



Deep shelf/slow speed processing vessels

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Drums fitted with deep shelves and rotating at relatively slow speeds for wet processing hides into leather were first brought into use in the mid-1990s. Since that time the technology has evolved, and they are now being used for soaking, liming, tanning and retanning/dyeing.

The external appearance of these drums is little different from the conventional wooden drum, although alternative materials such as plastics and stainless steel are being used in construction.

However, the internal structure has evolved and been developed, and in general the shelf depth is now up to approximately 50% of the drum radius. The most common construction uses shelves with a straight leading edge, but the technology includes curved leading edges, and straight edges shaped with a waved profile, all with the objective of gaining the best balance between hide spreading/opening and mechanical action. Either three or four shelves are fitted within these drums, being orientated towards the centre of the drum (both forward/reverse rotation), or set slightly off centre (above the axle line) so that a scoop is formed between the shelf, end of the drum and the drum body (favours forward rotation).



the shelf and dropping to the base of the vessel. Because the mass is large the hides on the bottom of the shelf are compressed as they are lifted on rotation – thus absorbing chemicals in solution. There is then a pressure release when the mass slides from the shelf to drop with the float, followed by more compression when the load lands at the bottom of the drum for the cycle to repeat. The height of this drop and the weight of the mass are much greater than found in the traditional drum so the compression/direct mechanical action is thus greater.

Because the mass needs to drop cleanly to the bottom of the drum body and avoid contact with lower shelves the drum speed needs careful attention. This means that in practice the speeds of rotation are slow compared to conventional vessels, typically 0.7 rpm for washing and soaking, 1.4 rpm for liming/unhairing and tanning, and 3.5 rpm for retanning/dyeing. This slow speed of drum rotation minimises friction and thus reduces the danger of grain scuffing.

Advantage is also gained when drums are filled with hides and float above the axle level. Where shelves/pegs of conventional length are fitted, their action on rotation has little effect in the



Examples showing deep shelf drums being used for dye/retan/fatliquor. The leading edge of the shelf can be profiled, and different drainage arrangements enable recirculation of floats.

Different mechanical action

The action of these drums is very different from traditional vessels fitted with shelves and pegs.

The relatively shallow shelves fitted within the traditional drum coupled with a fast speed of rotation lifts part of the hide mass before the hides drop back into the float. However, this creates a rolling motion which caused twisting or rolling of individual pieces. The use of pegs alone causes a teasing action which avoids this rolling motion, and this is so effective that pegs are commonly found in combination with shelves fitted in traditional drums and tri-compartmental vessels.

But deep shelves ensure that, on rotation, a very large mass of hides is lifted high within the drum before gently sliding from

centre of the hide mass. However, deep shelves provide a deep stirring action and move the hides throughout the mass.

Advantages can be summarised:

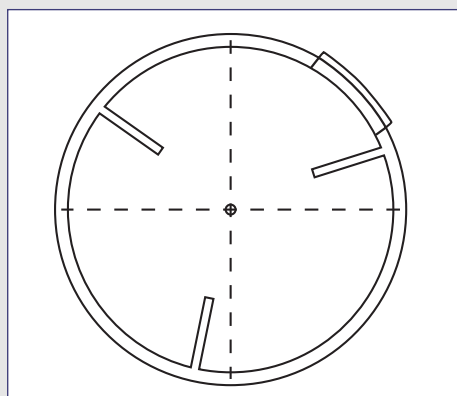
The following advantages have been stated:

- Goods/float above the axle (soak/unhairing/liming): Gentle folding and thorough stirring action throughout the whole load.
- Goods/float below the axle (tanning/retan/dyeing): Goods are lifted near to the top of the drum, and then slide from the shelf to the bottom of the drum to provide very direct mechanical action.

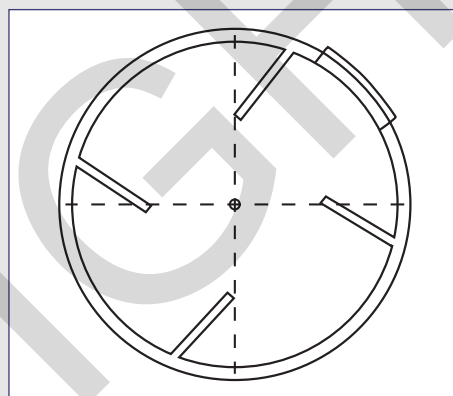


- Low level of friction minimises the dangers of scuffing or abraded grain.
- No rolling action of goods as can be found with conventional shelves: hides better spread out in processing.
- No peg pressure indents in the goods.
- Yield/quality no different to when using pegs.
- Speed of rotation: 0.7, 1.4 or 3.5 rpm.
- Greater consistency from processing loads of various weights when compared to traditional drums.
- Because of the slow speed of rotation compared to conventional drums:
 - 50% power requirement,
 - very quiet in use,
 - reduced maintenance.
- Recirculation, loading, unloading, etc., as conventional constructions.
- Water savings between 0 to 25%.
- Chemical saving stated between 0 to 10%.

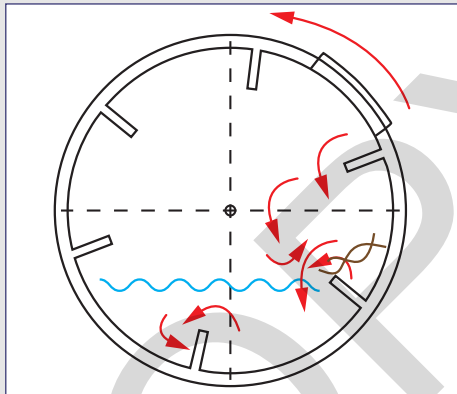
Construction and motion within drums fitted with deep shelves



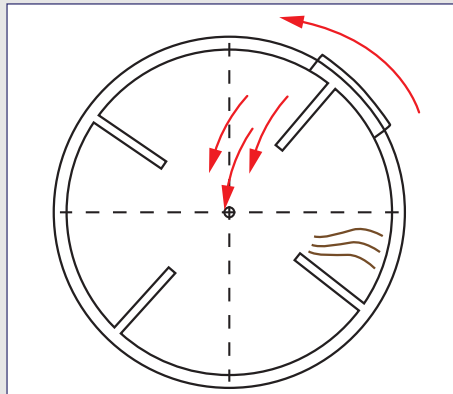
1: Shows construction with three shelves orientated to the axle (centre).



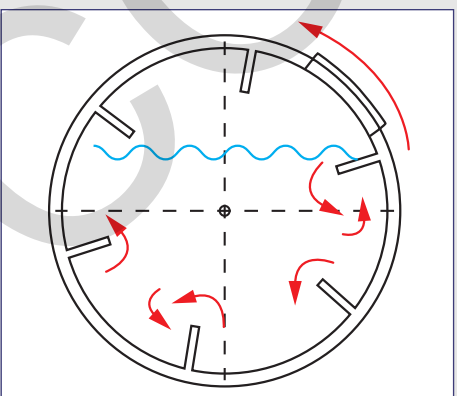
2: Shows construction with four shelves orientated at an angle to the axle (centre).



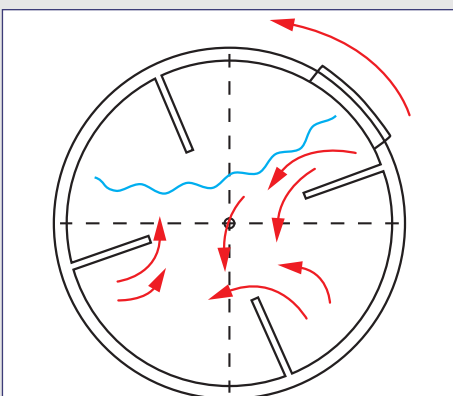
3: In conventional drums, on rotation, a rolling motion of the hides and sides develops that leads to pieces twisting.



4: With deep shelf construction and slow speed of rotation, pieces are lifted high in the drum, and then drop to the drum base without rolling.



5: When conventional drums rotate with the load/float above the axle, the movement of the mass is restricted to the peripheral parts.



6: With deep shelf construction with the load/float above the axle, movement occurs through the whole of the hide mass.