APPLICATION OF RING SPINNING GEOMETRY VER 2.0 TO

SPINNING MILLS

www.itru.net

Table of Contents

1.1 Introduction

This PC-program has been developed through many years of research and experience carried out in spinning mills. Spinning Geometry and bobbin dimensions have been designed to help spinners and winders to improve productivity in spinning and winding departments.

1.1 Effect of yarn package density upon spinning efficiency

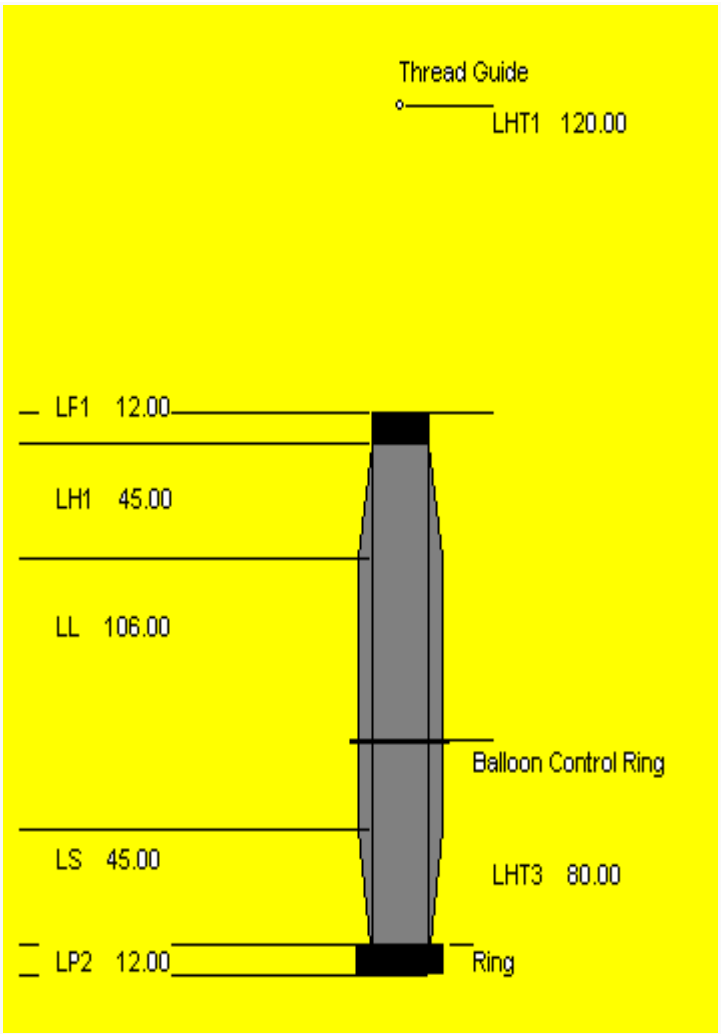
Spun yarn weight of spinning cops effects efficiency of ring frames and winding machinery. Hence, this makes necessary for checking of package weight very carefully and obtain optimum values for spinning and winding. Amount of yarn spun onto ring tubes depends upon the following factors:

•Volume of yarn

•Yarn packing density (g/cc)

These two factors determine the yarn weight but they are also influenced by

- Tube dimensions
- Full bobbin dimensions
- Conicty of tube
- Clearance between tube and spindle
- Spindle diameter-
- Yarn winding starting position
- Yarn winding ending positions
- Bottom stroke length
- Ring rail lift
- Winding length Per stroke
- Yarn twist
- Type of raw material
- Yarn count
- Spinning yarn tension
- Traveler weight



- Yarn diameter
- Fibre packing density in yarn formation

Therefore, for optimum results all these above parameters should be checked and regulated. Hence ,setting and controlling all these parameters without a PC-program requires a lot of time consuming calculations and computations.

Spinning efficiency is closely related to number of doffs per shift As the package weight increases number of doffs per shift decreases and efficiency increases . This necessitates the optimum shaping of spinning bobbins The other important point is to increase efficiency in high speed winding . The quality and formation of spinning cops have an enormous effect upon the efficiency on winding and work load. Especially unattended spinning cops due to end breaks causes lower efficiency in winding.

Optimum package weight is determined by volume and packing density . This PC-program computes packing density in three volumes considering the conicity of tube i.e. bottom, straight and top sections.

Since yarn package is weighed so yarn packing density is computed . The other important point is the number of coils per ring rail stroke which determines the coiling distance. Coil spacing depends upon the yarn diameter and should be 7 to 8 times of yarn diameter. Since yarn diameter is computed for a given type of raw material and yarn count hence optimum regulation of coil spacing is achieved.

1.2 Unwinding properties of spinning bobbin for high speed winding.

Unwinding tension is greatly influenced by the spinning bobbin shapes. In order to achieve high speeds in winding following measures should be taken in ring frames:

- •Coil spacing
- •Winding speed
- •Package density
- •Ring rail stroke

Therefore, setting of spinning technical data parameters effect determines the quality and productivity of winding department.

1.3 Effect of Spinning Geometry upon end-break rate

This PC-program also includes spinning geometry technical data parameters . End break rate is influenced by the spinning yarn tension during spinning. Yarn tension is influenced by

i.Spinning geometry

ii.Spindle speed

iii.Ring diameter

iv.Tube diameter

v.Laying angle

vi.Traveler weight

In modern ring frames yarn tension is regulated by regulating the spindle speed. To increase spindle speed spinning geometry and balloon shape should be checked with stroboscope. This procedure will identify the off-standard running spindles. Hence, this PC-program predicts running yarn tension according to given technical data so that excessive spinning tension could be avoided. It is clear that increasing spindle speed could be achieved with this SPINNING GEOMETRY PC-PROGRAM.

1.3 Causes of End Breaks and effect of Spinning Cops Building

Approximately 60% of end breaks in ring spinning frames breaks occurs from front role to ring . The causes of end breaks are not all the time related to yarn strength and evenness . Not proper spinning cops formation also may lead to high end break rate due to air-drag forces ,spinning balloon and eccentricity between spindle and ring . Therefore, spinning cops formation is not simply a winding onto tube and also has an effect upon yarn hairiness .

1.4 Causes of End Breaks and Optimization of Traveler Weight upon Ring Spindle Speed

An increase in end break rate causes great losses in mills such as

"Increase in waste

"Decrease in number of spindles Per spinner hence increasing labor costs

"Increase in costs in subsequent processes i.e. higher the end break rate in spinning higher the end break rate in weaving

"Not being able to increase machine speed due to work load, waste and yarn quality especially with yarn strength and variation .

Therefore ,by reducing number of end break rate eliminates many problems in spinning .The causes of end break differ from mill to mill and type of raw material used even fibre to fibre friction could be the main cause. These problems could only be analysed and solved through Knowledge Based Quality Management systems and pc-programs .

In spinning yarn tensile properties differ from front roller to traveler and traveler spinning tube. Most of the end breaks related to spinning balloon geometry. It should be observed with stroboscope. Type of traveler and its weight and coefficient of friction between yarn and traveler have enormous effects upon winding tension and end break rate.

2.0 Mill Performance and Summary of benefits

Application of Ring spinning Performance pc-program in your mill following improvements could be achieved

- •-Proper cops formation
- •-An increase in efficiency 1 to 3 % in ring frames due to less doffing
- •-Less end break rate in ring frames
- •-Less faulty spinning cops formation
- •-Higher winding efficiency
- •-Motivation of employees
- •-Improved yarn quality parameters mainly voluminous and hairiness

3.0 Spinning Geometry as a part of R&D project

We carry out this PC-program as a part of increasing production improvement in ring spinning research and development project . If you are interested in this project please get in touch with us.

4 Pc-program Outputs

4.1 Machine Card Index

Ring Spinning Performance ver 2.1 has been developed through a research project carried in textile mills. It has been intended to increase efficiency and production volumes and also assist to reduce labour costs to minimum value.

Machine Card Input data consists of following items to be inserted to the data base.

MACHINENO
LOTNO
MACHINETYPE
TESTDATE
DRAFTINGSYSTEM

TRAV	Type of traveler.....
WTRAW	Weight of 10 Traveler.....in ..g.....
NE	Yarn Count Nec.....
TPI	Yarn Twist Per Inch
RPM	Spindle RPM
GCC	Specific Density of yarn g/cc.....
LHT1	Thread Guide to Tube.in mm LHT1.at start
LHT3	Height of Ballon Control from Ring LHT3..at start

LP2	Start of yarn traverse distance..... HP2.
LP1	Finish of yarn traverse distance.... HP1.
LH1	Ring rail stroke in mm..... LH1.
DD	Full Bobbin diameter..... DD
LS	BOTTOM STROKE LENGTH..... LS .
LL	STRAIGHT STROKE LENGTH..... LL
HLM	TUBE LENGTH..... LM
DA2	TUBE DIA AT THE BOTTOM..... DA2
DA1	TUBE DIA.AT THE TOP..... DA1
DIARING	RING DIAMETER.....
DIASPIN	SPINDLE DIAMETER.....
LAYM	Lay length in meters.....
TCS	TRAVELER CLEANER SETTING.in mm.....
SYW	Spinning Cops Weight
LHT3F	Height of Ballon Control from Ring LHT3F.at full
YARNRKM	Yarn RKM
RKMCV	RKM CV

New-Adds a new record to the data base

Add-Adds a selected record to the data base.

Edit-Edits selected record in the data base.

Delete-Deletes selected record from the data base.

it would take a lot of time for entering all the records so Filter Box is used for copying records for the same date. For this purpose the copying records in Filter Box is used. With the help of Filter Box and Copying Record button the last day of Machine Card Index Data is completely copied to the new Data .So the operator only enters the end of Counter Readings of each shifts.

Press Apply Button which loads dates worked

Select the Last Date from Combobox

Press Filter Selected Date Tool bar button which is on the right of date string Button loads the selected date which is the last day of ring frame spinning geometry test.

Load DBF loads data base table Default table spinbgeı.dbf

Save DBF saves data base table

Pack Table Purge Deleted : Removes the Deleted the deleted records from the database

Delete :Deletes the records on the grid. Therefore be careful

Empty : Clears the table

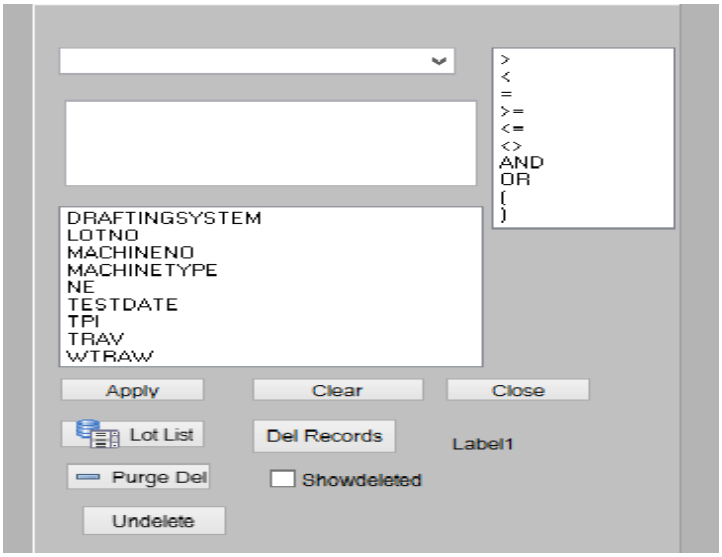
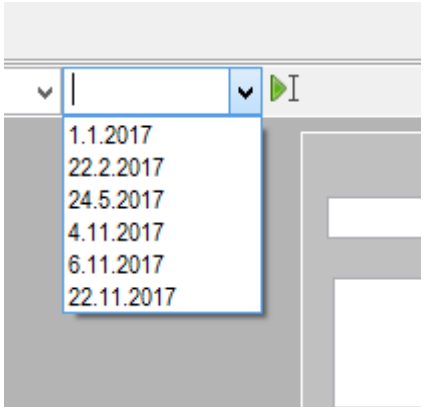
Create Table: Empty table and save with new file name.

Undelete : Undelete deleted record

Apply : Filter the records according to database parameters.

Lotlist : Make lists for date,lot,machine type and date.

And all the records for that day are listed and when Copy Record button is pressed all the record is copied and operator only enters the end of counter readings of SA2, SB2 and SC2 . For 125 machine this takes about maximum 15 mins.

<table>
<tr>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</table>

With filter box you can filter records Apply button applies filtering command such Machine No=1

and Lotno='A-25' filters the records with Machine no=1 and Lotno=A-25

Insert (+) command copies the selected record. Use the same date of record when copying otherwise you will damage the date base. . If there is a holiday change the date time from computer so that correct date is entered.

There are also many filtering logic are available i.e and ,or , >>, <= ,(,) <> etc. . One can use any combinations of these

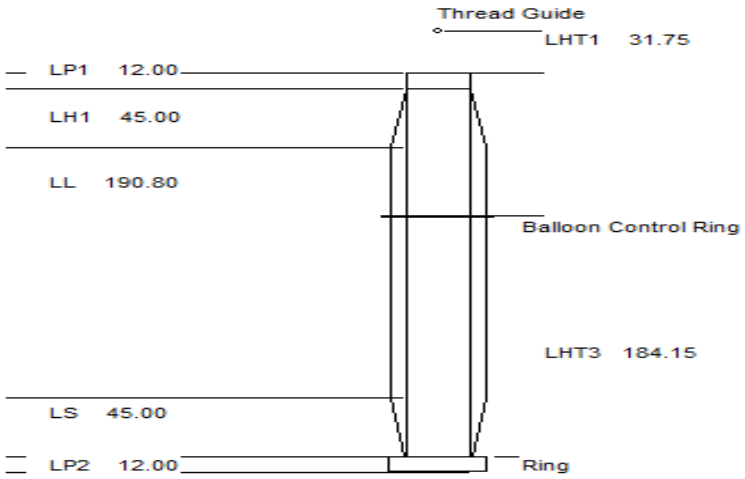
5 File Manager and Reports

5.1. Single Report

```
Machine type.............................=w
Machine Number...........................=1
Drafting System..........................=PK2500
Lot #....................................=01-56
Date.....................................=1.1.2017
Yarn Count Nec...........................=    30.00
Type of traveler.........................=A4
Weight of 10 Traveler........in ..g......=     0.30
Specific Density of yarn    g/cc.........=     1.53
Thread Guide to Tube.in mm LHT1.at start =    31.75
Height of Ballon Control from Ring LHT3..=   184.15
Start of yarn traverse distance..... HP2.=    12.00
Finish of yarn traverse distance.... HP1.=    12.00
Ring rail stroke in mm.............. LH1.=    45.00
Full Bobbin diameter................ DD  =    42.00
BOTTOM STROKE LENGTH................ LS .=    45.00
STRAIGHT STROKE LENGTH.............  LL  =   190.80
TUBE LENGTH......................... LM  =   304.80
TUBE DIA AT THE BOTTOM.............. DA2 =    30.00
TUBE DIA.AT THE TOP................. DA1 =    28.00
RING DIAMETER.......................    =    45.00
SPINDLE DIAMETER.........................=    25.00
Lay length in meters.....................=     5.00
TRAVELER CLEANER SETTING.in mm...........=     1.00
FRONT ROLLER DELIVERY M/MIN..............=    16.61
SPUN YARN WEIGHT...........GRAM..........=    85.00
YARN VOLUME  TOP.              ..........=    16.16
YARN VOLUME  STRAIGHT          ..........=   146.83
YARN VOLUME  BOTTOM            ..........=    16.49
YARN VOLUME  TOTAL              .........=   179.48
YARN PACKING DENSITY   GR/CC    .........=     0.47
YARN DIAMETER..................  .........=     0.16
Optimum COILING DISTANCE IN MM..at empty.=     1.27
Optimum NUMBER OF COILS PER LIFT.........=    35.32
NUMBER OF COILS PER LIFT..AT FULL........=    18.95
COILING DISTANCE AT FULL BOBBIN..........=     2.38
NUMBER OF COILS PER LIFT..AT EMPTY.......=    27.44
COILING DISTANCE AT EMPTY BOBBIN.........=     1.64
COILING DISTANCE/YARN DIA..RATIO FULL....=    14.91
COILING DISTANCE/YARN DIA..RATIO SKIN....=    10.30
SPINDLE R.P.M.........  .................= 14500.00
TURN PER INCH............................=    21.00
GRAM/SPINDLE HOUR........................=    19.60
-----------------------------------------
Winding angle in radians..at empty.......=     0.73
Winding angle in degrees .at empty.......=    41.81
Winding tension in grams .at empty...ff..=    35.70
Winding tension in gr/tex.at empty.......=     1.81
Winding angle in radians.at full.........=     1.20
Winding angle in degrees at full.........=    68.96
Winding tension in grams at full.....ff1.=    25.50
Winding tension in gr/tex.at full .......=     1.30
Balloon height at empty cops in mm.......=   324.55
Balloon height at full  cops in mm.......=    62.80
```

```
Total ring rail movement in mm.....=   280.80
Yarn rkm...............................=    14.00
Yarn rkm cv%...........................=     8.00
Minimum yarn strength in g.............=   218.79
Mean  yarn strength in g...............=   275.59
Maximum yarn strength in g.............=   332.60
```

```
MACHINE TYPE.............   =w
MACHINE NUMBER.............. =1
DRAFTING SYSTEM............. =PK2500
LOT #....................... =01-56
DATE........................ =1.1.2017
YARN COUNT NE............... =    30.00
TYPE OF TRAVELER............ =A4
WEIGHT OF 10 TRAVELER IN G=      0.30
YARN VOLUME  TOTAL    .....=    179.48
YARN PACKING DENSITY GR/CC=      0.47
```



5.2 Summary Reports

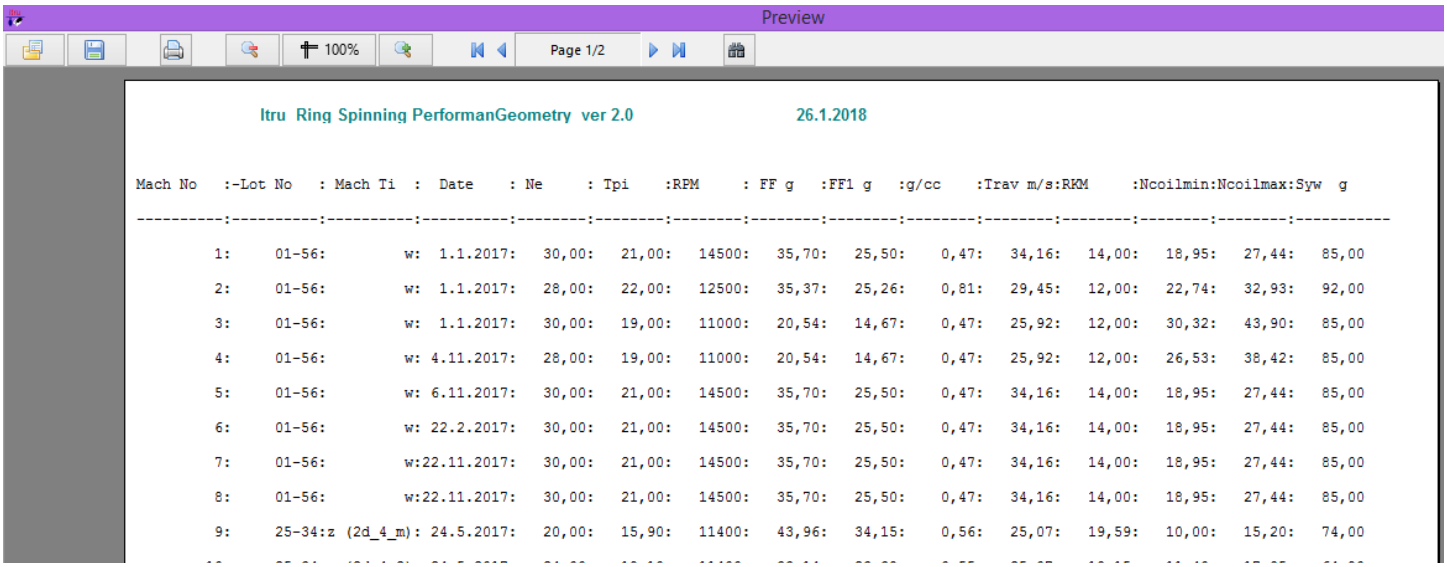
a) Select Filtering box then press Apply button

b) Press File Manager button after these one can get the functions of items shown below:

Reports are given

1) All
2) Ne
3) Lot
4) Lot & Ne
5) NeSum
6) LotSum

7) Lot&Nesum
8) Ave tests per day
9) Lot & Ne per day
10) Ne/Lot/Tpi
11) Ne/lot/Tpi-Sum
12) Ne/lot/tpi/date



Itru Ring Spinning PerformanGeometry ver 2.0 26.1.2018

Mach No	Lot No	Mach Ti	Date	Ne	Tpi	RPM	FF g	FF1 g	g/cc	Trav m/s	RKM	Ncoilmin	Ncoilmax	Syw g
1:	01-56:	w:	1.1.2017:	30,00:	21,00:	14500:	35,70:	25,50:	0,47:	34,16:	14,00:	18,95:	27,44:	85,00
2:	01-56:	w:	1.1.2017:	28,00:	22,00:	12500:	35,37:	25,26:	0,81:	29,45:	12,00:	22,74:	32,93:	92,00
3:	01-56:	w:	1.1.2017:	30,00:	19,00:	11000:	20,54:	14,67:	0,47:	25,92:	12,00:	30,32:	43,90:	85,00
4:	01-56:	w:	4.11.2017:	28,00:	19,00:	11000:	20,54:	14,67:	0,47:	25,92:	12,00:	26,53:	38,42:	85,00
5:	01-56:	w:	6.11.2017:	30,00:	21,00:	14500:	35,70:	25,50:	0,47:	34,16:	14,00:	18,95:	27,44:	85,00
6:	01-56:	w:	22.2.2017:	30,00:	21,00:	14500:	35,70:	25,50:	0,47:	34,16:	14,00:	18,95:	27,44:	85,00
7:	01-56:	w:	22.11.2017:	30,00:	21,00:	14500:	35,70:	25,50:	0,47:	34,16:	14,00:	18,95:	27,44:	85,00
8:	01-56:	w:	22.11.2017:	30,00:	21,00:	14500:	35,70:	25,50:	0,47:	34,16:	14,00:	18,95:	27,44:	85,00
9:	25-34:z (2d_4_m):		24.5.2017:	20,00:	15,90:	11400:	43,96:	34,15:	0,56:	25,07:	19,59:	10,00:	15,20:	74,00

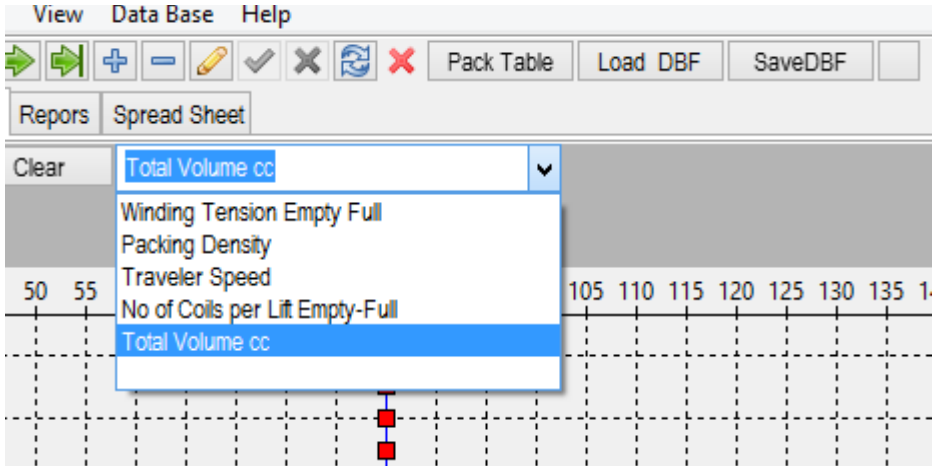
6 Pc-program Outputs and How to use the pc-program

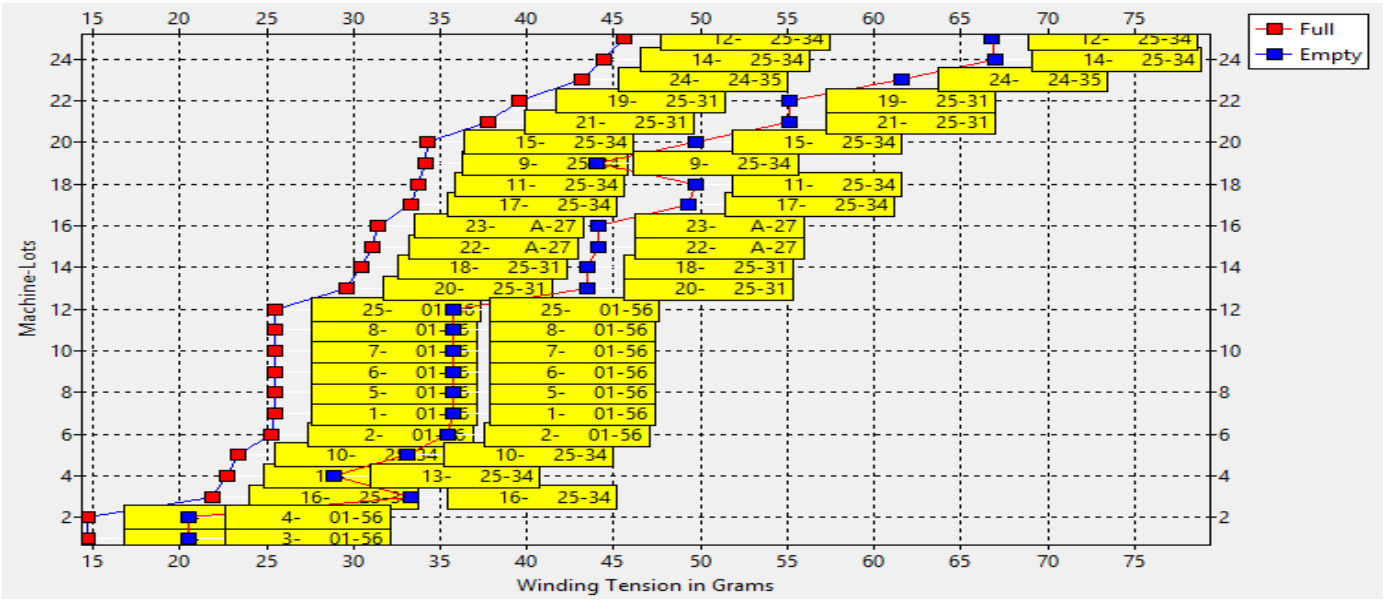
Spinning Geometry has effects upon end break rate and yarn quality and production levels. Out of production hours depends upon spinning cops weight which in turn depends on packing density.

Check full spinning cops end measure the cops formation parameters as related to the program and compare the data in the program and correct accordingly.

6.1 Charts

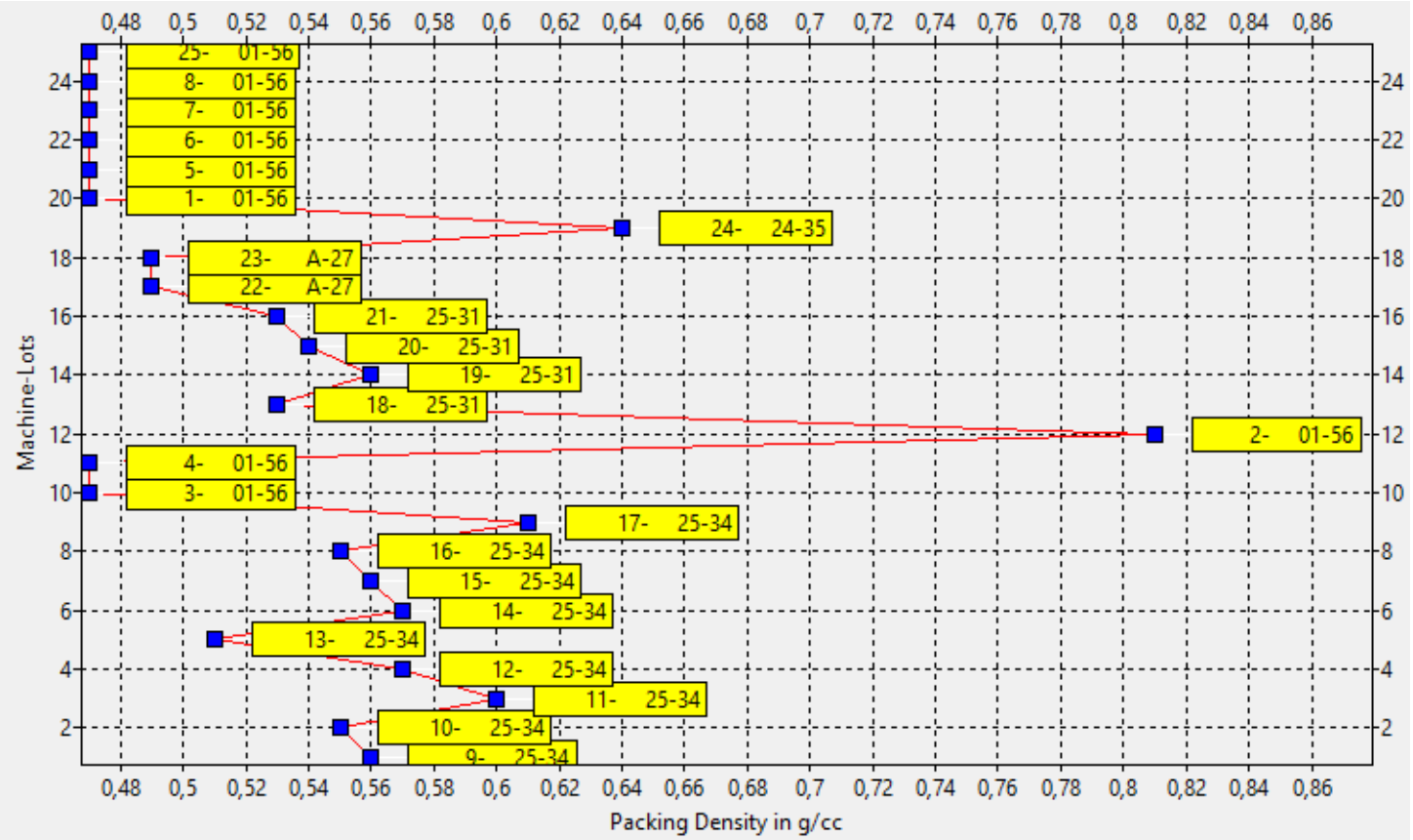
-Summary of Winding Tension sorted full and empty machine base.





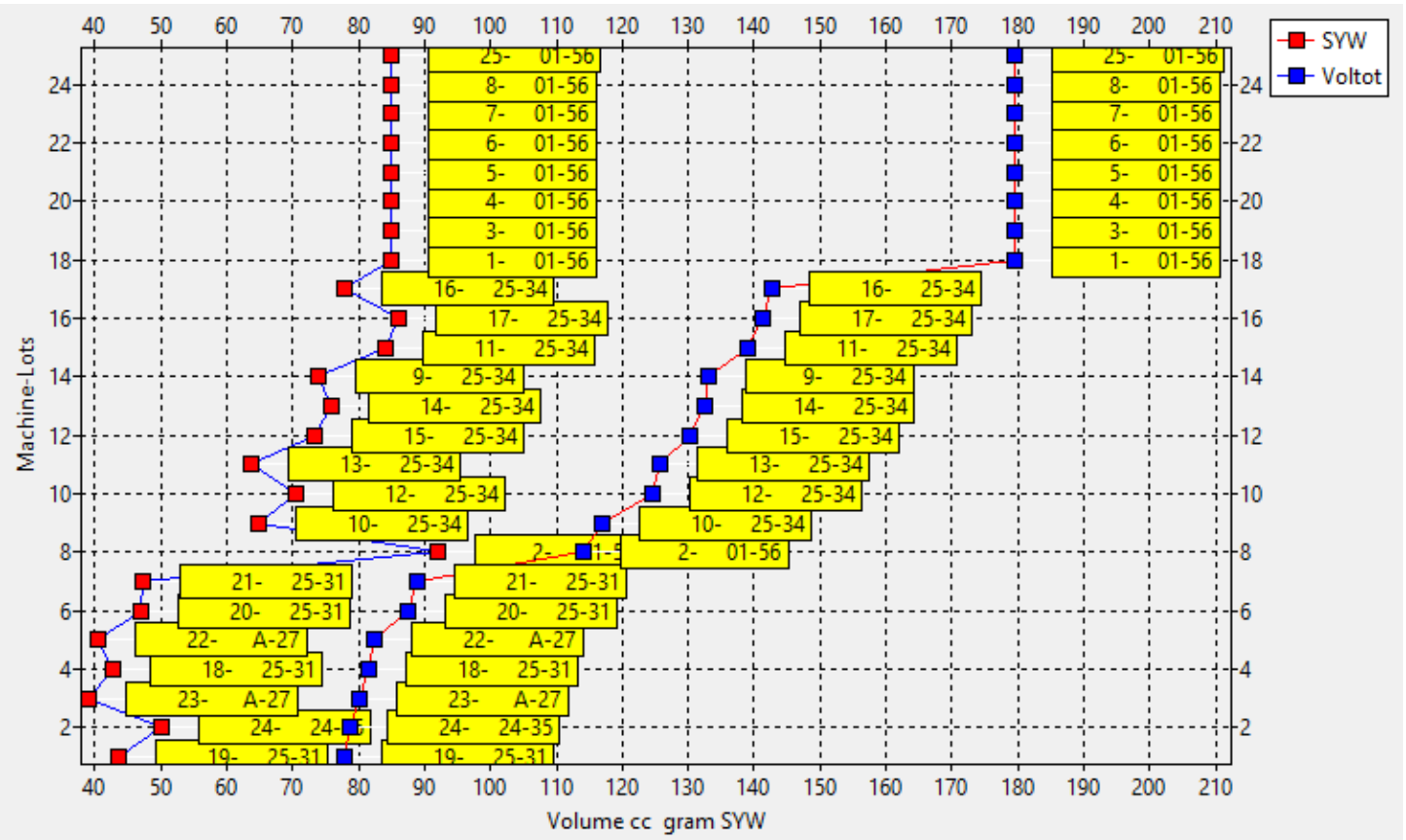
Compare these with end break rates and optimise spindle rpm

Packing Density on Machine Based



Increase packing density which is less than 0,55 g/cc

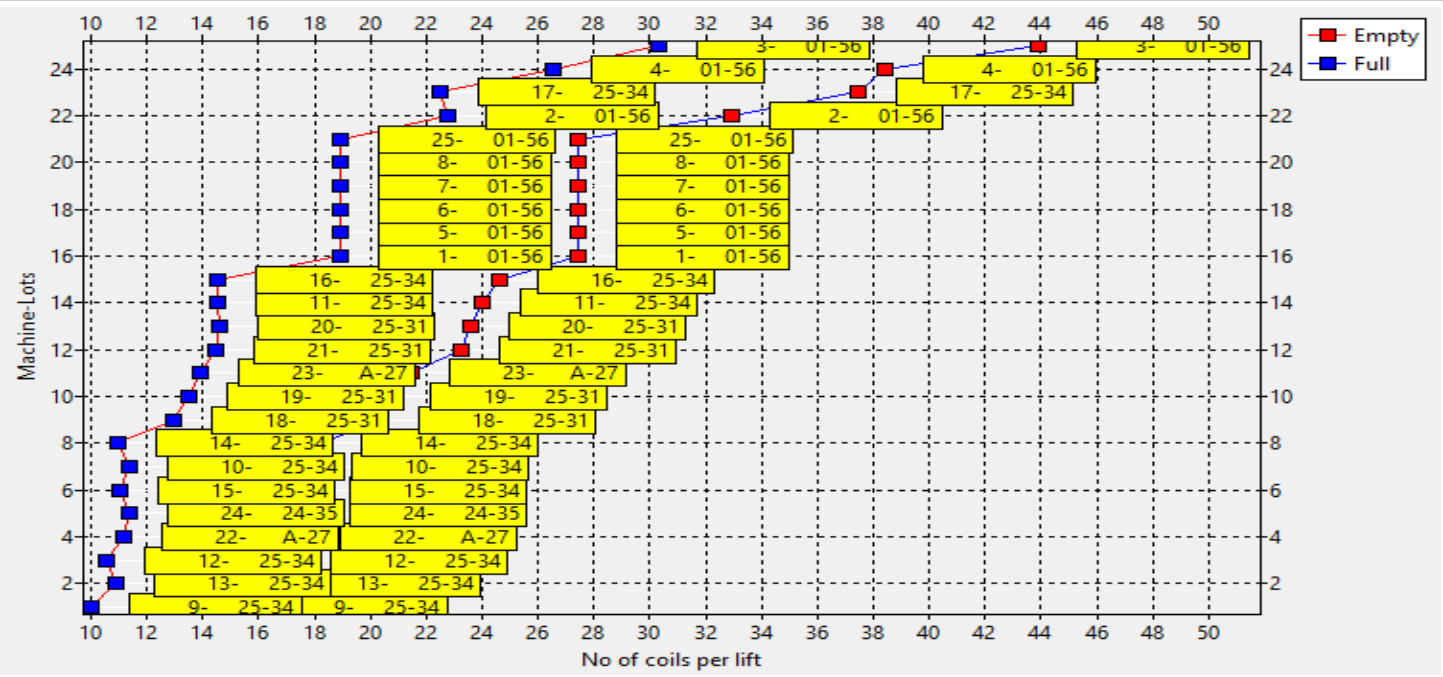
Spinning Volume and Spinning Cops weight comparison



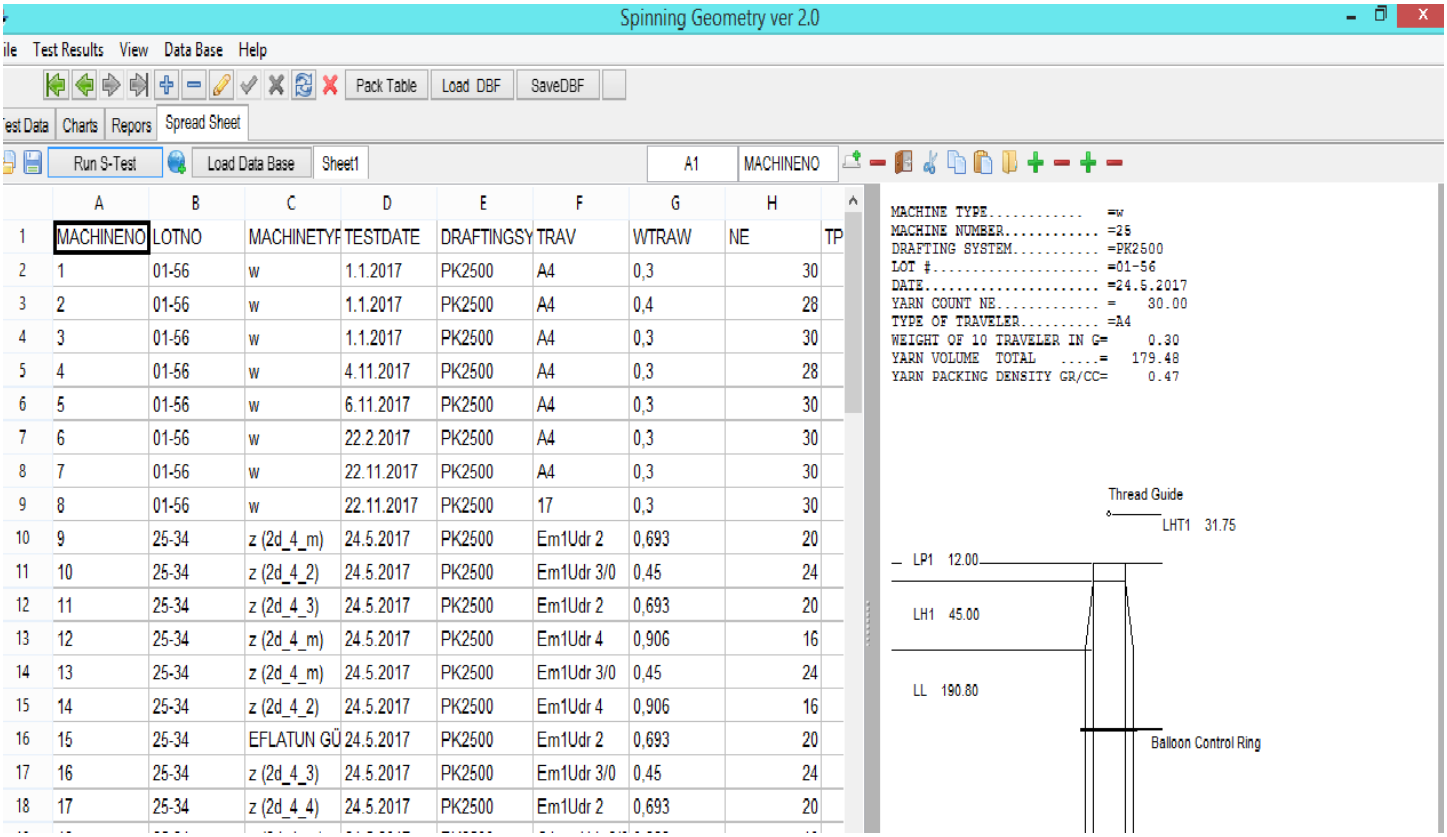
Spinning Volume and Spinning Cops weight comparison with similar volumes given different weights indicate low packing density.

No of coils per lift at empty and full cops gives information about packing density.

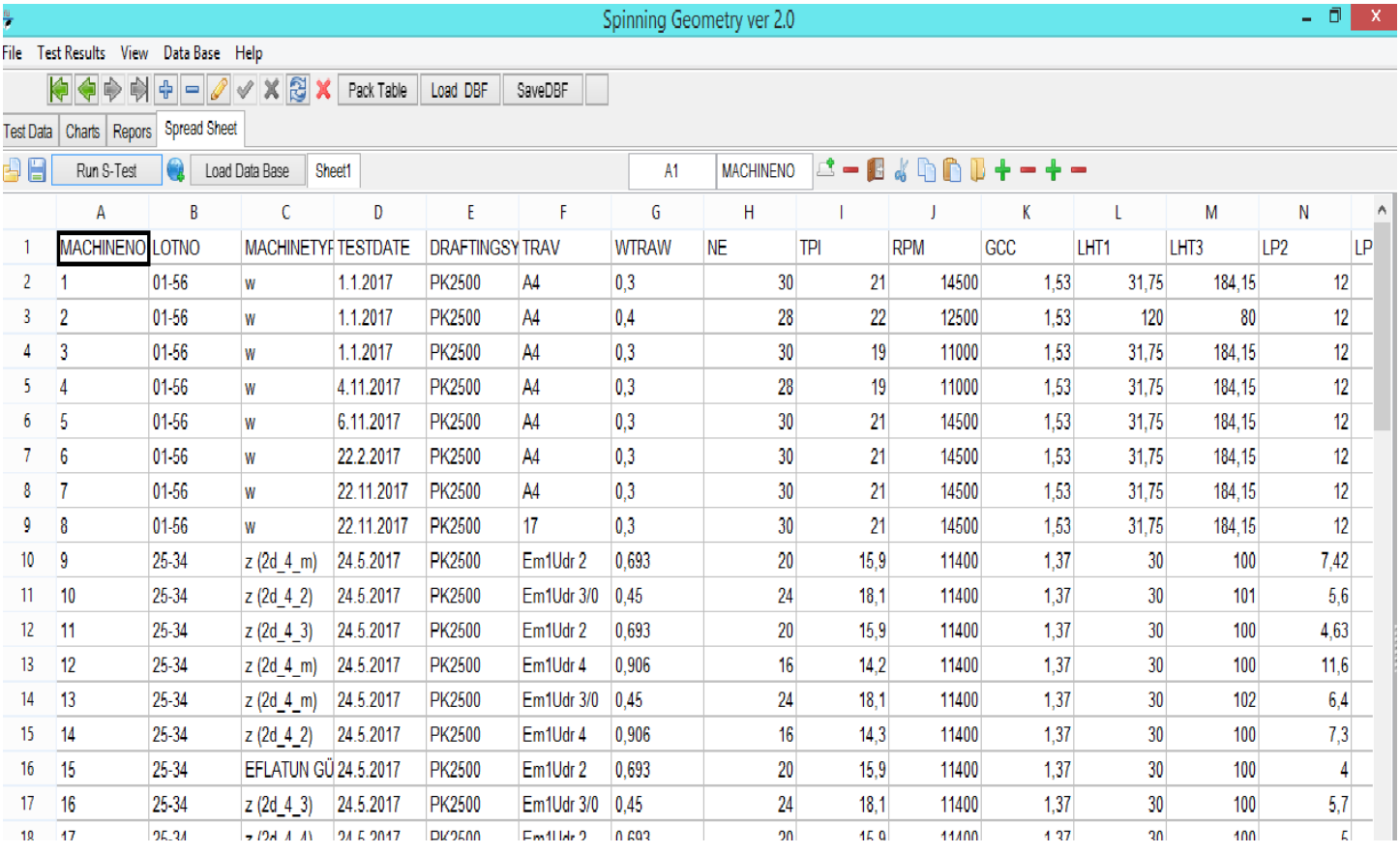
No of coils per lift at empty and full cops



6.2 Spread Sheets



	A	B	C	D	E	F	G	H	TP
1	MACHINENO	LOTNO	MACHINETYP	TESTDATE	DRAFTINGSY	TRAV	WTRAW	NE	
2	1	01-56	w	1.1.2017	PK2500	A4	0,3	30	
3	2	01-56	w	1.1.2017	PK2500	A4	0,4	28	
4	3	01-56	w	1.1.2017	PK2500	A4	0,3	30	
5	4	01-56	w	4.11.2017	PK2500	A4	0,3	28	
6	5	01-56	w	6.11.2017	PK2500	A4	0,3	30	
7	6	01-56	w	22.2.2017	PK2500	A4	0,3	30	
8	7	01-56	w	22.11.2017	PK2500	A4	0,3	30	
9	8	01-56	w	22.11.2017	PK2500	17	0,3	30	
10	9	25-34	z (2d_4_m)	24.5.2017	PK2500	Em1Udr 2	0,693	20	
11	10	25-34	z (2d_4_2)	24.5.2017	PK2500	Em1Udr 3/0	0,45	24	
12	11	25-34	z (2d_4_3)	24.5.2017	PK2500	Em1Udr 2	0,693	20	
13	12	25-34	z (2d_4_m)	24.5.2017	PK2500	Em1Udr 4	0,906	16	
14	13	25-34	z (2d_4_m)	24.5.2017	PK2500	Em1Udr 3/0	0,45	24	
15	14	25-34	z (2d_4_2)	24.5.2017	PK2500	Em1Udr 4	0,906	16	
16	15	25-34	EFLATUN GÜ	24.5.2017	PK2500	Em1Udr 2	0,693	20	
17	16	25-34	z (2d_4_3)	24.5.2017	PK2500	Em1Udr 3/0	0,45	24	
18	17	25-34	z (2d_4_4)	24.5.2017	PK2500	Em1Udr 2	0,693	20	



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	MACHINENO	LOTNO	MACHINETYP	TESTDATE	DRAFTINGSY	TRAV	WTRAW	NE	TPI	RPM	GCC	LHT1	LHT3	LP2	LP
2	1	01-56	w	1.1.2017	PK2500	A4	0,3	30	21	14500	1,53	31,75	184,15	12	
3	2	01-56	w	1.1.2017	PK2500	A4	0,4	28	22	12500	1,53	120	80	12	
4	3	01-56	w	1.1.2017	PK2500	A4	0,3	30	19	11000	1,53	31,75	184,15	12	
5	4	01-56	w	4.11.2017	PK2500	A4	0,3	28	19	11000	1,53	31,75	184,15	12	
6	5	01-56	w	6.11.2017	PK2500	A4	0,3	30	21	14500	1,53	31,75	184,15	12	
7	6	01-56	w	22.2.2017	PK2500	A4	0,3	30	21	14500	1,53	31,75	184,15	12	
8	7	01-56	w	22.11.2017	PK2500	A4	0,3	30	21	14500	1,53	31,75	184,15	12	
9	8	01-56	w	22.11.2017	PK2500	17	0,3	30	21	14500	1,53	31,75	184,15	12	
10	9	25-34	z (2d_4_m)	24.5.2017	PK2500	Em1Udr 2	0,693	20	15,9	11400	1,37	30	100	7,42	
11	10	25-34	z (2d_4_2)	24.5.2017	PK2500	Em1Udr 3/0	0,45	24	18,1	11400	1,37	30	101	5,6	
12	11	25-34	z (2d_4_3)	24.5.2017	PK2500	Em1Udr 2	0,693	20	15,9	11400	1,37	30	100	4,63	
13	12	25-34	z (2d_4_m)	24.5.2017	PK2500	Em1Udr 4	0,906	16	14,2	11400	1,37	30	100	11,6	
14	13	25-34	z (2d_4_m)	24.5.2017	PK2500	Em1Udr 3/0	0,45	24	18,1	11400	1,37	30	102	6,4	
15	14	25-34	z (2d_4_2)	24.5.2017	PK2500	Em1Udr 4	0,906	16	14,3	11400	1,37	30	100	7,3	
16	15	25-34	EFLATUN GÜ	24.5.2017	PK2500	Em1Udr 2	0,693	20	15,9	11400	1,37	30	100	4	
17	16	25-34	z (2d_4_3)	24.5.2017	PK2500	Em1Udr 3/0	0,45	24	18,1	11400	1,37	30	100	5,7	
18	17	25-34	z (2d_4_4)	24.5.2017	PK2500	Em1Udr 2	0,693	20	15,9	11400	1,37	30	100	5	

7 Practical Procedures for Applications of Ring Spinning Geometry Ver 2.0 Pc-Program

In order to have full functional benefits of the Pc-Programs

a) All the machine settings in relation to cops formation and spinning geometry should be checked
b) All the spinning cops weight should be measured
c) All the doffing time for each machine should be measured
d) Cops formation should be observed during spinning at lower ,straight and upper case
d) Full cops diameter should be checked for each machine.
e) All the machine spindle speed and delivery of front rollers should be measured
and corrective measures should be taken to check the machine main motors or frequency converters that adjust the variable speed.
f) Cops formation should be checked with stroboscope and and pictures should be taken at that time
g) The program should be applied for a week period and efficiencies of each machine should be traced which will give information about main out of production hours and doffing time.
2- Cops formation and packing density could be used to minimize Doffing Time for each machine
3- Apply Ring Spinning Performance Test Pc-Program to increase the production volumes of each machine and each spinners and improve quality related to end break rate and use Spin Plan Pc- Program to correct the main process defects
4- Apply Card Fibre Transfer Test and Comber Data Pc-Program along with QC-Ring Pc-Program to increase production , reduce waste and improve all over yarn quality
5- Carry out Spinning Performance Test by Itru Fibre /Fabric Tester to improve your quality, reduce your material costs from bale to ring frame delivery.