INVESTIGATION OF BLANKET FEED CHARACTERISTICS ON A WEB OFFSET PRESS

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ABSTRACT

The availability of "no-pack" blankets for use on large newspaper offset printing presses has raised the question of how tension levels are affected by these blankets. This paper discusses tests that were performed on a newspaper printing press, during production runs. The goal of the testing was to (a) measure the tension levels before and after the printing nip (web feed) with various no-pack blankets, (b) measure the tension levels elsewhere in the press with these blankets, and (c) evaluate possible methods of controlling tension levels through various press adjustments. In preparation for the tests, a listing was made of factors, other than the blankets, that could affect the tension levels so that these factors could be held constant, where practical, or monitored so that their effect would be considered. These factors included pressroom conditions, printing process materials, press configuration and adjustments. The most significant data is presented and discussed.

Results showed considerable variation in web feed characteristics of the no-pack blankets tested. Web tension levels between a black and a color unit could be controlled only in the range established by the blanket characteristics. The tests verified that color units with a common impression cylinder are one-way tension isolators and that proper tension control after the color unit can best be accomplished from the folder.

INTRODUCTION

This paper documents testing that was performed during production runs on a large metropolitan newspaper printing

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press. To convey an impression of the physical size of this press, it has the capability to print up to 144 newspaper pages per revolution. It stands about 30 feet above the foundation and is about 73 feet long.

The testing was performed to provide information for pressmen to help them obtain optimum web feed conditions.

It is known that there are many variables that can effect the tension level of a paper web. Some of these variables have been investigated and it has been shown that both the blankets (Kuehn, 1953) and press components (Chodorowski, 1977) can cause tension level changes. Additional factors are shown in Chart 1.

TEST APPROACH

Considerable care was required in planning this test so that the effects of web feed of blankets could be separated from other variables. The first task was to conceive of a test setup that would allow measurement of just the effects of the blankets. Previous investigations indicated it was likely that a color lead would help to achieve this. Figure 1 shows a typical 4-color lead. The web passes through the mono unit, where ink is applied to both sides of the web. The web then goes through the 3-color unit where the three remaining colors for process color printing are applied. The cylinder in the center of the color unit is the common impression cylinder. The hypothesis was that the friction between the web, blanket cylinders, and the common impression cylinder would isolate tension changes downstream of the color unit so that they would not be transmitted into the section of the web where the testing would be done. Subsequent testing verified this hyposthesis. The color lead is a common newspaper lead; therefore, the output from these tests will be a benefit to newspaper press operators.

TEST SETUP

The instrumentation was installed on a Goss Metro press which was selected because of the large number of these presses in use. The run consisted of four web leads; the instrumentation was setup on a dedicated front page lead (see Figure 2) which is used on every run of the particular paper selected for this test. This lead always had process color illustrations. The test blankets were mounted on the mono unit. New blankets, which were randomly selected, were used at the beginning of each test.

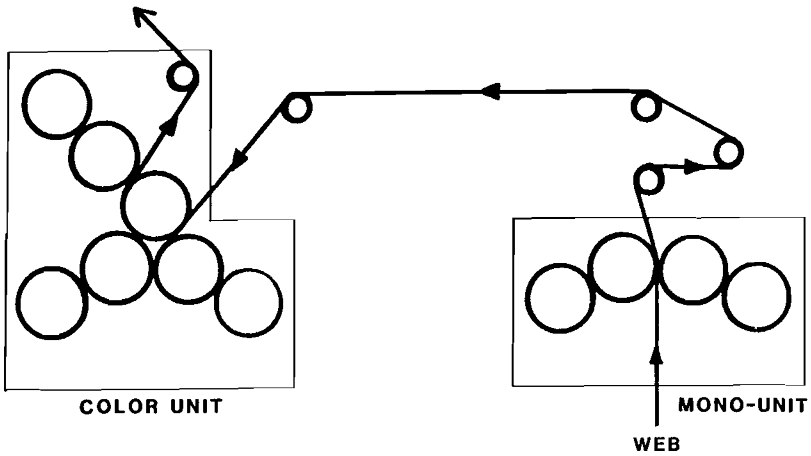

Figure 1- A color lead was used for all tests

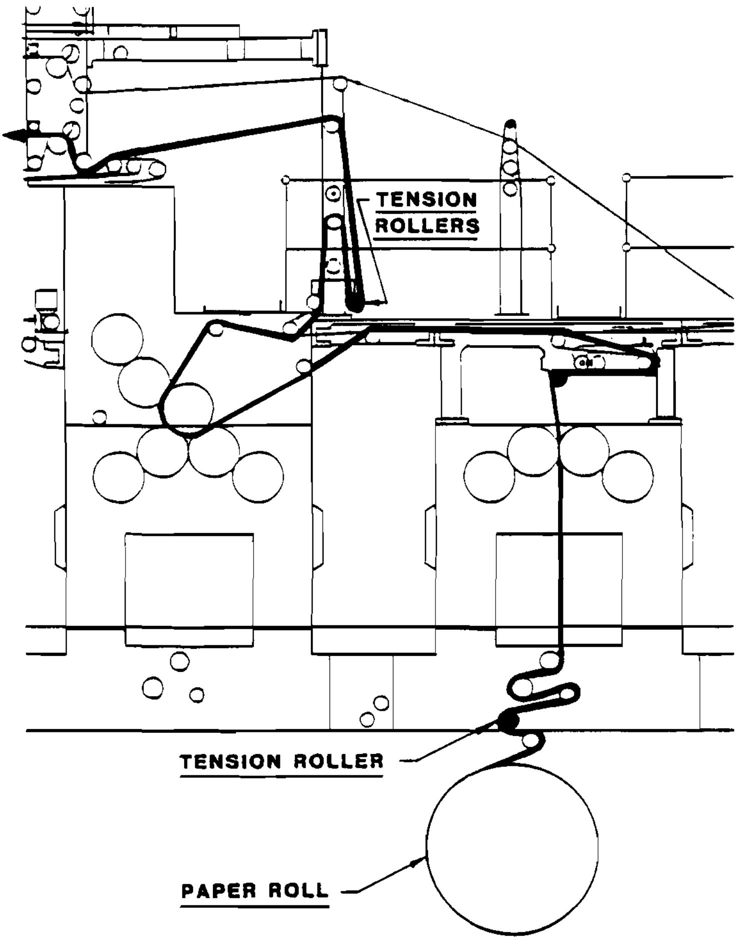

Figure 2- Test Set-Up

A particular manufacturer's blanket was selected for use on the color unit and was kept for a control datum for all tests.

The pressman can control tension levels only at specific locations in the press as follows. A tension regulator allows adjustment of the web tension before the mono unit. The folder controls allow adjustment of the section of the web downstream of the color unit. The folder controls consist of the three folder adjustment; the folding cylinder bands, the nipping rollers and the trolleys on the roller-top-of-former. By adjusting the cylinder bands, the pressman can make the folding cylinder circumference larger (for higher tension) or smaller (for lower tension). Tightening the nipping rollers so that they squeeze the web more will increase tension. Tightening the squeeze at the roller-top-of-former will also increase the tension.

Kidder tension sensing rollers were mounted in three places. One before the mono unit, one between the mono unit and the color unit, and one after the color unit. The outputs from these rollers were connected to a microprocessor controlled data recording system. (A description of the data recording system appears in the paper by Tyma, 1979.) The system was used to minimize the involvement of the pressmen in collecting data. The recorder was instrumented and programmed so that to record running data, the pressman had only to trigger the system. He did this three or four times per run. The data was recorded on magnetic tape which was then reduced by computer for analysis.

Blanket Height: The blanket height measurements were made as follows. The "before run" value is the average blanket height after the webs have been led through the press but before the start of the press run. At this point, the blanket attachment bolts are re-torqued and the blanket height measured at three points around the circumference. The measurement from the three points are averaged for the data entry. The "after run" blanket height is the average of three measurements, at the same three points, made after the first day run is completed.

TENSION ISOLATION OF COLOR UNIT

As previously stated, the hypothesis that the color unit was a one-way tension isolater was verified by test data. The data is shown in Figure 3. The test was per-

COLOR UNIT IS A TENSION ISOLATOR

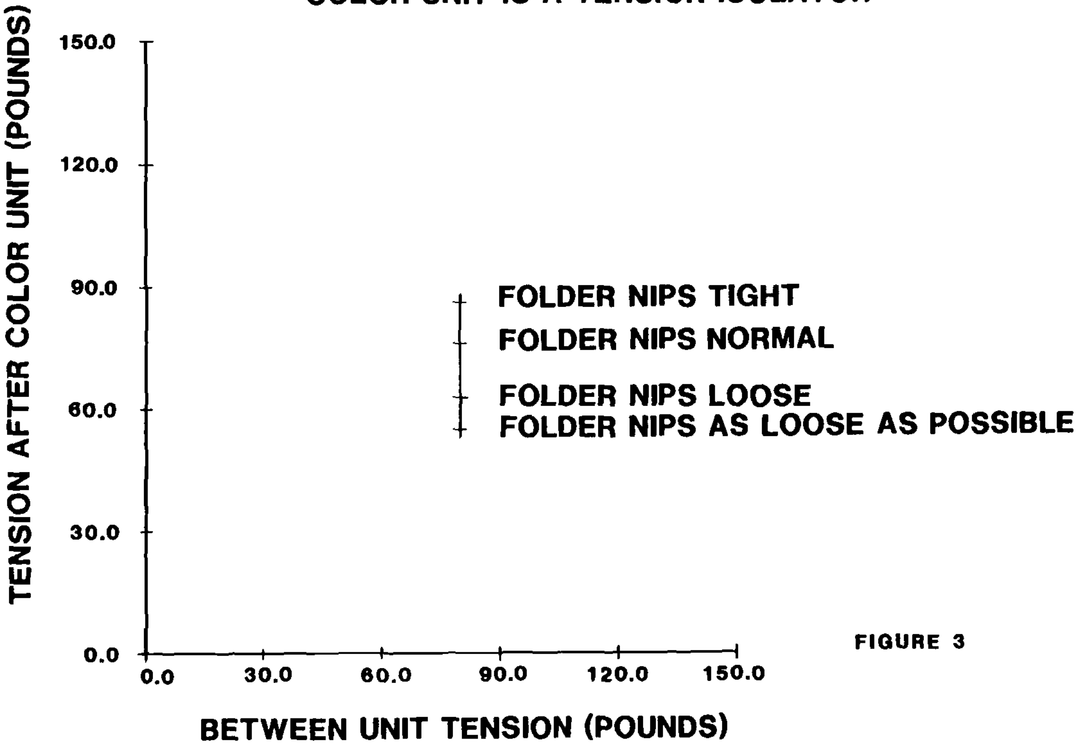

FIGURE 3

formed by adjusting the folder nipping rollers to change the tension level after the color unit and measuring any tension variation between the color and the mono unit. The folder nipping rollers were adjusted to tight, normal, and loose settings. The settings were determined by observing the indentations in the product. With these nip settings, the tension level after the color unit ranged from 50 to 80 pounds. The tension level between units stayed at 75 pounds.

The effect of tension changes from the other direction is shown in Figure 4. The tension level before the mono unit was varied by changing the setting of the tension regulator. The tension changes before the mono unit had a measurable effect on the tension levels between the units and also after the color unit. The changes in the before-unit tension caused a similar tension change between units. But, because of the color unit, there was a lesser change in the tension after the color unit. It appears then, that the color unit is a "one way" tension isolator. Using this result simplified testing considerably and made testing during a production run a practical approach.

OTHER FACTORS THAT COULD AFFECT WEB TENSION

A careful effort was made to consider other major factors that could affect web tension. Ideally, all of these factors should be held constant. However, it would not be practical to expect to hold all of the factors constant in a production environment. The list of these factors is shown in Chart 1. The first eight were held constant or controlled. The last two were measured and recorded so that their effects could be investigated at a later date.

TEST PROCEDURE

The test procedure consisted of a first day test and subsequent four-day test. The first day consisted of mounting the blankets, calibrating instrumentation, verifying initial conditions and recording the data for the first day run. All of these tasks were performed by, or under the supervision of the test engineer.

For the subsequent four days, most of the data was recorded by triggering the data recorder. Other additional data were recorded manually at the beginning and end of each daily run. All of these tasks were performed by the

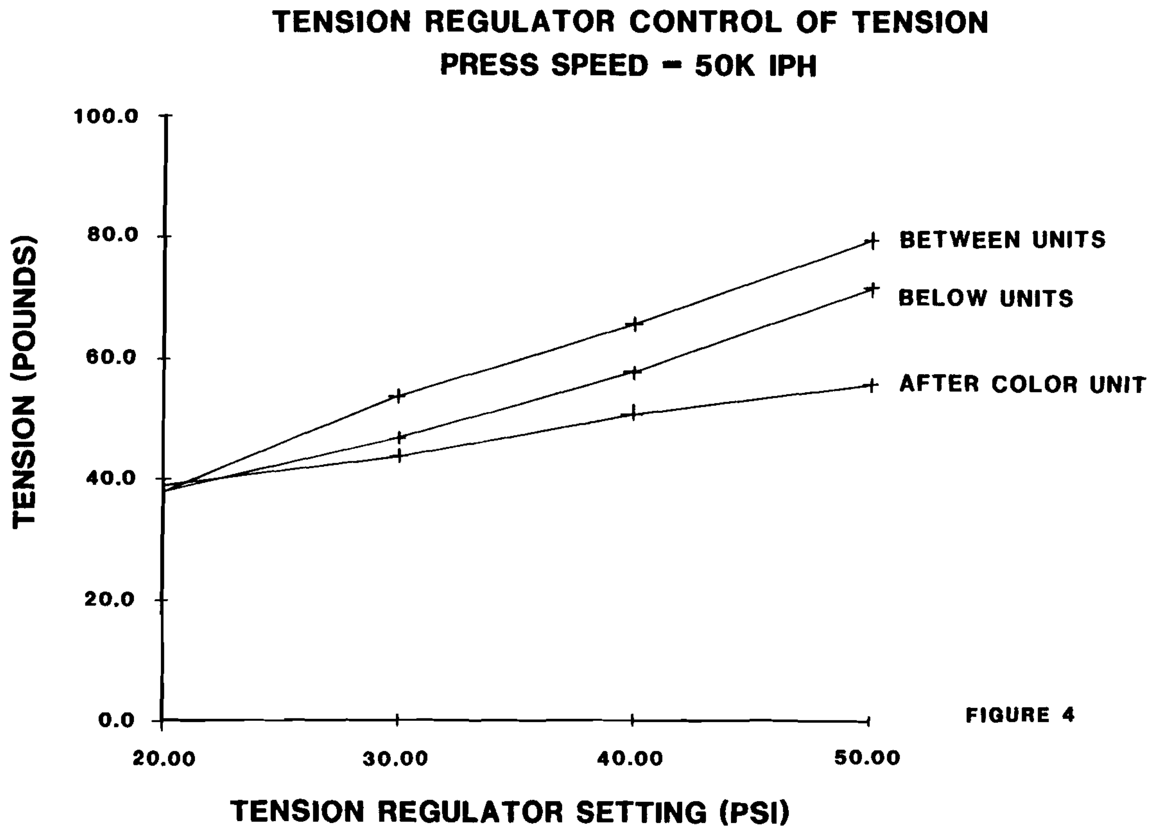
TENSION REGULATOR CONTROL OF TENSION
PRESS SPEED = 50K IPH
TENSION (POUNDS)
100.0
80.0
60.0
40.0
20.0
0.0
20.00
30.00
40.00
50.00
TENSION REGULATOR SETTING (PSI)
BETWEEN UNITS
BELOW UNITS
AFTER COLOR UNIT

FIGURE 4

CHART I

OTHER FACTORS THAT COULD AFFECT TENSION

- Ink
- Dampening Fluid
- Paper
- Iron-To-Iron Setting
- Washup Solvent
- Press Speed During Data Recording
- Test Lead
- Started Tests with New Blankets
- Humidity
- Operating Temperatures
    - Room
    - Blankets

pressroom personnel.

SIGNIFICANT DATA COLLECTED

Of all the data collected the first day, the most significant items that will be discussed here are:

- Blanket height
  - -Start of test
  - -End of test
- Tension levels
- Humidity
- Press Speed

The blanket height and humidity measurements were made at the beginning and end of the run. Tension levels were measured at specific press speeds (30, 40, and 50 KIPH) and tension regulator settings (20, 30, 40 and 50). See Appendix A, pages A1 to A4.

Of all the data collected during the four subsequent days, the most significant items that will be discussed are:

- Tension levels
- Press speed
- Time of measurement

All of these were automatically recorded on the microprocessor data recorder. Press speeds and tension levels were not specified. The pressman was instructed to simply trigger the recorder when the press was up to production speed and printing good copy. The recordings were triggered at about one-hour intervals thoughout the run. The blanket height was measured at the end of the fourth day.

TESTING CONSTRAINTS

In a project of this kind, one must be aware of the constraints when considering the results. The major constraints are listed below:

- Only four blankets from each manufacturer were tested. The blankets were randomly selected.

- The test duration was too short compared to the average life of a blanket to indicate what long-term characteristics might be.

- All the paper used for these tests were from one supplier but there was no attempt made to save samples for analysis of moisture content or elasticity.

- The blanket washup procedure consists of washing and wiping the blankets after each run. The concern here is that the blanket wash fluid may have an effect on the blanket material that would alter the feed characteristics. Since this is a manual procedure, it is subject to human variability.

The inker or dampener settings could not be held constant. The pressmen had to make the appropriate adjustments to produce the print quality desired.

Pressroom humidity and temperature was not controlled, but was measured and recorded.

TEST RESULTS

Web Feed: The test results indicate considerable variability in the feed characteristics amongst the blankets tested. The results also show a lesser variability of the individual blankets over time. The variability amongst the blankets is shown in the first day tests plotted on page A5. The data are presented in the form of before-unit tension vs between-unit tension. The 45 degree line on this plot indicates the condition that is termed "even web feed". For the purposes here, this term is defined as the condition where the tension level before and after the mono unit are the same. That is, the average tension level before the web goes into the blanket nip is the same as the average tension level leaving the nip. Test blanket "E" was a packed blanket and was used as a "control sample" for comparison with the newer no-pack blankets. Blanket "E", for this test, came the closest to an even web feed condition. Blankets that are far below this line tend to give soft webs between units and require higher tension levels before the mono unit to maintain register. Blankets that are far above the line tend to under feed and give tight webs between the units. There was no significant change in room temperature during the first-day tests. Blanket temperatures were measured on the last two blankets tested (blankets E and G) and there was a 14^{o} to 20^{o} increase at the end of the run.

The tension values shown on page A5 should be considered as very approximate because the data for the subsequent four-day tests for the individual blankets showed variations over time as high as $\pm$ 20% of the mean value. Two samples of this data are shown on Page A6. The data are presented in the form of between-unit tension as a percentage of below-unit tension versus time. Percentage of below-unit tension was used to give a number value to the effect of web feed. Assigning a number value allowed plotting web feed versus time. Of the two blankets shown, blanket D underfeeds slightly. This blanket was tested for six days. The variation in web feed during the runs and from day-to-day can also be seen. Blanket E overfeeds slightly. Again, the variation of web feed during the runs and from day-to-day is shown. These variations could result from a number of factors (such as the variation in the elasticity or friction of the paper, amount of ink or dampening fluid, temperature, etc.). It was observed that the humidity levels varied from the beginning to the end of the first day runs. It was lowest at the beginning of the test and increased as the run progressed. The affect of all these factors on web tension and web feed need further investigation. Hopefully, a better understanding of the effect of these factors will help to identify the cause of the variation in the web feed of the individual blankets during runs and from day-to-day.

Blanket Height: Only two of the no-pack blankets changed height during the tests; A and G decreased .001 of an inch. The data did not show any correlation of blanket height to web feed. It is not intended here to imply that blanket height does not effect web feed. It is felt that the variability of materials and construction had more effect on web feed than blanket height. Additional testing is needed to determine the effect of blanket height alone.

CONCLUSIONS

Web feed characteristics of blankets are an important element of the overall tension contol systems of a press. The knowledge of these characteristics can help the pressman obtain optimum tension settings for a given production run.

Process color leads, such as the lead used in the tests, are more sensitive to blanket web feed characteristics than other leads. This stems from two observed conditions:

1. A three-color unit does not transmit upstream any tension changes made at the folder;

2. The range over which tension between a mono and a 3-color unit may be adjusted is largely determined by the web feed characteristics of the blankets.

In a large Metro newspaper press, which was used in the tests discussed in this paper, the range of tension control devices for each web and at the folder is broad enough to accommodate the observed variability of the blankets tested. Therefore, the pressman has the freedom to select blankets for the printing characteristics and longevity in addition to web feed characteristics.

CLOSING REMARKS

There remains a considerable amount of work to be done in the areas that were mentioned:

(a) The effect of blanket temperature and pressroom humidity on web feed.

(b) The effect of blanket height on web feed.

(c) Determination of the causes in the blanket feed variability over time.

ACKNOWLEDGEMENT

The authors would like to acknowledge the generous and able support of Mr. Carl Storey, pressroom superintendent; Mr. Mickey Bella, vice president of production; Mr. Jeff Downing, assistant pressroom superintendent; and the production management and personnel of the Journal Newspaper, Springfield, Virginia, without whom none of this testing could have been accomplished.

LITERATURE CITED

1. Kuehn, A. T. , "True Rolling and Cylinder Packing on Offset Presses". Lithographers Journal, December, 1953, pp 12-15.

2. Chodorowski, W. T., "Web Tension in a Hybrid Newspaper Press", TAGA Proceedings, 1977, pp 386-400.

3. Tyma, Louis S., "Newspaper Runnability", IFRA Newsprint Symposium Paper, Frankfurt, Germany, April 26, 1979.

APPENDIX

INITAL TEST COMPARISON SHEET

	B 10/26/82		C 11/03/82	
Press Speed 40K	Tension Above	Tension Below	Tension Above	Tension Below
Web Tension	10	44	X	X
	20	51	42	56
	34	64	54	66
	42	74	67	78
Press Speed 50K	Tension Above	Tension Below	Tension Above	Tension Below
Web Tension	X	X	X	X
	21	52	42	59
	28	65	53	68
	40	74	69	78
Blanket Height				
Before Run	.080		.082	
After Run	.080		.082	
Humidity				
Before Run	52%		59%	
After Run	69%		79%	
Room Temperature (°F)				
Before Run	--		68°	
After Run	--		69°	
Blanket Temperature (°F)				
Before Run	--		--	
After Run	--		--	

1146D-11

INITAL TEST COMPARISON SHEET

	A 11/10/82		D 11/16/82	
Press Speed 40K	Tension Above	Tension Below	Tension Above	Tension Below
Web Tension	X	X	X	X
	16	60	50	60
	30	70	64	70
	40	80	74	78
Press Speed 50K	Tension Above	Tension Below	Tension Above	Tension Below
Web Tension	X	X	X	X
	22	64	54	60
	36	72	70	70
	52	84	80	80
Blanket Height				
Before Run	.081		.080	
After Run	.080		.080	
Humidity				
Before Run	33%		39%	
After Run	43%		52%	
Room Temperature (°F)				
Before Run	57°		68°	
After Run	58°		69°	
Blanket Temperature (°F)				
Before Run	--		--	
After Run	--		--	

1146D-12

INITAL TEST COMPARISON SHEET

	F 12/01/82		E 12/08/82	
Press Speed 40K	Tension Above	Tension Below	Tension Above	Tension Below
Web Tension	72	52	40	40
	80	64	54	52
	90	76	66	62
	104	84	80	72
Press Speed 50K	Tension Above	Tension Below	Tension Above	Tension Below
Web Tension	85	54	38	38
	90	60	54	47
	110	72	67	58
	120	82	80	72
Blanket Height				
Before Run	.081		.081	
After Run	.081		.079	
Humidity				
Before Run	44%		51%	
After Run	66%		68%	
Room Temperature (°F)				
Before Run	67°		70°	
After Run	68°		70°	
Blanket Temperature (°F)				
Before Run	--		71°	
After Run	--		91°	

1146D-13

INITAL TEST COMPARISON SHEET

	G 12/15/82	
Press Speed 40K	Tension Above	Tension Below
Web Tension		
	96	46
	110	56
	120	68
	136	78
Press Speed 50K	Tension Above	Tension Below
Web Tension		
	100	44
	115	60
	130	70
	140	80
Blanket Height		
Before Run	.079	
After Run	.078	
Humidity		
Before Run	39%	
After Run	53%	
Room Temperature (°F)		
Before Run	68°	
After Run	69°	
Blanket Temperature (°F)		
Before Run	70°	
After Run	84°	

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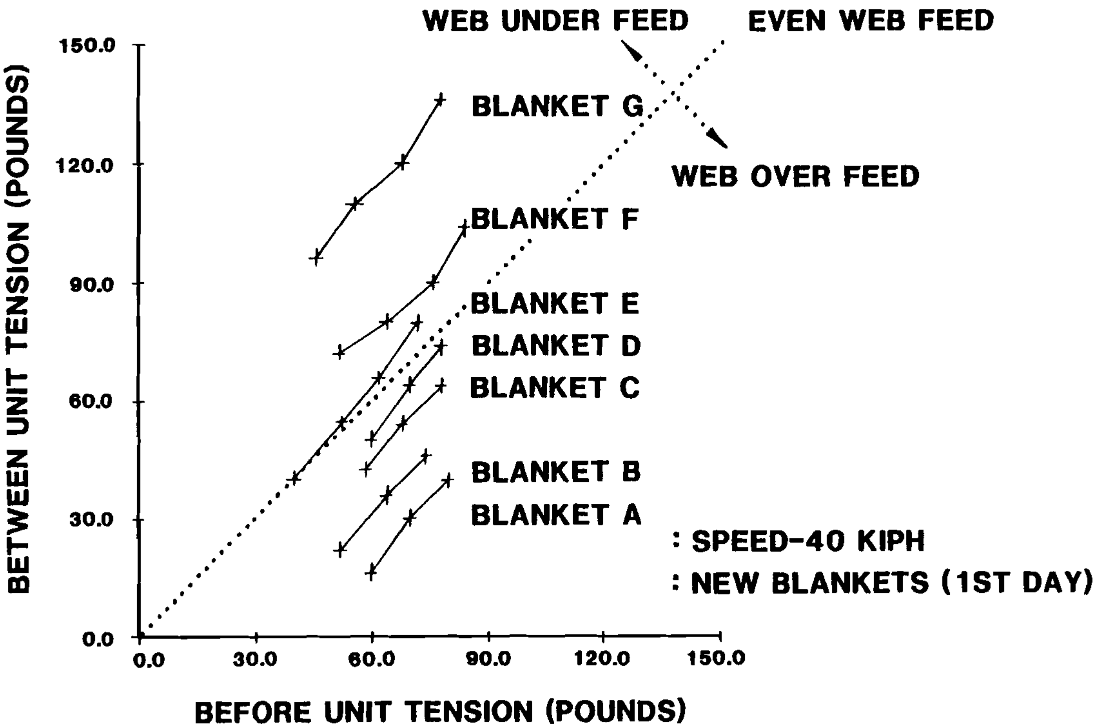
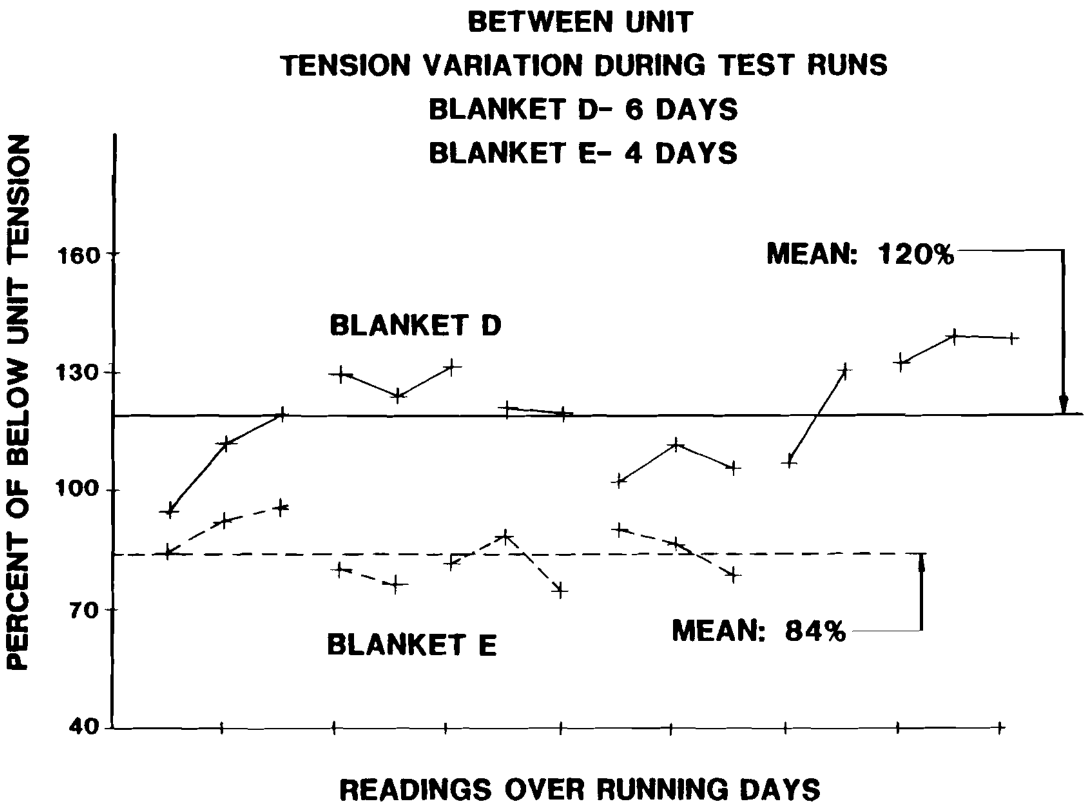
TENSION CHARACTERISTICS OF BLANKETS (1ST DAY)




BETWEEN UNIT
TENSION VARIATION DURING TEST RUNS
BLANKET D- 6 DAYS
BLANKET E- 4 DAYS
PERCENT OF BELOW UNIT TENSION
160
130
100
70
40
BLANKET D
MEAN: 120%
BLANKET E
MEAN: 84%
READINGS OVER RUNNING DAYS