

Development of a hand operated dehuller

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Objectives

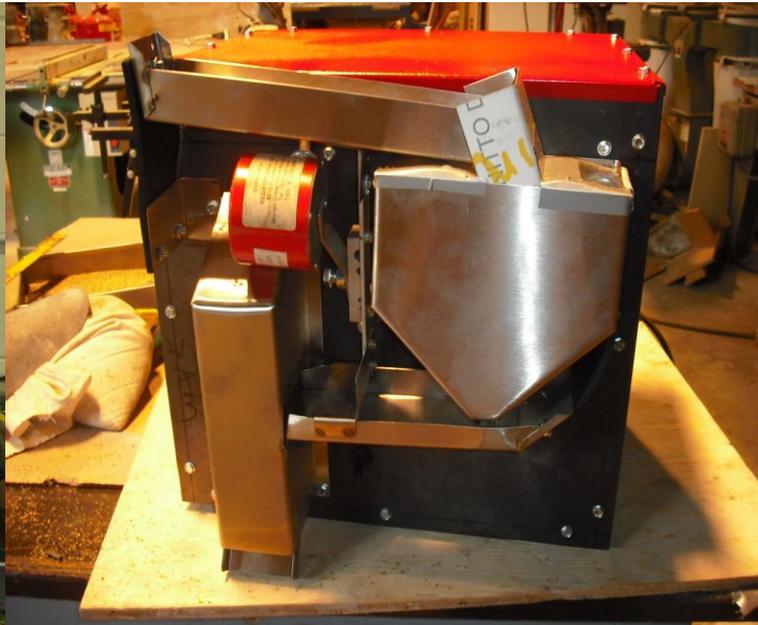
1. To develop a hand operated dehuller for millets

- *Ease of operation and handling*
- *Efficiency >95%*
- *Minimal broken grains*
- *100% husk separation from dehulled grains*



Fabrication of Hand Operated Millet dehuller

Millet dehulling equipment development



McGill

Testing



Centrifugal



Rollers + Centrifugal

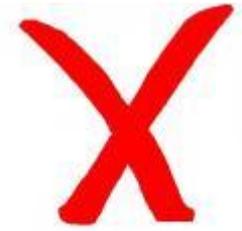


Rollers

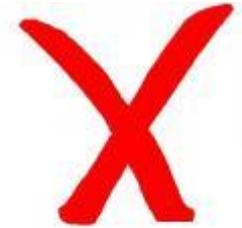
Results



- **Centrifugal**
 - Low efficiency



- **Centrifugal-Roller Combination**
 - High efficiency
 - High broken



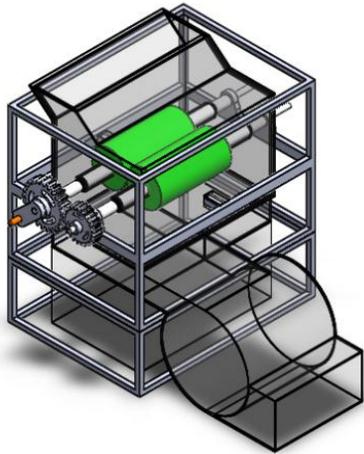
- **Rollers**
 - High efficiency
 - Low broken



Design

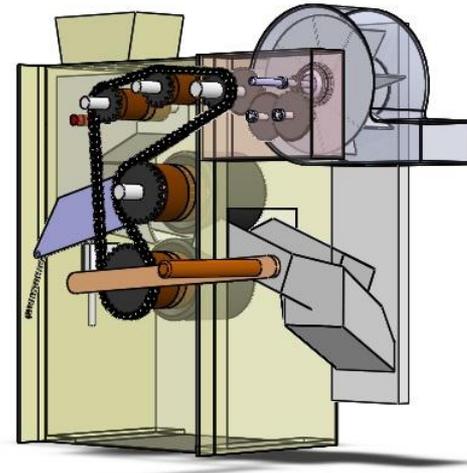
Initial proposed design

- Gears for operating the machine

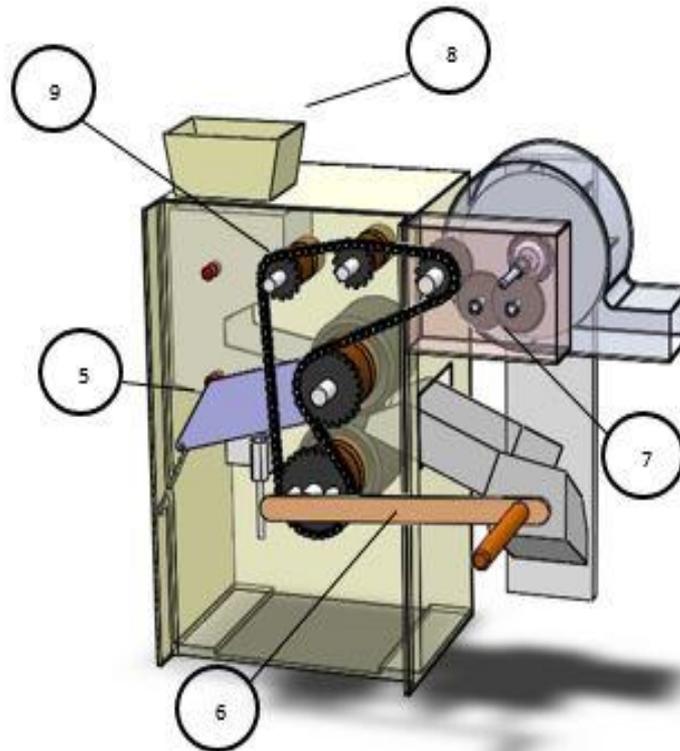
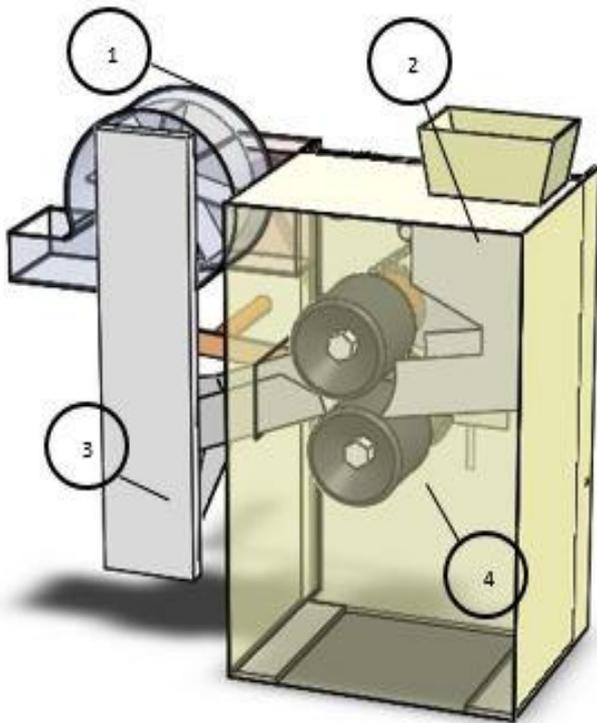


Final implemented design

- Chain-sprocket mechanism for rollers; gears for blower fan



Design



DEHULLER COMPONENTS

1. Centrifugal blower
2. Feeding chute
3. Vertical channel
4. Rubber rollers
5. Lever for spacing adjustments
6. Crank handle
7. Gear box
8. Hopper
9. Chain-sprocket arrangement

Operating principles

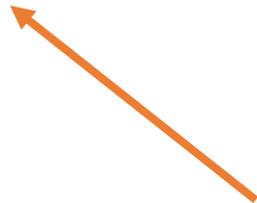
Dehulling = Shearing + Friction



Rollers



Chain-Sprocket arrangement



Aspirating = Centrifugal force



Blower



*Spur gear assembly
(compound gear train)*



Power transmission

Testing

The machine was tested with **3 millet varieties** at **4 different roller spacing** to determine the optimum spacing range suitable to dehull millets.



*Foxtail
millet*

Kodo millet



*Barnyard
millet*

Testing of performance

Whole grain



Dehulled grain



Hulls



Broken grain



Testing

- Complete dehulling of the grains was achieved after three passes
- However, for kodo millet more than three passes are required to achieve complete dehulling

Roller spacing (in mm)	Results (3 – pass)								
	Foxtail millet			Kodo millet			Barnyard millet		
	A	B	C	A	B	C	A	B	C
0.20	99.4	97.96	0.30	72.3	65.26	0.36	99.01	94.27	0.47
0.25	99.4	98.10	0.83	76.83	68.96	0.19	99.44	94.17	1.22
0.30	98.84	97.24	0.36	64.8	59.03	0.08	94.99	90.03	0.32
0.35	98.06	94.88	0.125	41.15	37.82	0.03	93.06	87.49	0.08

A – Dehulling efficiency; B – Head rice recovery; C – Percentage broken grains

Final design



Front view



Back view

Summary

- ✓ The fabricated dehuller can be used as a 3 – pass processing system to dehull millet varieties like foxtail and barnyard.
- ✓ Reduced broken grains (to < 0.5-1.2%)
- ✓ More than 99% hull separation was possible for foxtail millet and more than 93% for barnyard millet. Kodo millet achieved around 75% hull separation

Thank you



Questions

