

DEVELOPMENT OF ECO-GIN

General Situation

The textile chain in Pakistan starts with the process of cotton ginning, which is considered as a weak link in this chain. The quality of ginned cotton produced by majority of the ginning factories is poor. Foreign contaminants such as small pieces of poly-propylene (PP), poly-ethylene, jute fibers, hairs of cotton pickers etc., get included in the seed cotton and consequently in cotton bales. The trash content is usually above 8%.

The quality of ginning has improved world wide. The cotton sold in the world market is of improved grade. It has become therefore, imperative that we should improve the quality of ginning to effectively compete with the world market. The world textile industry requires trash free cotton. The modern ginning factories have to produce cotton to satisfy the requirements of foreign buyers and textile mills. There was therefore, a dire need to modernize our ginning industry.

The establishment of some latest and most modern cotton ginning factories should be encouraged. Since capability to manufacture ginning machinery exists in the country, as such, the latest ginning machinery can be fabricated by the local manufacturers provided they are given necessary facilities.

Sr. No.	Province	No. of Factories	%age	Gin-Stand With No. of Saws			
				80	90	100	120
1.	Punjab	1063	84	136	2758	1842	96
2.	Sindh & Baluchistan	200	16	22	856	35	0
Total		1263	100	158	3614	1870	96

Effect of Ginning on Cotton Quality

Among the factors affecting quality of cotton, ginning is one of the main factors. The absence of standards for ginning machinery and improper ginning practices affects the quality of cotton. Furthermore, the present ginning machinery is very old and the parts and components vary in sizes. Since Engineering Development Board (EDB) is functioning under the administrative control of Ministry of industries, Production & Special Initiatives (MoIP&SI) therefore, EDB was entrusted the task of up-gradation and standardization of ginning machinery. In pursuance of the directive of the Ministry, EDB conducted the survey of ginning industry and ginning machinery manufacturers to evaluate and identify:

- Existing ginning practices;
- Possible measures to be adopted to improve technical up-gradation / modification of ginning machinery; and
- Areas of manufacturing where suitable manufacturers can be developed.

During June 2005 on recommendations of EDB, MoIP&SI constituted a Task-Force for the development of up-graded and standardized ginning machine. The Task-Force comprised of following members from public and private sector:

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| 1. | Ch. Masood A. Majeed
Executive Director
Bismillah Cotton Ginning Industries
Bahawalpur | Chairman |
| 2. | Mian Mahmood Ahmad
Managing Director
Mahmood Cotton Ginners
Khanpur, Rahim Yar Khan | Member |
| 3. | Dr. M. Yasin Bhatti
Director
Agriculture Mechanization Research Institute (AMRI)
Multan | Member |
| 4. | Mr. Liaquat Ali Khan
Joint Director
Pakistan Cotton Standard Institute (PCSI)
Karachi | Member |
| 5. | Mr. Khalid Kifah
Deputy General Manager
Small & Medium Enterprises Development Authority
(SMEDA)
Lahore | Member |
| 6. | Mr. Alamgir Akhtar Khan
Assistant. Agri. Engineer
Agriculture Mechanization Research Institute (AMRI)
Multan | Member |
| 7. | Engr. Ch. Amanullah
Managing Director
New Chaudhry Agri. Mech. Engrs.
Multan | Member |

8.	Mr. Muhammad Mahboob Director Mian Rahim-ud-Din & Sons Multan	Member
9.	Mr. Javed Ashraf Malik Deputy General Manager Engineering Development Board Islamabad	Member/Secretary

Objectives of the Task-Force were:

- Improve quality of cotton lint
- Interchangeability of Standard Parts and Components
- Maximize Staple Length
- Minimize Cotton Wastage
- Decrease in Power Consumption
- Provide Consistent Production of Ginned Cotton of Constant Fiber Length

Issues in Ginning Industry

- Non Standard Machinery and parts
- Non Consistent Feed Rate
- Damaged Staple Length during Ginning Process
- Inadequate Saw Projection Through Huller & Ginning Ribs
- Inappropriate Saw Diameter & Speed
- Use of Worn Out Saws, Ribs & Spacers
- Excessive Heating of Seed Cotton
- Lack of Moisture Control System
- Inefficient Trash Removal
- Non Standard Design and specs of Machine
- Lack of Trained Ginners, Fitters & Manufacturers

The Task-Force developed a new prototype Saw-Gin machine with 124 saws named as ECO-GIN and got it installed at Bismillah Cotton Ginning Industries, Bahawalpur before the start of last ginning season.

ECO-GIN

ECO-GIN is designed on standard parts available in Pakistan i.e. Saw-Gin Blade, Ribs, Spacers, Shafts, Motors, Controls etc.



Description	Conventional	ECO-GIN
Feeder Cleaner		
Design	Straight Spike Rolls Cleaner	Feeder Extractor Cleaner
No. of Channel Saw Rolls	Not Installed	2
Dia. Of Channel Saw Rolls	-	508 mm
Height of Channel Saw Rolls	-	9.5 mm
Doffing Brush Rolls Dia.	Not Installed	406 mm
Brush Height	-	50.8 mm
No. of Spike Rolls	4 – 6	4
Dia. of Spike Rolls	250 – 279.4 mm	266.7 mm
Material of Spike Rolls	MS Sheet of Pipe	MS Pipe
Length of Spike	38 mm	38 mm
Dia. of Spike	6.35 mm	10 mm
ECO-GIN		
Chamber Width	1638.3 – 2450 mm	2160 mm
No. of Saws	80 – 120	124 mm
Width of Ribs at ginning point	15.50 – 18.50 mm	14 mm
Ribs Space	1.4 – 2 mm	2.5 mm
Width of Space Block	16.00 – 19.60 mm	15.56 mm
Shape of Saws	Straight Teeth	Curved Teeth

It is evident from the table that the parts and components installed in old machine varies in sizes therefore, cannot be termed as standardized, whereas, standardized parts and components of specific sizes have been designed for ECO-GIN.

Parts and Components



Ginning Saws

Conventional	Improved
<ul style="list-style-type: none"> • Straight teeth • Sharp root • Without heat treatment • Manual sharpening • Deflected blade of saw • Creates friction with ribs 	<ul style="list-style-type: none"> • Curved teeth • Curved root • With heat treatment • Self sharpening • Straight blade of saw • Free movement of saws b/w ribs

Ginning Ribs

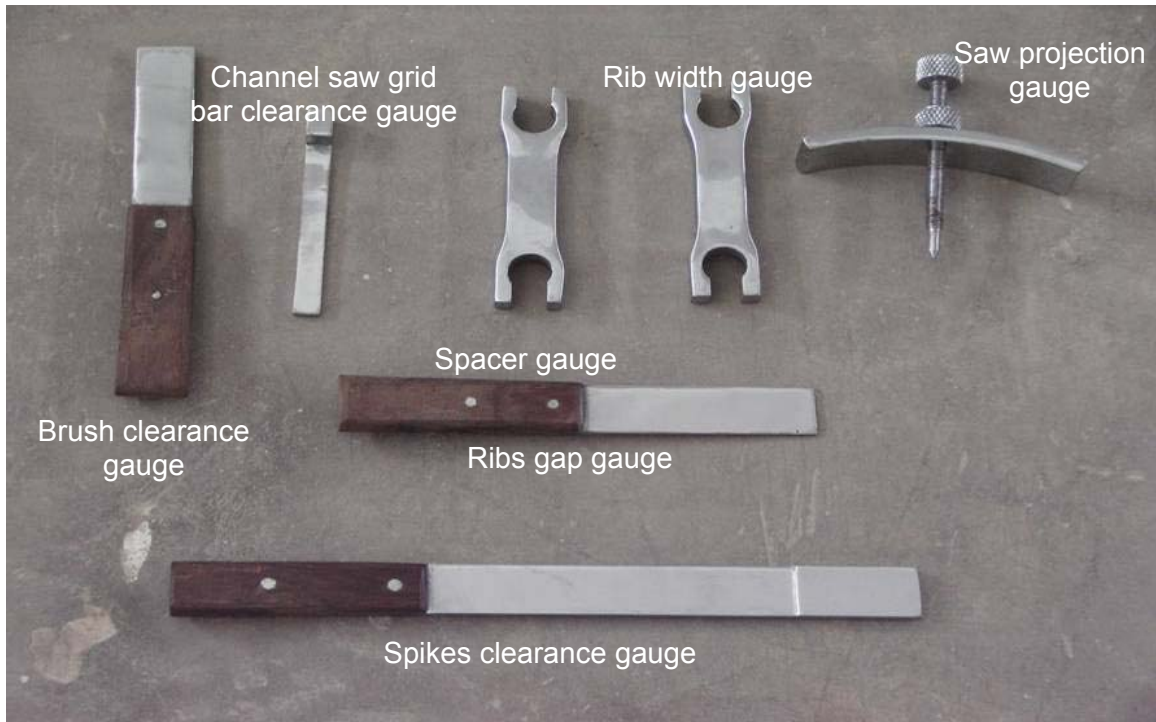
Conventional	Improved
<ul style="list-style-type: none"> ➤ Un-even foot width ➤ Weak at ginning point ➤ Without heat treatment ➤ Non-Standardized ➤ Long fitting time 	<ul style="list-style-type: none"> ➤ Uniform foot width ➤ Strong at ginning point ➤ With heat treatment ➤ Standardized ➤ Short fitting time

Ginning Spacer

Conventional	Improved
<ul style="list-style-type: none"> ➤ Non-Standardized ➤ Non uniform width of spacer ➤ Needs marking for selection of Spacer 	<ul style="list-style-type: none"> ➤ Standardized ➤ Uniform width of Spacer ➤ No need of marking

Development of Gauges and Fixtures

Gauges for ribs, spacers, saw projection, rib saw fitting and ribs space were developed to facilitate inspection and Fixtures for placement of saw shaft, ribs & spacers profile were developed to facilitate assembly



Description	Conventional	Improved
Ribs gauge	No inspection system	Easy inspection
Spacer gauge	No inspection system	Easy inspection
Saw projection gauge	Fitting by sticks	Easy fitting
Rib saw fitting gauge	Fitting by sticks	Easy fitting
Ribs space gauge	By coins or sticks	Standard gauge

Important Results

The followings are the operational results of ECO-GIN in comparison with conventional Saw-Gin machine.

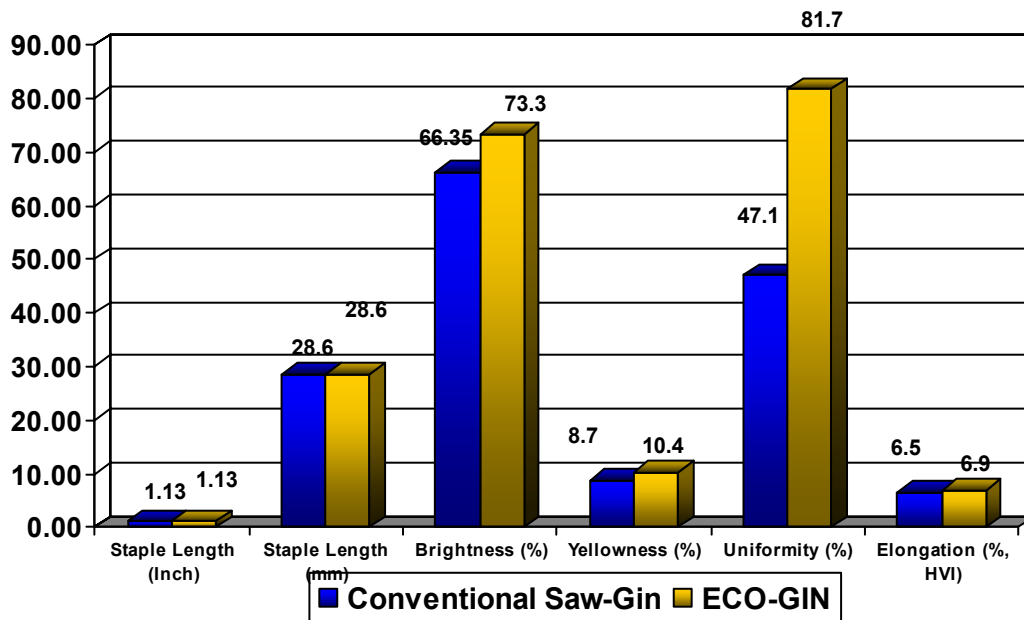
Description	Conventional	ECO-GIN
Sound Level (db)	100 – 102	87 – 90
Prod. Lint Cotton (Avg. Kg/Saw/Hr)	3.19	6.26
Ginning Out Turn (Avg. GOT%)	35.67	35.88
Avg. Power Load (Ampere)	27.5	37.5
Load to Prod. Ratio	8.62	5.99

Power Saving

A saving of around Rs.14/- per bale has been estimated. In case local industry is replaced with ECO-GIN machine, there would be saving of Rs. 168/- million per annum on account of electricity consumption in ginning industry on the basis of 12 million bales per annum.

- **ECO-GIN**
 - Power Consumed per Bale = 2.66 KW
- **Conventional Machine**
 - Power Consumed per Bale = 5.47 KW
- **Saving per Bale (units)** = **2.81 KW (Rs. 14)**
- Annual Prod. of Lint Cotton = 12 Million Bales
- Power Saving if local ginning industry is replaced with Eco-Gin = **34 GW (Rs. 168 Million)**

Test Results of Cotton Lint



Advantages of ECO-GIN

- Higher machine output
 - Comparable lint quality
 - Structure stability and easy in repair / maintenance
 - Saving in electricity
 - Saving in space
 - Saving in manpower
 - Low installation cost
 - Locally available standardized parts & components
 - Low sound level
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