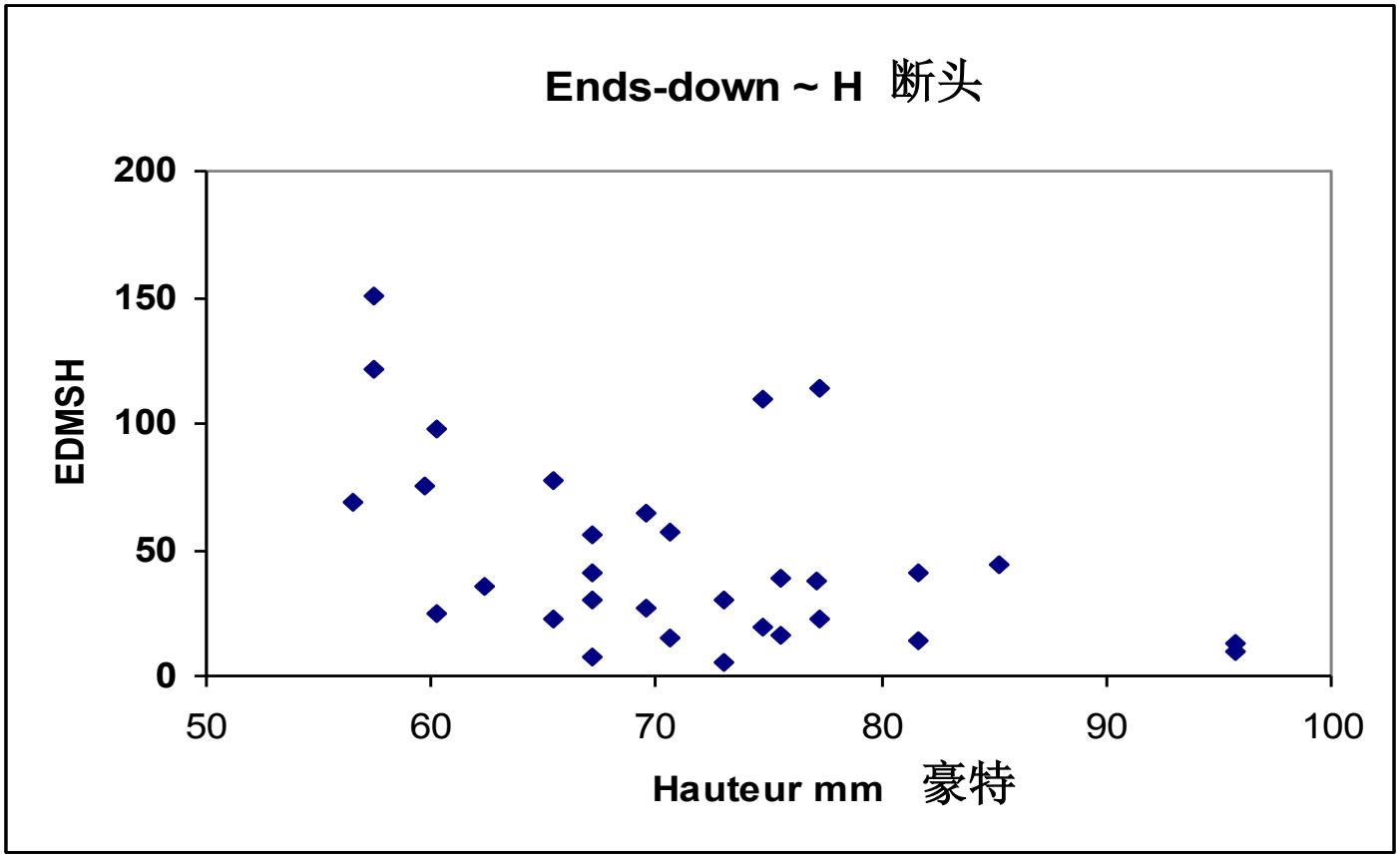
$$B = H (1 + V^2)$$

V = 豪特离散系数
V = Fractional Coeff. Variation of Hauteur

纤维长度与纱线强度
Fibre Length and Yarn Tenacity



纤维长度与纺纱之间关系
Fibre Length and Spinning



平均纤维长度 – 豪特
Mean Fibre Length - Hauteur (ref - Toptech '96)

- 对于纱线强度与断头率、**10mm = 1 µm**
  For yarn tenacity & ends down, 10mm = 1µm
- 对于条干均匀度、**25mm = 1 µm**
  For yarn evenness, 25mm = 1µm
- 对于织物手感 – 没有可比性
  For fabric handle – no trade-off

节省的结果
Savings

节省**10**豪特毫米可以（大约）：
10mm of Hauteur can allow (approx.):

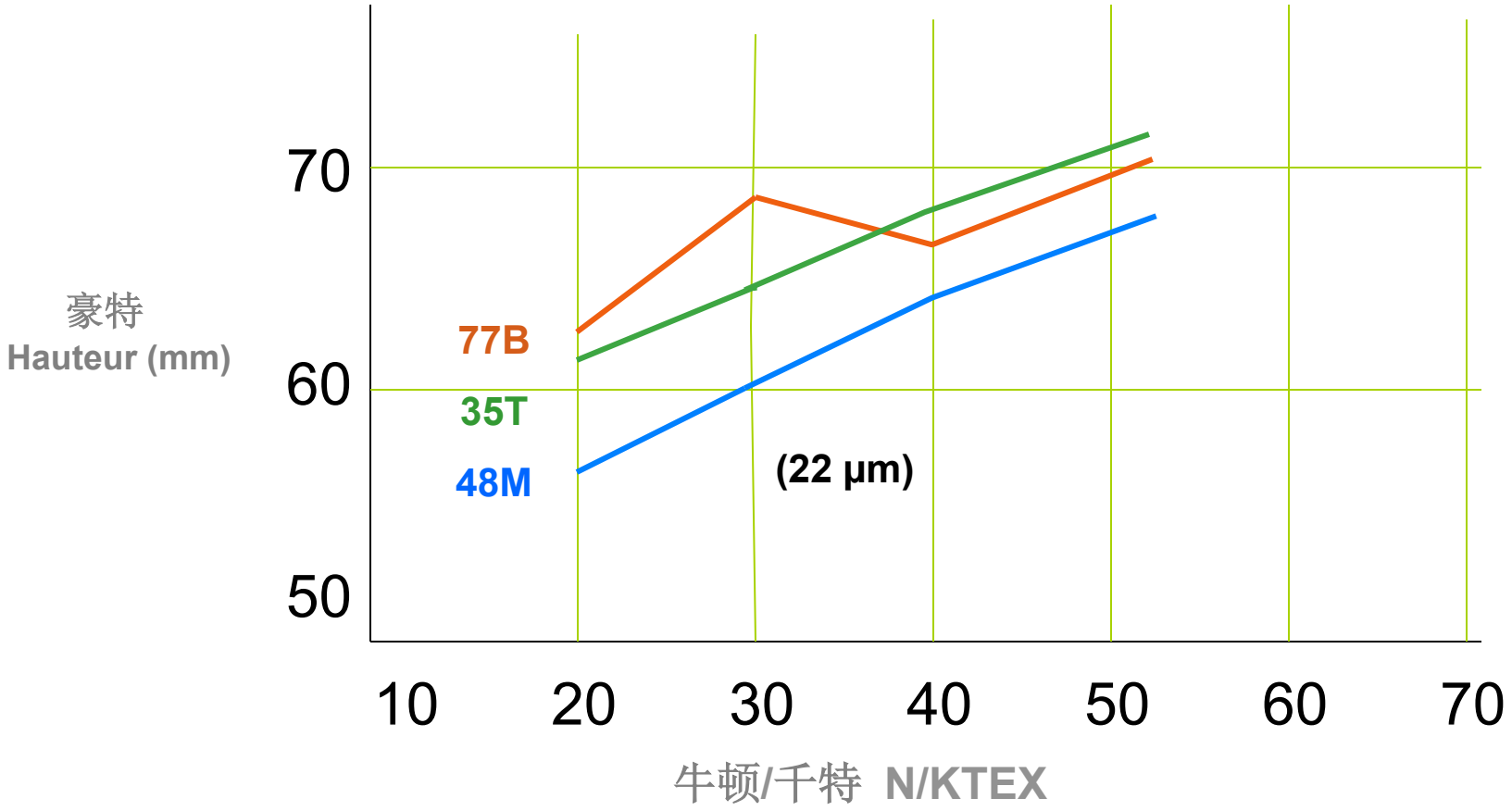
- **10%**捻度的降低，或者
  a 10% reduction of twist, or
- 提高**7%**的纺纱速率
  a 7% increase of spinning speed, or
- 相当于增加**1 µm**（更便宜）
  a cheaper (1µm coarser) wool

纤维长度离散
Coeff. of Variation of Fibre Length

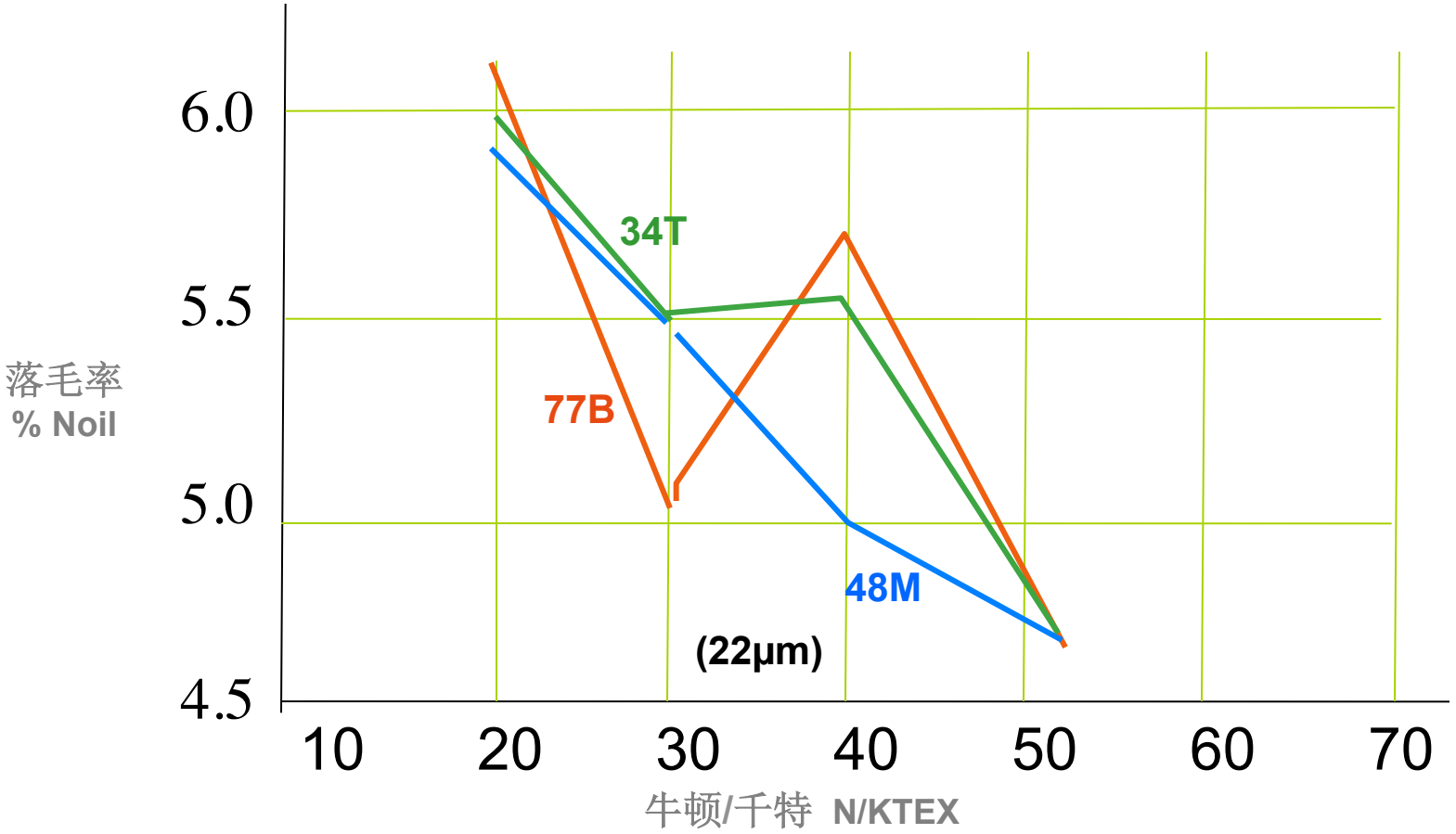
- 工业上通常认为**CV(H)**非常重要
  Industry generally claims CV(H) is very important
- 在混毛过程中毛丛长度长，毛丛强度低是一般可以获取较高的**CV(H)**。但是在混毛时应该注意比例。
  Longer staple length and lower strength gives a high CV(H). As does blending a wide range of fibre lengths
- 毛丛长度短一般减少纤维的扯断
  Shorter staples give less breakage
- 工业试验证实豪特值的影响比豪特离散要重要的多
  Controlled industry trials reveal it is the shorter H not the high CV(H) that matters

毛丛强度与断裂位置的影响
STAPLE STRENGTH and POB

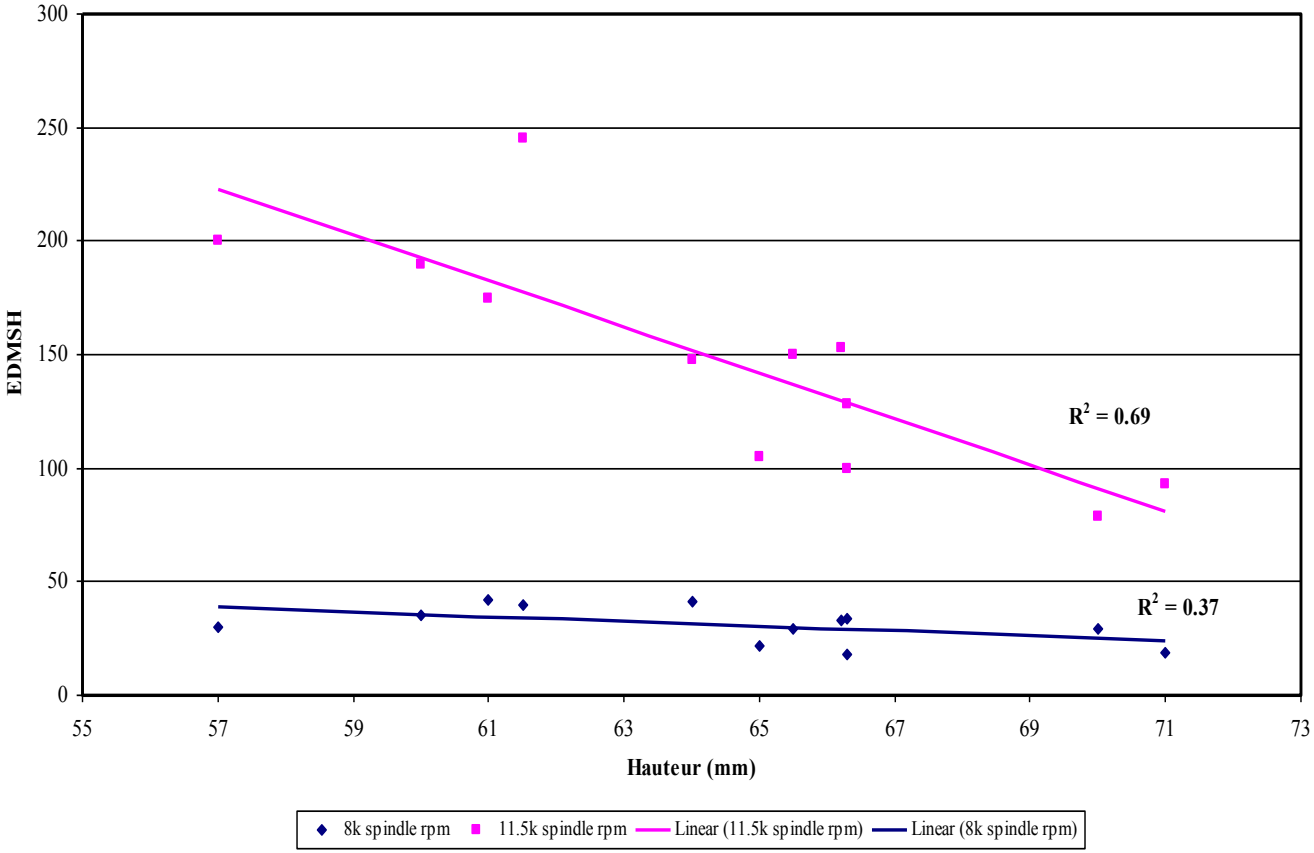
豪特、毛丛强度与毛丛断裂位置
Hauteur, Staple Strength, and POB



落毛率、毛丛强度与毛丛断裂位置
Noil, Staple Strength, and POB

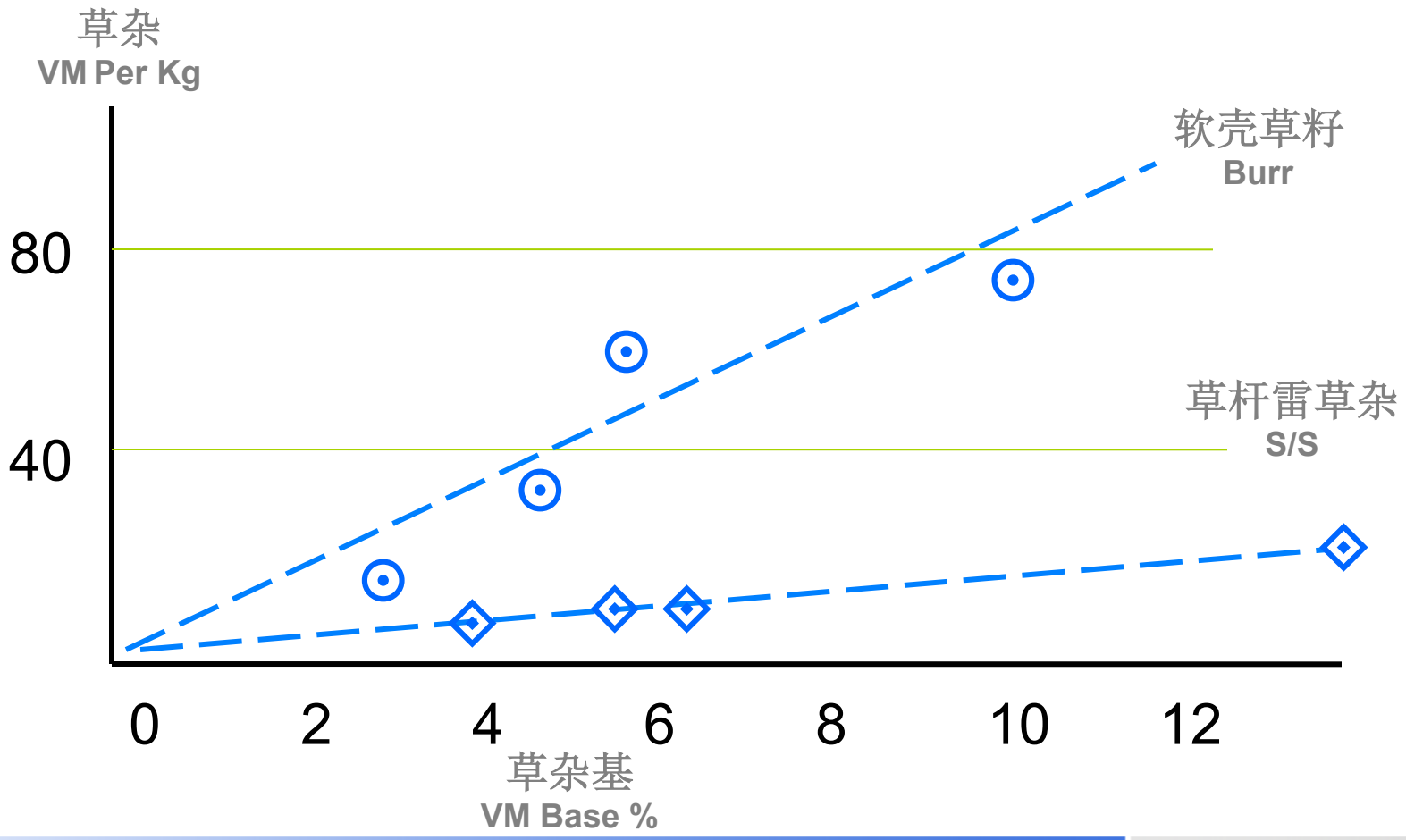


纺纱断头、毛丛强度与毛丛断裂位置
Spinning Breaks, Staple Strength, and POB



草杂的影响
VEGETABLE MATTER

草杂基与草杂在织物中的比较
VM Base and VM in Fabric



草杂含量
Vegetable Matter (VM)

对比生产线 Line	草杂基 VM Base %	毛条中的草屑 VM Top (Per Kg)		草杂所引起织物中的孔洞 Holes in Fabric (per kg)	
		>3mm	>10mm	Total	Due to VM
B, AAA	2.7	14	1.0	2.4	0
B, Pcs	10.7	83	13.2	4.5	1.0
K, AAA	2.8	5.2	0.4	0.7	0
K, Pcs	10.3	5.8	0.6	3.9	0.1

纤维卷曲度
FIBRE CRIMP

纤维卷曲度
Fibre Crimp

1. 检测的样品问题/准备工作
   Problems with Measurement sample history/ preparation

➢套毛
fleece

➢梳毛
combed

➢放松回弹之后
relaxed

纤维卷曲度
Fibre Crimp

- **2.** 对加工变化的影响
  Effects Process Variation

  - 制成率 – 从**0.5**至**1.0%**在落毛率上的增加相当于纤维卷曲度**10**度/**mm**的增加。
    Yield – 0.5 to 1.0 % increase in Romaine for each 10 degree/mm increase in curvature.

纤维卷曲度
Fibre Crimp

- **3.** 对加工变化的影响
  Effects Process Variation

➢ 纤维的方向性 (Fabric Dimensions)

- 纤维卷曲度越高将增加纤维的方向稳定性
higher crimp wool increase dimensional stability in use

➢ 织物的重量 (Fabric Weight)

- 随着纤维卷曲度的增加，织物重量亦增加
fabric weight clearly increases as fibre crimp increases

- 每增加**85**至**100**度**/mm**将导致织物重量**5%**的增加
an increase of 85 to 100 deg/mm caused a 10gsm in 200gsm, (5%), increase.

纤维卷曲度
Fibre Crimp

4. 对产品质量的影响
(Effects Product Quality)

- 起球 – 高卷曲度减少起球
  Pilling – higher crimp pill less
- 厚实感 – 高卷曲度增加厚实感(保暖？)
  Bulk – higher crimp gives greater bulk and cover (warmth?)
- 手感 – 高卷曲度产生僵硬感
  Handle – higher crimp tends to give stiffer handle

消费者的需要与偏好
Consumer Needs/Preferences

		需求比例 Preference share %
接触皮肤的柔软度	Soft Next to skin*	19
可机洗程度	Machine Washability	13
形状恢复	Shape Retention	12
手感柔软度	Soft to Handle*	11
轻质	Light Weight*	11
抗起球能力	Resist Pilling	10
抗褶皱能力	Crease Resistant	9
容易熨烫	Easy Ironing	9
滚筒干燥	Tumble Drying	6

* 41% - 纤维细度相关统计 *41% - Fibre diameter related

最终的使用
End - Use

- 后整理与织物的结构>> 纤维的特性
  Finishing and Fabric Structure >>Fibre Properties

刺痒
Prickle

特性Property		重要性Importance
纤维细度	**Fibre Diameter**	10
细度离散	**CVD (>27 micron)**	3
纤维长度	**Fibre Length**	2
纱线支数	**Yarn Count**	0
包裹因素	**Cover Factor (knit)**	4
后整理	**Finishing**	10

褶皱的回复
Wrinkle Recovery, WR

褶皱的回复（WR)

- 取决于恢复力
- depends on relaxing stress

- 纤维之间的摩擦力（不重要）
- lesser extent, fibre-fibre friction

细支羊毛 – 恢复效果差（少）
Finer Wools – Worse (small)

纤维卷曲度 – 卷曲度越高越好（少）
Fibre crimp – Higher crimp better (small)

起球
Pilling

特性 Property		相对效果 Relative Effect
织物厚度	Fabric Tightness	10
纱线捻度	Yarn Twist	5
纤维细度	Fibre Diameter	5
纤维的卷曲度	Fibre Crimp	?

颜色 Colour

漂白、光亮、彩色（女装）- 需要白色羊毛

White, bright, pastel (Ladies Wear) - need white wool

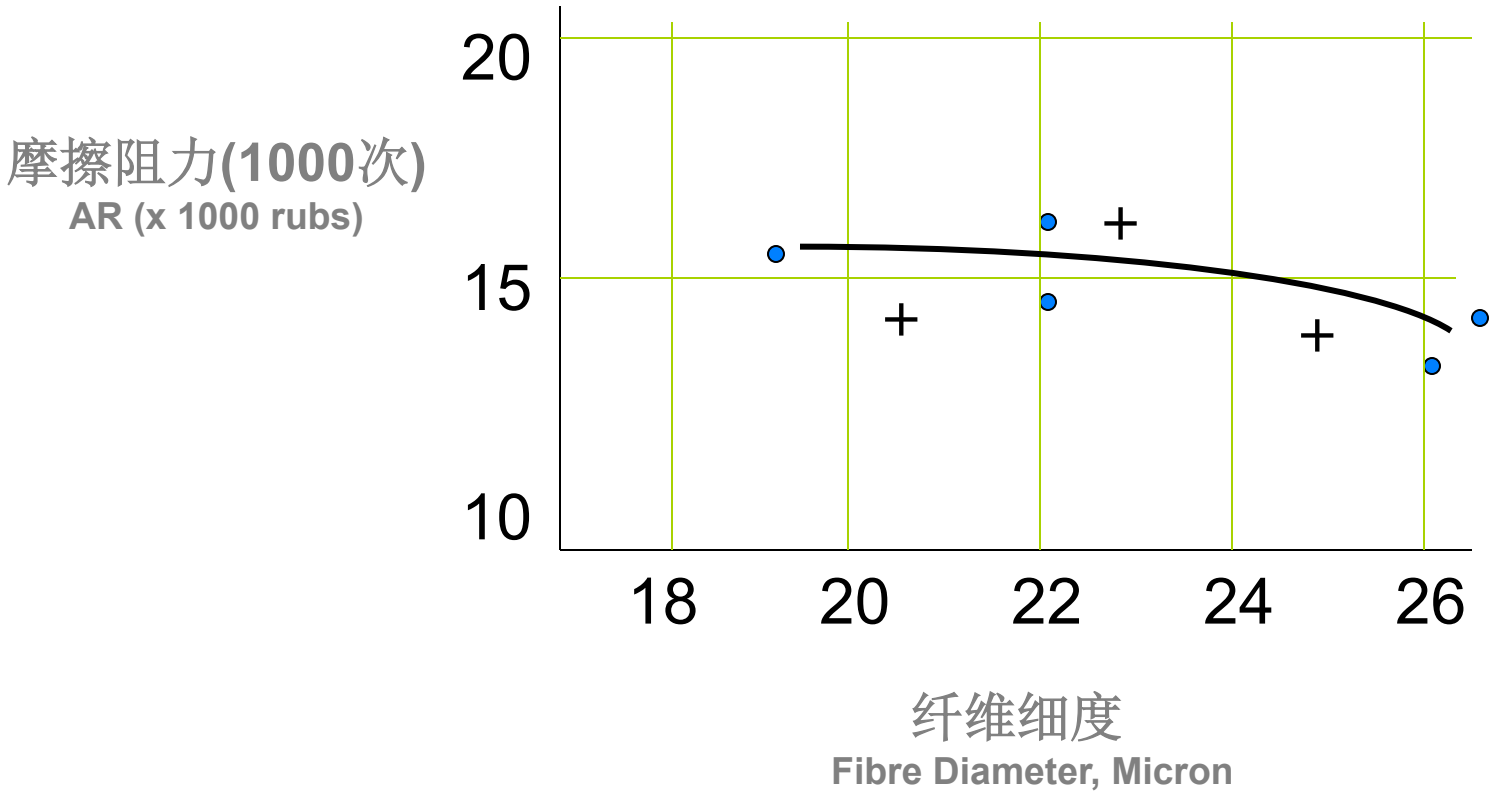
深颜色 – 颜色的重要性降低

– 但是颜色要保证一致

Dark Shades - Colour is less important

- Uniformity of colour

纤维细度与摩擦阻力
Fibre Diameter and Abrasion Resistance (AR)



纤维：加工与产品
Fibre: Processing and Product

原毛特性 Greasy Wool Property	Processing	Fabric
纤维细度 Fibre Diameter	XXXX	XXXX
制成率 Yield	XXXX	X
毛丛长度 Staple Length	XXX	X
毛丛强度与中断Staple Strength/POB	XXX	X
草杂含量 Vegetable Matter	XXX	X
洗净毛颜色 Clean Colour	XXX	XX
有色纤维含量 Dark Fibres	XX	XX
细度离散 Fibre Diam. Variation	XX	X
纤维的卷曲度 Crimp/Curvature	XX	XX
毛尖部位 Tip	X	X
水平模式 Horizontal	✓	?
垂直模式 Vertical	✓	✓

XXXX最重要

(Most Importance)

X重要性低

X(Least Importance)