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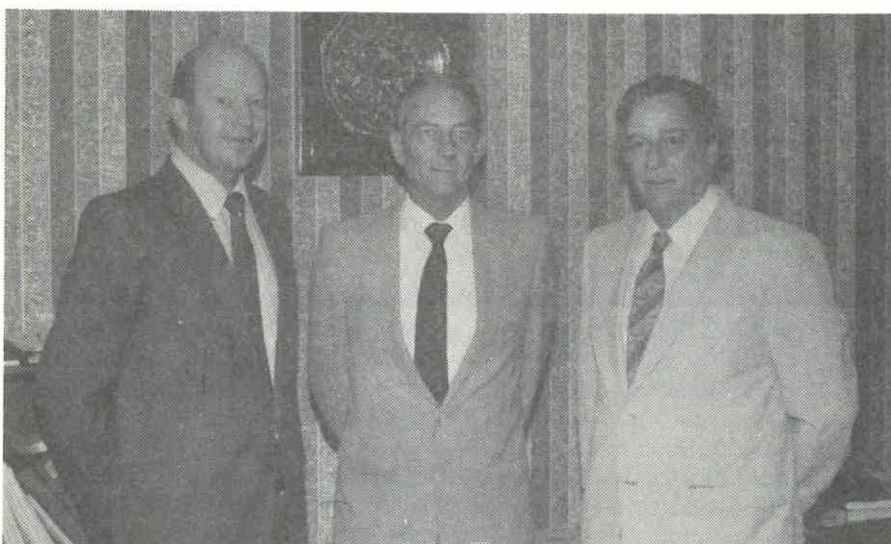
INSTITUTE NEWS

Retirement of Mr J P de Wit

Mr J P de Wit, Deputy President of the CSIR and Chairman of the SAWTRI Research Advisory Committee since 1979, retired at the end of 1985. Mr de Wit always showed a keen interest in the staff and the research work done at the Institute, and was a source of sound advice and guidance to SAWTRI during his term of office.

Mr J. P. de Wit, former Deputy President of the CSIR.

Dr J F Kemp, Deputy President of the CSIR, has taken over this portfolio from Mr de Wit and will in future chair SAWTRI's Research Advisory Committee.



Dr J. F. Kemp, Deputy President of the CSIR (centre) seen here together with Dr L. Hunter, Director, and Dr D. W. F. Turpie, Chief Director, during his recent visit to SAWTRI to familiarize himself with the Institute.

SAWTRI PUBLICATIONS

Since the previous edition of the Bulletin, the following papers were published by SAWTRI:

Technical Reports

No. 574 Van der Merwe, J. P., Processing Performance of South African Wools on the Woollen System of Manufacture. Part I: The Effect of Fibre Properties on Spinnability. (February 1986).

No. 577 Van der Merwe, J. P. and Brydon, A. G., The Processing of Karakul Blends on the Woollen System. Part II: Tweed-type Yarns and Fabrics. (February 1986).

SAWTRI Special Publications

WOL 73 Brydon, A. G. and Van der Merwe, J. P., Wrap Spinning: Principles and Development.

Papers by SAWTRI Authors Appearing in Other Journals

Galuszynski, S., Effect of Medium Ball and Slim Set Needle Points on the Forces Opposing Needle Penetration During Sewing of Woven Fabrics. *J.S.N. International,* **15**(85), 34 (1985).

Barella, A., Manich, A. M. and Hunter, L., El diametro y la vellosidad de los hilos de mezcla lana-poliester y lana acrilica a uno y dos cabos. *Rev. Ind. Text.* No. 225, 28—38 (1985).

Barella, A., Manich, A. M., Segura, A., Castro, L. and Hunter, L., La vellosidad de los hilos de algodon de continua de anillos y de rotor medida con el aparato "Digital I.T.Q.T." y su relacion con las propiedades de la fibra y del hilo. *Ingeniéra Textil,* Barcelona, No. 375, 9 (1985).

Barella, A., Manich, A. M., Segura, A., Castro, L. and Hunter L., Estudio del diámetro y la vellosidad de los hilos de fricción en comparación con los de anillos y de rotor. *Investigacion e Informacion Textil y de Tensioactivos,* Vol. XXVIII, No. 3, 105 (Sept. 1985).

Turpie, D. W. F. and Hunter, L., Mohair Research at SAWTRI. *The Angora Goat & Mohair Journal,* **28**(1), 63 (1986).

TENSIONS GENERATED BY DIFFERENT YARN JOINTS IN ALL-WOOL YARNS

by

J F McMAHON

ABSTRACT

The effect of different yarn joints (fisherman's knot, weaver's knot, air splice) on the tension of a running yarn in capstan-like conditions was investigated in terms of guide diameter and yarn linear density for all-wool worsted yarn. The results show that the fisherman's knot caused a greater increase in yarn tension than the weaver's knot. The spliced joint produced the lowest increase in yarn tension.

INTRODUCTION

During the weaving of fabric, the warp threads must overcome some frictional forces on their journey from loom beam to cloth fell due to contact between the yarns and relevant guides[1]. The effect of these forces is a progressive increase in warp thread tension, reaching a peak in the front shed sector at the moment of beat-up[2–6]. The most significant guide, in this respect, is the heald eye.

At beat-up some fell displacement takes place leading to some warp thread movement[7,8]. This thread movement occurs towards the cloth beam as the reed advances and towards the warp beam as the reed recedes. Normally, the shed is not closed during this period and capstan-like conditions lead to significant frictional resistances at the heald eye[9–13]. Further frictional forces are produced by yarn/yarn movement during beat-up action, in accommodating the weft into its required position in the cloth fell (the weaving resistance has to be overcome).

The introduction of a yarn joint to the heald eye or cloth fell at the moment of beat-up may cause some sudden increases in the magnitude of these forces opposing yarn movement, and subsequently the yarn tension, leading to yarn breakages.

In this study, the effect of knots and splices on yarn tension during yarn movement against a guide and against a yarn in capstan-like conditions was investigated in terms of guide diameter and yarn linear density for all-wool worsted yarn.

EXPERIMENTAL PROCEDURE

Method and Apparatus

A recently introduced friction measuring device[13] was used to measure the effect of yarn joints on the tension of yarn moving in contact with a guide. For the movement of a yarn against a yarn, a modified version of the same apparatus[14] was employed.

Materials and Range of Parameters

Three all-wool worsted yarns spun from similar tops (19,2 μm) were used in the experiments:

27 tex Z 733
37 tex Z 640
44 tex Z 560

Three different types of yarn joint were produced on a general purpose SAVIO MINI RAS 15 automatic winding machine fitted with SAVIO knotting and splicing ancillary equipment. The joint specifications were as follows:

Fisherman's knot .... 7 mm tail length
Weaver's knot.................................. 7 mm tail length
Pneumatic splice .... 3 mm tail length

The tests were all conducted at a yarn speed of 100 cm/min. Contact angles of 20° and 30° were used for yarn against guide and yarn against yarn, respectively.

The effect of guide diameter was investigated using the 37 tex yarn and two stainless steel rods, acting as yarn guides, of respective diameters 0,5 and 1,1 mm .

The effect of yarn linear density was investigated using the 1,1 mm guide.

The 37 tex yarn and its joints were tested against a heald eye of the following specifications:

® Grob nickel-plated flat steel	—	2,3 x 0,35 mm
Eye	—	6 x 1,5 mm
Shape	—	B
Offset	—	F2
Above centre	—	10 mm
Open to the right	—	Z

Yarn to Yarn Friction

The 37 tex yarn was tested against a length of the same yarn, with a right-angle between yarn axes.

RESULTS AND DISCUSSION

In all of the tests conducted, the presence of a yarn joint caused a significant increase in yarn tension. The fisherman's knot consistently caused

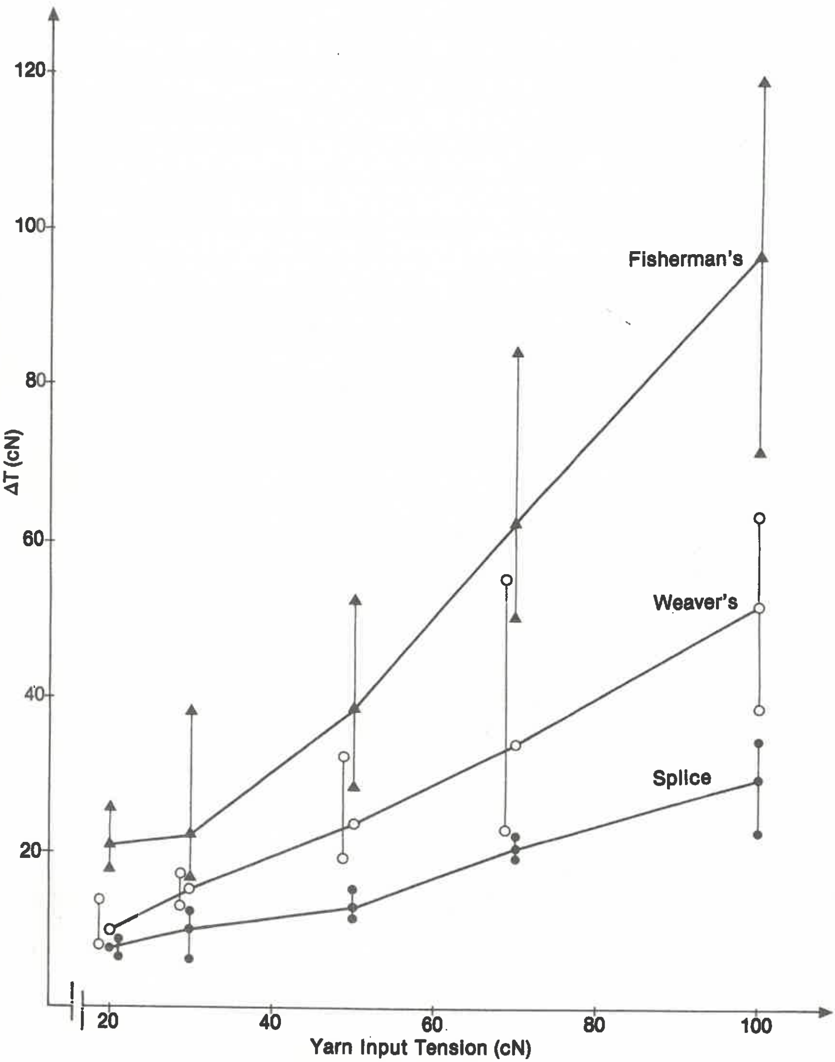


Fig. 1: Increase in yarn tension (ΔT) v. yarn input tension for different yarn joints — 0,5 mm guide diam.; 37 tex yarn.

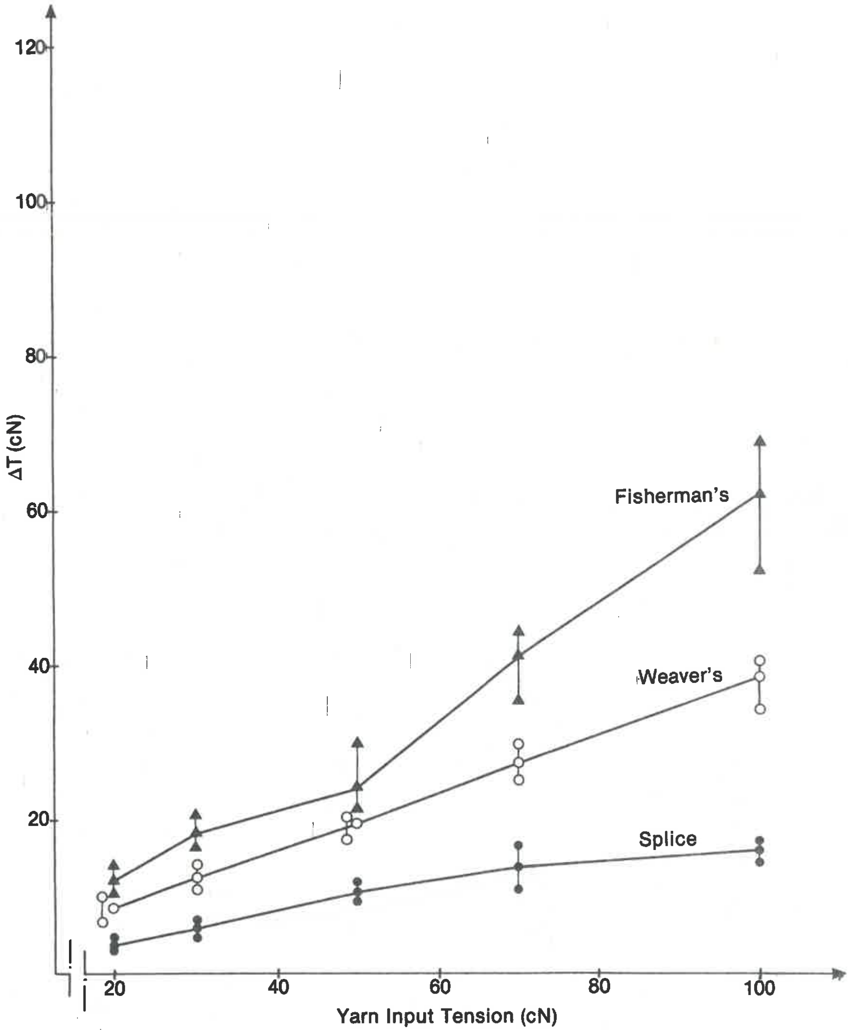


Fig. 2: Increase in yarn tension (ΔT) v. yarn input tension for different yarn joints — 1,1 mm guide diam.; 37 tex yarn.

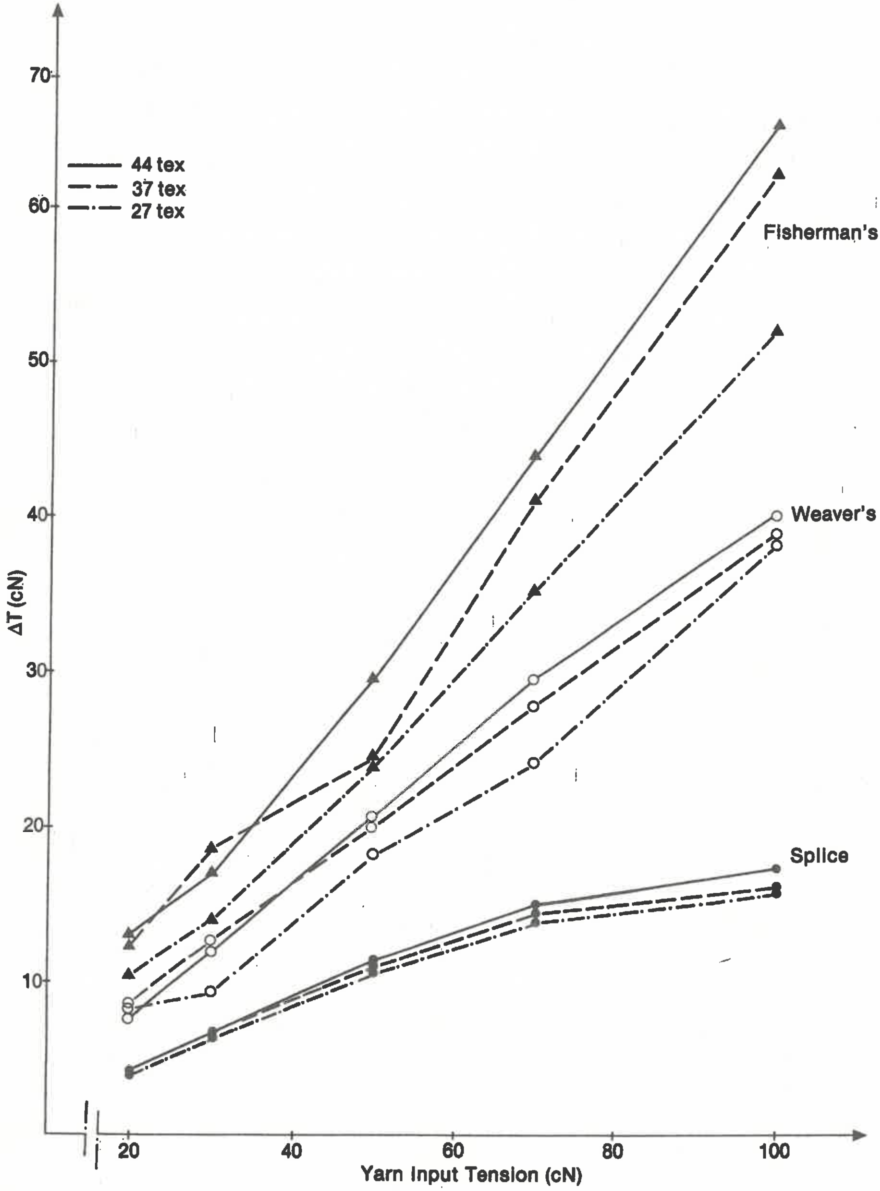


Fig. 3: Increase in yarn tension (ΔT) v. yarn input tension for different joints — 1,1 mm guide diam.; 27, 37 and 44 tex yarns.

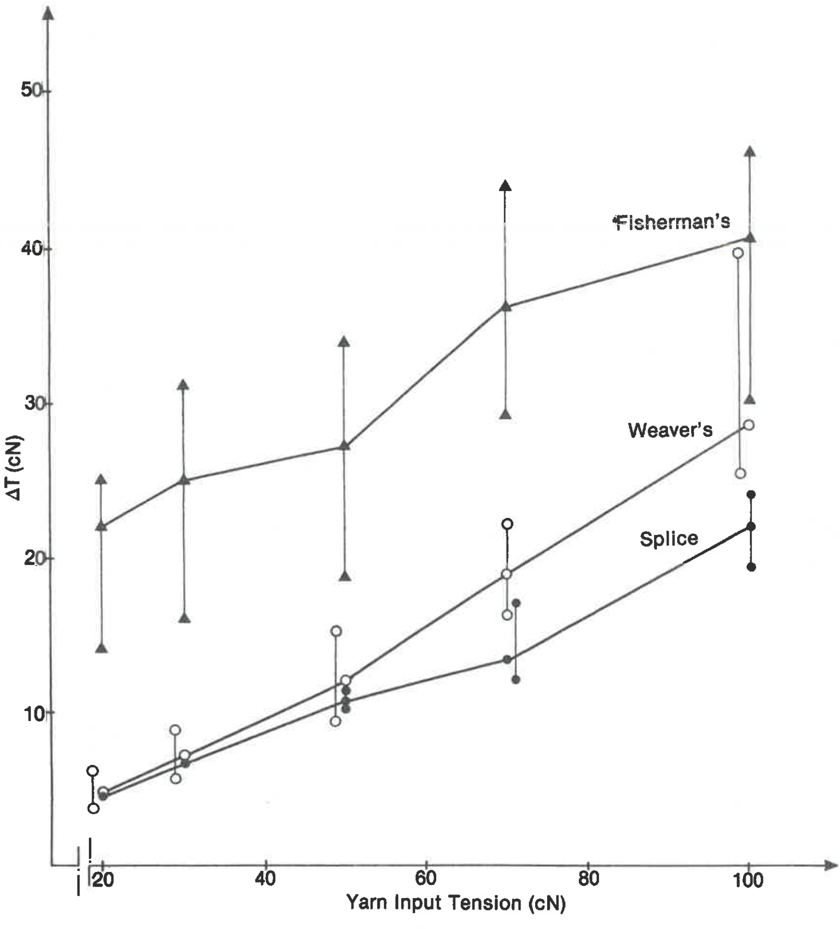


Fig. 4: Increase in yarn tension (ΔT) v. yarn input tension for different joints — heald eye; 37 tex yarn.

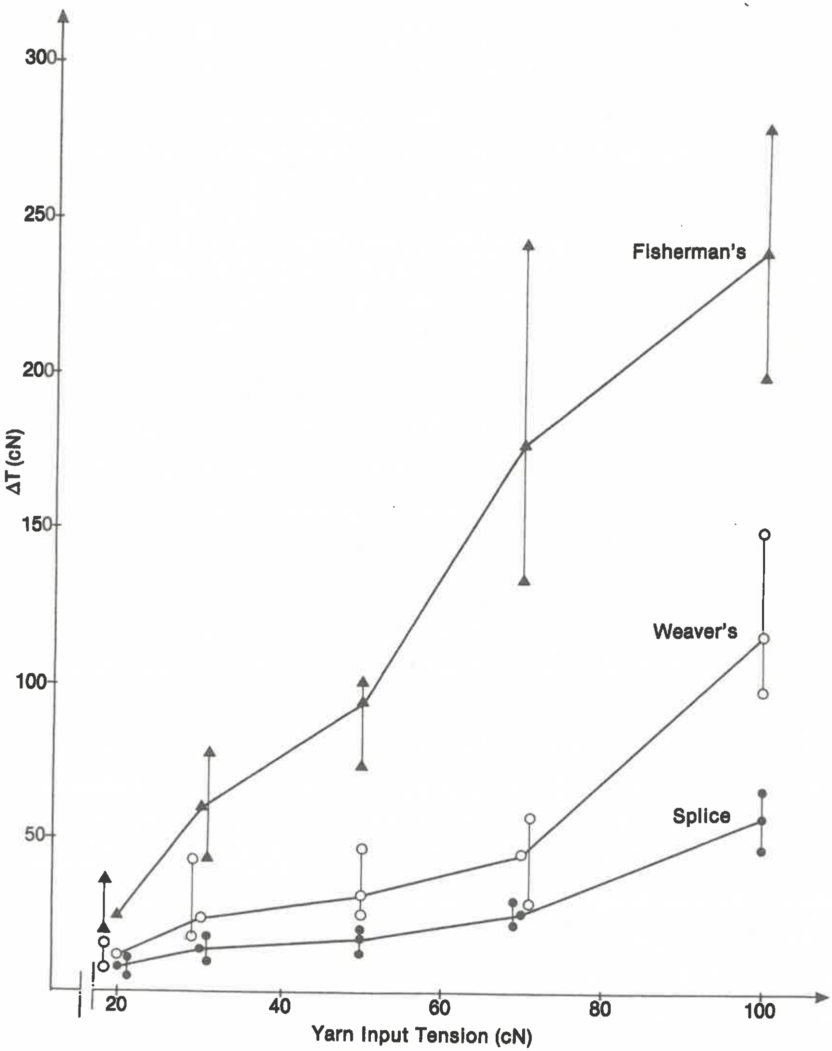


Fig. 5: Increase in yarn tension (ΔT) v. yarn input tension for different joints — yarn/yarn; 37 tex yarn.

the greatest increase. The weaver's knot ranked second in each test with the spliced joint having the least effect.

Effect of joint orientation

The increase in yarn tension due to the fisherman's knot, weaver's knot and spliced joint showed some variation in magnitude depending on joint orientation. This is depicted on the graphs by the range values (for example, Fig. 1). The splice joint, however, showed the lowest range value.

It was found that the tail can contribute to a significant degree to the yarn tension because at certain orientations of the joint, the tail can be bent back directly underneath the body of the joint adding to the joint diameter. This behaviour caused the greatest increase in yarn tension for all the joints.

Effect of Guide Diameter

The results obtained (Figs 1 and 2) show that the increase in yarn tension due to the presence of a joint decreased in magnitude as guide diameter increased.

The value of the range generally decreased with guide diameter for all yarn joints. The spliced joint, in this respect, exhibited the lowest range values for both guide diameters.

Effect of Yarn Linear Density

The results (Fig. 3) show that the increase in yarn tension due to the presence of a joint generally increased with yarn linear density.

For the fisherman's knot, the results for the 44 and 37 tex knotted yarns showed steeper slopes than those for the 27 tex knotted yarn. For the weaver's knot and splice, on the other hand, all three yarn counts generally showed similar slopes.

Heald Eye

The general trends (Fig. 4) were similar to those obtained for stainless steel guides.

Yarn/Yarn Friction

The increase in yarn tension due to the presence of a joint, for yarn against a yarn was considerably greater in magnitude than for yarn against a guide although the same general trends prevailed.

SUMMARY

The effect of yarn joints on the tension of a running yarn in capstan-like conditions was investigated in terms of guide diameter, yarn linear density and type of joint for all-wool worsted yarns. The presence of a joint caused a significant increase in yarn tension, the magnitude of which decreased with an increase in guide diameter and increased with both yarn linear density and tension. The influence of the type of joint was investigated for yarn against a

guide, yarn against heald-eye and yarn against yarn conditions. The results show that quite a high increase in yarn tension can be attributed to the fisherman's knot and, to a lesser extent, the weaver's knot. The air splice, on the other hand, was shown to have less influence on the tension of the yarn. In this respect, the spliced joint can offer a significant advantage over the traditional fisherman's and weaver's knotted joints during the weaving process.

ACKNOWLEDGEMENTS

The author is indebted to Mr G. A. Robinson (SAWTRI) for his comments.

USE OF PROPERTY NAMES

The names of proprietary products where they appear in this report/publication are mentioned for information only. This does not imply that SAWTRI recommends them to the exclusion of other similar products.

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