羊毛的混配
Blending Wool

为了满足技术要求所生产质量稳定一致的毛条
for a uniform top which meets specification

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羊毛的混配
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为了满足订单的要求将所合适的羊毛按照质量与数量的比例进行均匀的搭配与混合以便达到质量一致的产品。
Consists of selecting the right amounts of suitable wools to fulfil an order & then mixing them to give a uniform product.

一旦羊毛混配的质量与数量被确定之后，每一个混合批将被视为*一个完整的单位*，并在随之而来的加工中始终作为一个*整体*加以对待。
Once the material has been selected it is a unit and should all be treated together.

羊毛混配的目的是在满足订单的前提下尽量减少费用
The objective is to fulfil the order with minimum outlay

- 羊毛的选配是非常复杂的工作，应由懂行的专业人员进行操作。
  Wool selection is a complex process best performed by experts
  - 关键的议题是否会充分利用客观检测的信息
    this is true despite the use of objective measurement
- 有一些种类的羊毛比较容易采购到
  Some wool is easy to obtain
- 而有一些种类的羊毛则不容易被采购到
  Some is less common
  - 尽管这类的羊毛可能只占混毛中的一个很小的比例，但往往非常重要而且难寻
    and despite only small quantities being required it may be a very difficult part of the blend to obtain

对于羊毛的要求首先应该与最终产品的要求紧密联系在一起
Wool requirements should be closely specified to fulfil the end product

- 使用的澳毛首先应该具备钻心取样与抓样取样的检测结果。只有这样对交货的质量才能够有保障。
  Use of wool which has been core sampled and grab sampled and tested provides an assurance that the consignment specification will be met.

- 如果可能的话，所采购的羊毛最好是作为生产加工的*整体*，并在加工过程中自始至终将该批羊毛作为一个*整体*加以对待。
  If possible order each consignment as a unit, fully specified, then process it through to top still as a unit.

羊毛混配的重要性
The importance of blending

- 最终的产品是纱线。这些纱线将会用来或织布或者制成针织产品
  The end product is a yarn which will be woven or knitted into fabric.
- 在纱线的截面积上，纤维的根数很可能为**40**根或者更少
  This yarn may have as few as 40 fibres or maybe even less in the cross section.
- 每一根纱线的截面积上应具有混原毛时所采用的相同纤维的比例
  Each cross section of the yarn should ideally contain a proportional blend of the input stock
  - 所以混合的过程是从最初阶段开始的！
    so blending needs to start early!

混毛的决策因素
Selecting a blend

- 一旦知道了纱线的技术要求之后毛条中的纤维细度与长度也将会被确认以便确保纱线的质量

  When the yarn requirement is known,the mean fibre diameter and length requirements of the top necessary to produce a good quality yarn are known.

- 使用预报技术如**TEAM**公式便可以将毛条的豪特长度**(Hauteur)**、豪特长度离散**(CVH)**以及落毛率**(Noil)**加以控制

  By use of the prediction formulae such as TEAM it is possible to calculate the expected:
  - mean fibre length – *Hauteur (mm)*
  - coefficient of variation of length – *CVH (%)*
  - Romaine or Noil – *(%)*

TEAM-3公式

The TEAM-3 formulae

- 豪特（**Hauteur**）

  H = 0.43SL + 0.35SS + 1.38D - 0.45VM - 0.15MBC - 0.59CVD – 0.32CVL + 21.8

- 豪特离散（**Coefficient of Variation of Hauteur**）

  CVH = 0.30SL - 0.37SS - 0.88D + 0.17MBC + 0.38CVL + 35.6

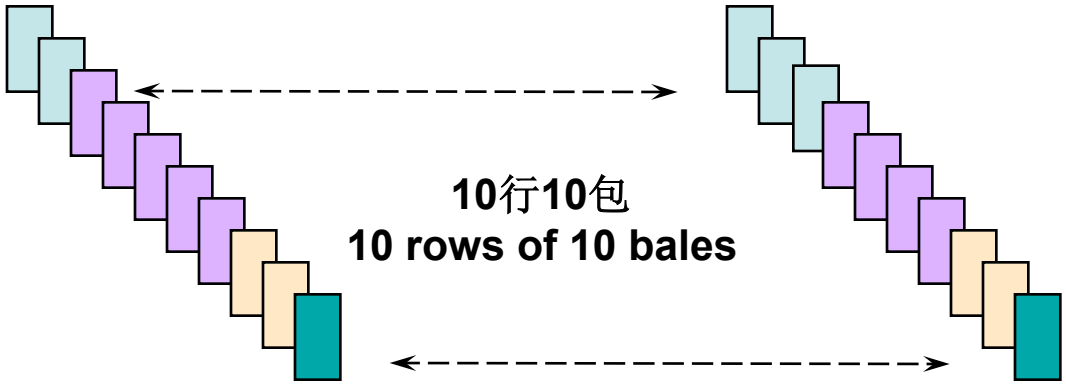
- 落毛率（**Romaine**）

  R = -0.13SL - 0.18SS - 0.63D + 0.78VM + 38.6

SL = 毛丛长度	*Staple Length*
SS = 毛丛强度	*Staple Strength*
D = 纤维细度	*Diameter*
VM = 草杂含量	*Vegetable Mater*
MBC = 中部断裂	*Corrected mid breaks (if <45%, MBC = 45%; if >45%, MBC = actual value)*
CVD =细度离散	*Coefficient of variation of fibre diameter*
CVL = 毛丛长度离散	*Coefficient of variation of staple length*

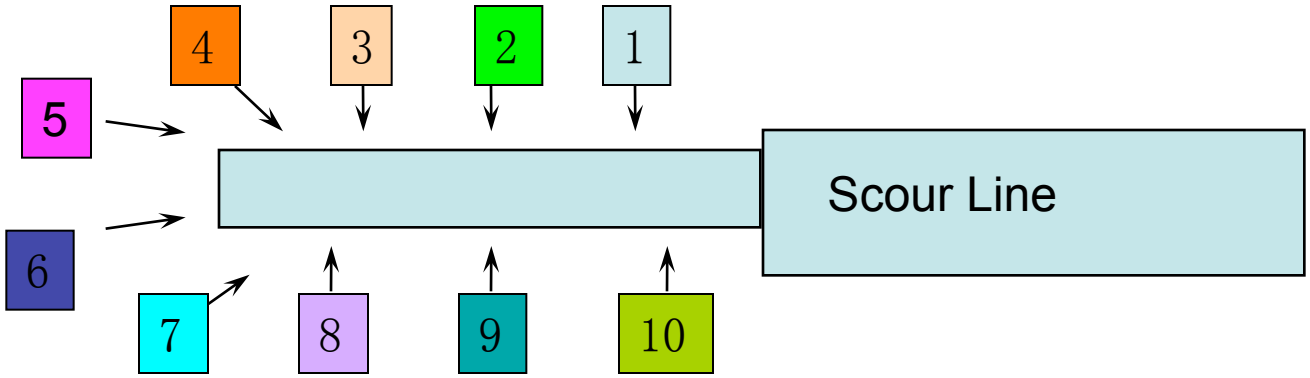
羊毛的混配
To mix the blend

- 在混毛中存在多少不同种类的羊毛？
  How many wool types are in the blend?
- 每一个种类的羊毛有多少包？
  How many bales of each type?
- 在现场将毛包按比例放置好，以便每一行中均有相同的代表性
  Organise the bales in the warehouse so that each row of bales forms a representative blend.



在洗毛机前
At the scour

- 将混合好的一行毛包围着洗毛机摆放
  One row of bales round the scour
- 不要选毛
  Do NOT sort the bales if specified
- 如果对混毛比例有异议，应该将整包羊毛去除
  If in doubt about meeting specification reject a full bale
- 从毛包中取毛应该按照一定顺序进行
  Take material from bales in sequence



对洗净毛的开松
At the scoured wool opener

- 对洗净毛的开松过程应该按照洗毛初始阶段，中间阶段以及最后阶段进行开松。在洗净毛进入梳毛机之前还将对羊毛进一步的混合

  By feeding material from the start, middle and end of the scour run, further blending will occur before entering the card.

在毛条制造过程中
During Topmaking

- 并合（**Doublings**）
  - 头道针梳（**1st Gill**） **1 x 6 = 6**
  - 二道针梳（**2nd Gill**） **6 x 6 = 36**
  - 三道针梳（**3rd Gill**） **36 x 6 = 216**
  - 精梳（**Comb**） **216 x 24 = 5184**
  - 头道末针（**1st Finisher**） **5184 x 4 = 20736**
  - 成条（**Topmaker**） **20736 x 6 = 124416**

在梳毛与成条过程中一共进行了**124416**次并合
***124416* doublings between card and top**

羊毛的混配
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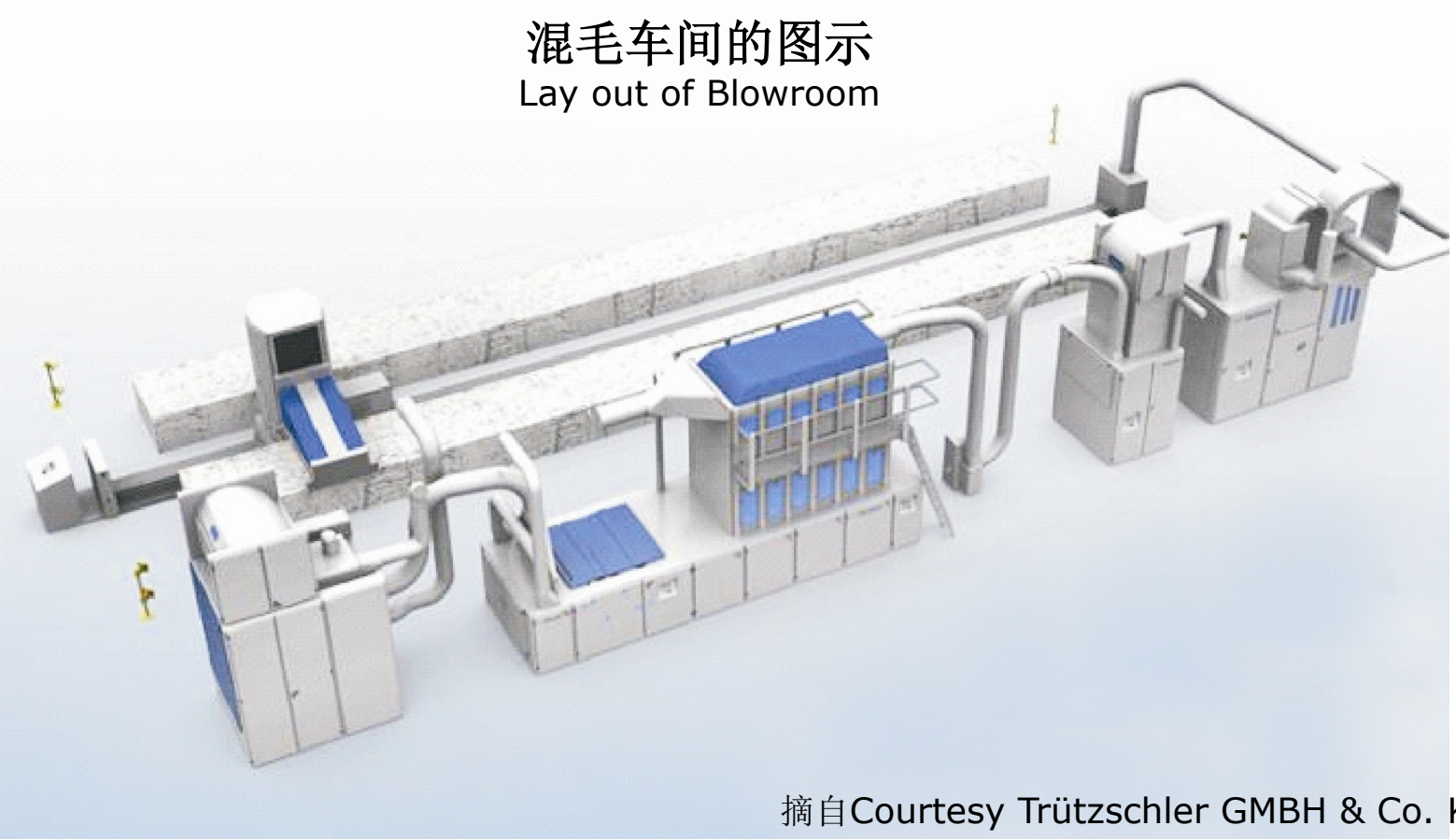
混毛车间的图示
Lay out of Blowroom



摘自Courtesy Trützschler GMBH & Co. KG

有意识地对纤维按照一定目的的混合应该满足两个目的
An 'engineered-in' fibre selection should meet two main objectives.

1. 投入纤维的特性一至并且与最终产品的要求所对应
   A uniform profile of the characteristics of input fibres and corresponding end products

2. 保证产出的产品特点代表了平均的价值并且满足要求
   Maintain the average values of output characteristics at their desired levels

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2), 1995

棉花工业的经验
Cotton Industry Experience

就经济效益而言，对纤维合理的选择应该考虑以下几点：
Economically, a proper fibre selection strategy should result in:

1. 对毛包更好的管理
   Better bale management
2. 改善毛包的收取方法
   Improved cotton bale acquisition
3. 改进工厂的效率
   Improved mill efficiency
4. 对棉花的最优化使用
   Optimum cotton use

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2), 1995

纤维的选择程序应该包括四个步骤

A fibre selection program should involve four basic steps:

1. 检查毛包内纤维特性的分布状况
   Examine the population distributions of fibre properties of the bales
2. 根据羊毛包内的羊毛参数的特点以及分布对羊毛进行混配
   Implement reliable bale picking schemes based on the distributions of fibre properties of the bales
3. 为了更好地控制产出品的参数一致性和平均性，应该建立合理的纤维与纱线的关系
   Control average output characteristics by developing reliable fibre-yarn relationships
4. 验证纤维的混合是否合理，应该监测产出端的一致性以及是否满足纱线的要求
   Verify the effectiveness of the fibre selection program by monitoring the uniformity of fibre characteristics of bale laydowns and corresponding yarn characteristics

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2),

毛包抽取方案
Bale picking schemes

1. 随机抽取方案
   Random picking scheme

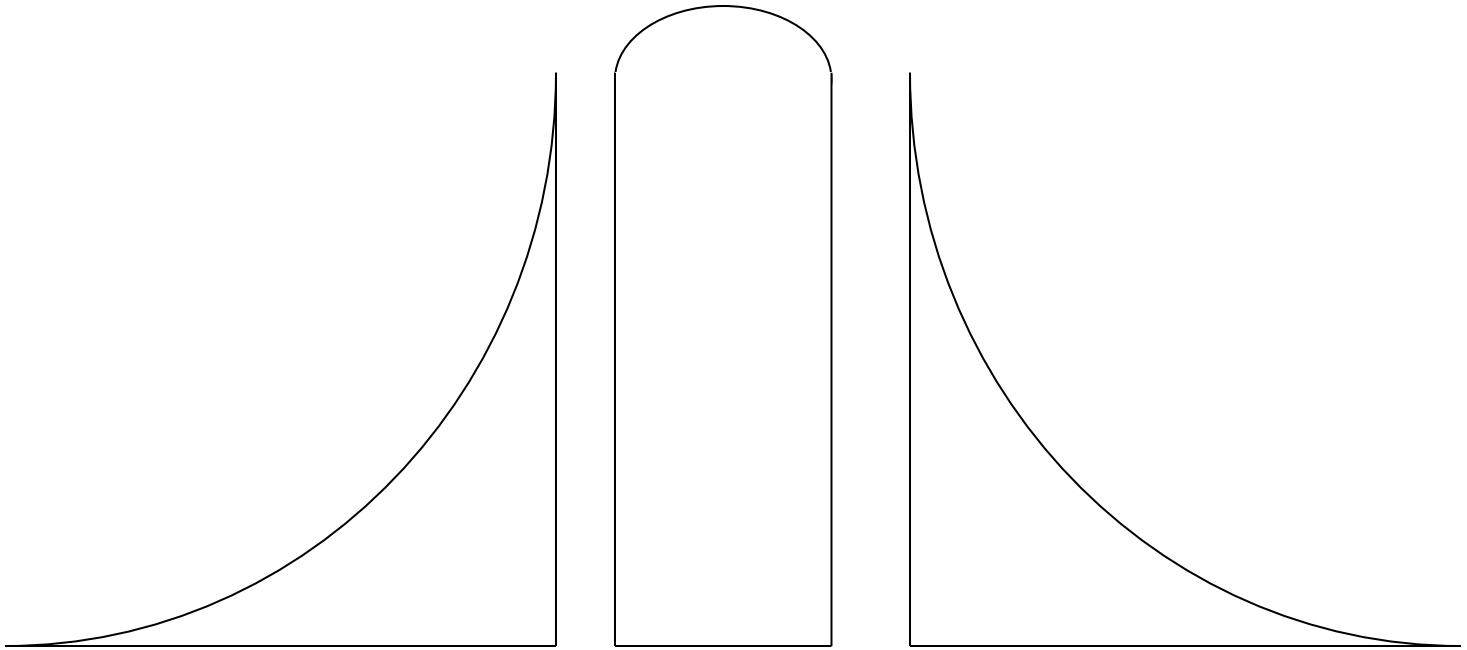
2. 重量比例抽取方案
   Proportional weight category picking scheme

3. 最优化抽取方案
   Optimum category picking scheme

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2),

羊毛纤维直径的正态分布图

Normal distribution of a fibre property, e.g. diameter



第一类　低
Category 1:
Low

第二类　中
Category 2:
Median

第三类　高
Category 3:
High

随机抽取方案
The random picking scheme

1. 陈旧和传统的数量混毛方案
   An old approach of massive bale blending

2. 羊毛包从已经混合好的批次中随机抽取
   Bales are picked randomly from the parent bale population

3. 任何价值与特点的纤维均会在混毛中有出现的可能
   Any value of the fibre characteristic will have the same opportunity to be represented in the mix

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2),

随机抽取方案
The random picking scheme

1. 如果能够做到彻底的随机抽取，则这个方案是最理想的方案
   If complete randomisation can be achieved this will result in ideal mixing

2. 数量的基数越大则参数差异也会越大（只适用羊毛吗？）。所以纯粹的随机抽取方案难度非常大，不实际。
   For large populations exhibiting high variability in fibre characteristics (typical for wool?), complete randomisation becomes extremely difficult

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2), 1995

重量比例抽取方案
The proportional weight category picking scheme

1. 在了解羊毛参数特性分布之后应该将配毛的比例按照几率大小进行数量上的合理搭配
   Bales belonging to a certain category should be represented in the mix in numbers proportional to the relative frequency of their category in the population

2. 在指定的范围内，毛包应该是被随机抽取
   Within a given category, bales should be picked at random

3. 这个方案适用于羊毛特性的分布呈正态分布 – 大数量纤维的混合在批次之间可能造成参数大的波动
   This scheme is suitable for populations that are normally distributed – large variations result in large between mix variability

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2),

最佳的抽取方案
The optimum category picking scheme

1. 建议在原毛参数差异过大的时候采用这种抽取方案
   Recommended for distributions exhibiting large differences in category variances

2. 根据拉格朗日递增分析法 – 在一个或多个不变量的情况下确定多变量的最大值与最小值
   Based on Lagrangian multiplier analysis - a method for finding the maxima and minima of a function of several variables subject to one or more constraints

3. 羊毛采购的决策将由多种因素决定。其中包括生产成本（如劳务与能源）。然而不论怎样，纤维的混合必须均匀。只有这样，成本与纤维的差异才能够得到均匀的分配。
   The number of fibre properties within a category is selected with respect to cost of sampling a fibre property from each category (labour, energy), the within category variance and the total number of fibre properties in each category

Ref.: El Mogahzy Y and Gowayed Y; Theory and Practice of Cotton Fibre Selection, Parts 1 & 2; TRJ 65(1) & 65(2),

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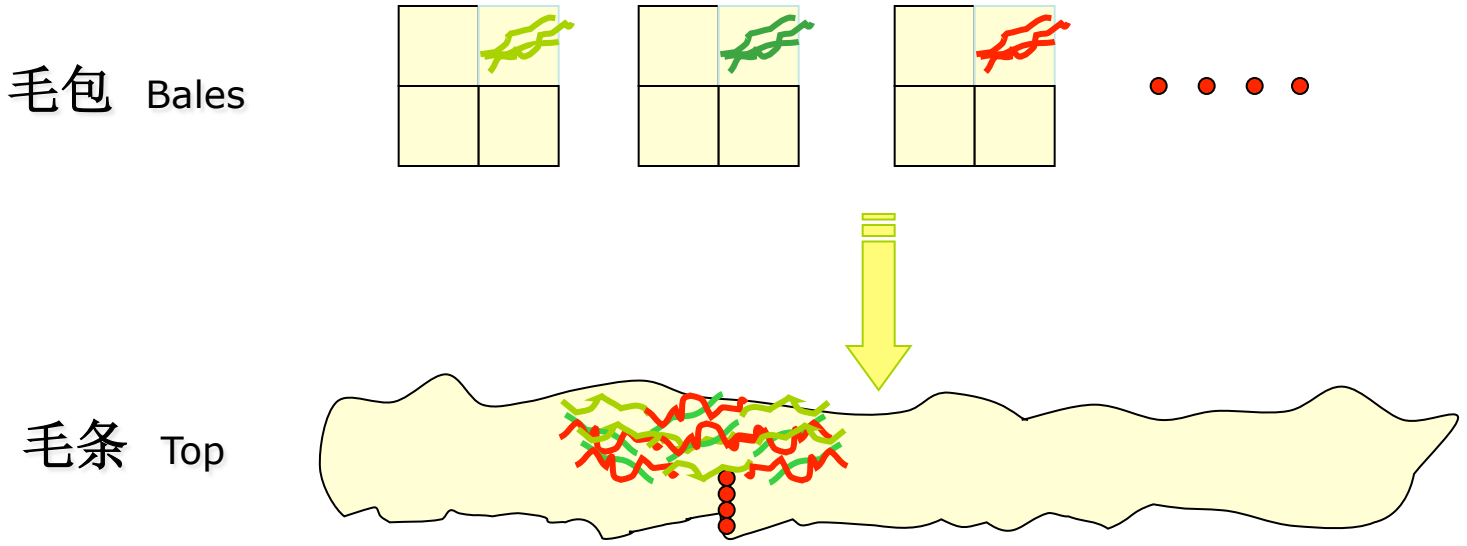

- 目标是：每一米的毛条中都均匀含有以上各种类的羊毛
  Objective: every wool type in each m of top

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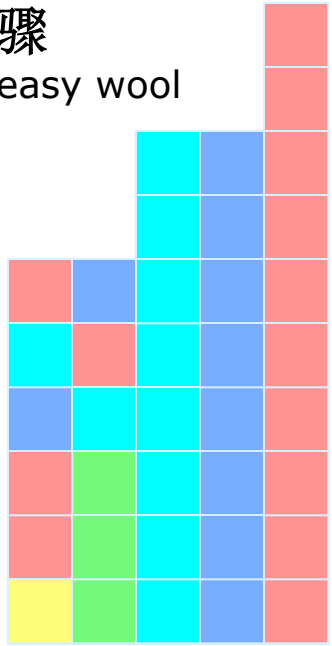
原毛混配的程序与步骤
Blending procedure for greasy wool



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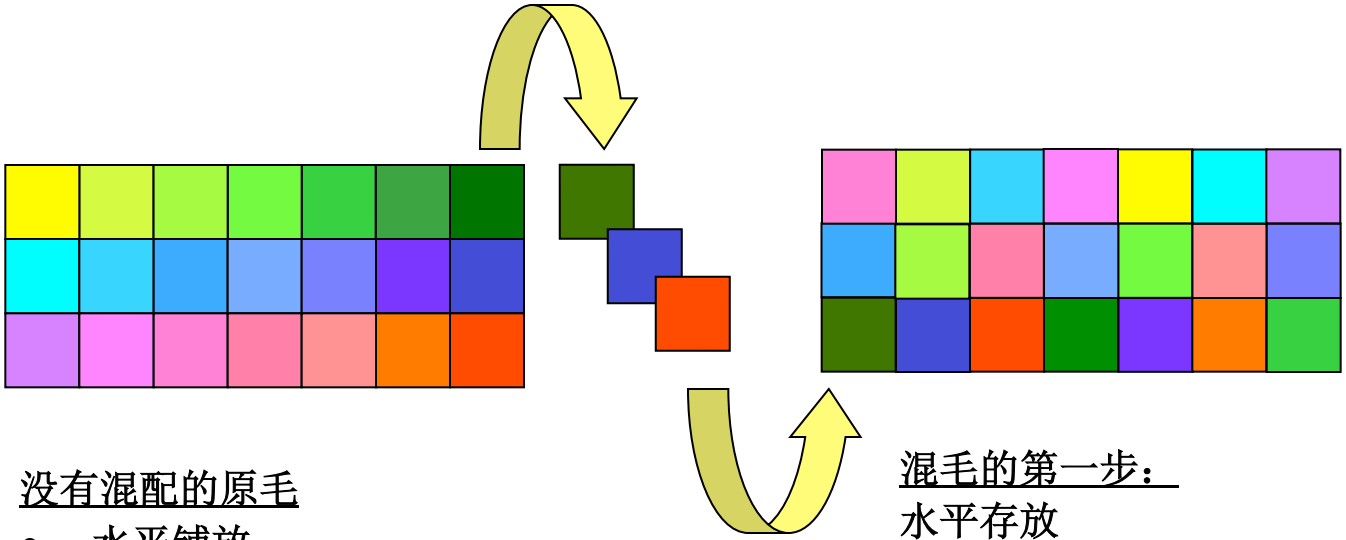

没有混配的原毛
- 水平铺放
- 垂直切取

Unblended wool
Horizontal layers
Vertical cuts

混毛的第一步：
水平存放
羊毛混合
均匀混合
关键点是所有的毛均匀混合在一起

First stage blending
- Horizontal deposition
  - Mixing of wool
  - Uniformity of blend
- Key condition - all wool together

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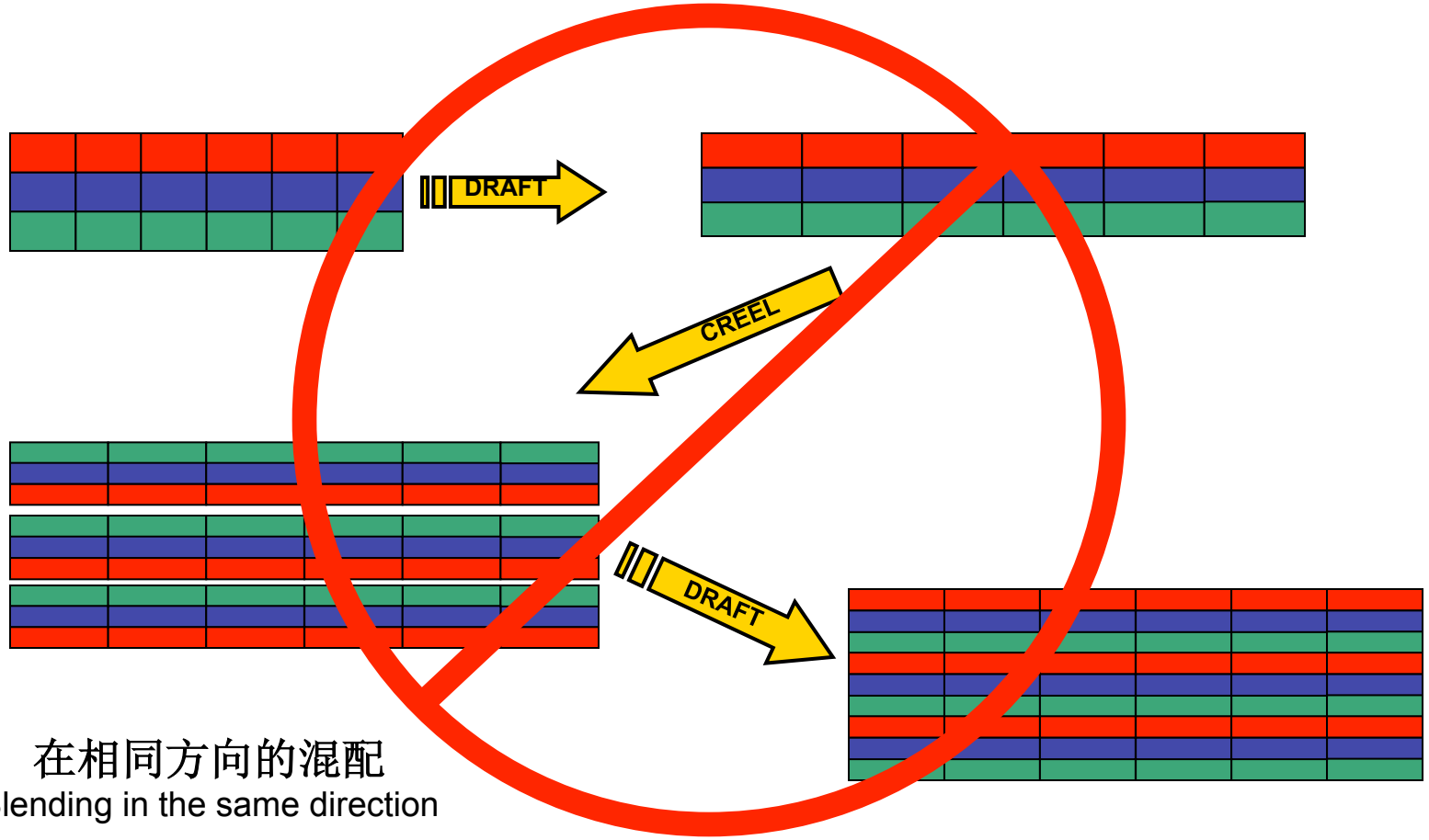

在相同方向的混配
Blending in the same direction