

ALPINA'S NEW FOOTWEAR DEVELOPMENT THROUGH OPTICAL FOOT MEASUREMENTS

Slavko Dolinšek
Faculty of Management
University of Primorska
Cankarjeva 5
Koper, Slovenia

Boštjan Novak
Alpina, d.o.o.
Strojarska ulica 2
Žiri, Slovenia

Peter Štrukelj
Faculty of Management
University of Primorska
Cankarjeva 5
Koper, Slovenia

ABSTRACT

In the paper, we first present some basic foot measurement procedures. We then highlight some advantages and disadvantages of optical foot measuring instruments. We then present results of foot measurements that were carried out on Slovenian footwear customers by the Slovenian footwear manufacturer Alpina. Thereupon, we present Alpina's development of the first generation of new customer adjusted footwear (from the process of collecting information to the process of footwear production).

Keywords: foot measurement, optical foot measuring instrument, customer adjusted footwear.

1. INTRODUCTION TO FOOT MEASUREMENT

In a footwear industry, foot measuring plays a decisive role in footwear development, production and marketing. Foot measuring is carried out for different purposes. Most commonly, feet are measured in order to acquire appropriate information on customer's feet. Based on measurements, an adjusted last can be made, an appropriate last can be selected from our own archives or footwear can be adjusted. In mass production of footwear, producers strive to gain a shape of a foot that would cover as much as possible a population of their customers. In this way, a footwear could be made that would suit a majority of customers. Consequently this means that with the lowest costs of last development, the widest possible range of customers could be satisfied.

For a perfect sole measurement we need 33 different measurements [4], yet we rarely carry out all of them. For ordinary individually adjusted footwear, around 20 different measurements usually suffice.

The most recurring measurements for costumed footwear design and production are:

- foot outline, horizontal foot outline under the right angle,
- foot print that shows weight distribution,
- side measurements of a foot, such as height of a big toe, height of a joint and instep,
- length,
- width,
- range measurements (ranges of a joint, instep, heel bone and ankle) [2].

In a mass footwear production, we do not conform to each particular customer separately, since based on the most basic foot measurements; we try to choose a footwear that would fit customers the most. In this case, most often we measure only 3 most important measures: length, foot width in a joint and range around a joint.

2. MODERN FOOT MEASUREMENT WITH OPTICAL MEASURING INSTRUMENT

Today, feet are measured by means of optical measuring instruments (without a touch) and computers. First optical measuring instruments were rather slow, inaccurate and very expensive. Today measurements are carried out in a simple manner, quickly and accurately. We can then acquire measurement data from a data basis of measured feet according to our research needs or according to the type of footwear that we will produce. Measuring time is usually shorter than 10 minutes; in cases it is even shorter than 5 minutes (together with putting one's shoes on and taking one's shoes off). Measurements are pretty accurate and have deviation in the ± 1 mm interval.

However, besides all advantages, optical foot measuring instruments also have some disadvantages:

- they are sensitive to a too strong external light, and that is why certain manufacturers recommend all kinds of "boxy" shapes of measuring devices that prevent light to enter the measurement area, yet this might have an unpleasant psychological influence upon a person that would like to get his/her feet measured (putting a foot in a dark hole...),
- shifting from one foot to the other during measurement (only very few measuring devices can measure both feet at the same time),
- usually they are sensitive to objects that reflect the light too much (shining parts), which is more evident in measuring objects (e.g. shoemaker's lasts) than in foot measurements,
- for a successful foot measurement execution, it is almost always necessary to put on white (the most white) socks,
- in some measuring instruments, it is necessary to stick black markers on a foot (in some instruments only 4 on each foot (Vorum), in others more than 4 (Inofoot))
- often, they are also rather immobile and can be used only there where they are placed...



Photo 1: Alpina's first optical foot measuring instrument, called Yeti



Photo 2: Alpina's most advanced optical measuring device, used today

3. FOOT MEASUREMENT OF ALPINA'S CUSTOMERS

Footwear producing factory Alpina has been trying for a very long time to approach its customers in different ways. With this purpose in mind, Alpina has tried to develop footwear, which would have such a shape that would suit the foot shape of as many customers as possible. Therefore, Alpina wanted to acquire data on how an average Slovene foot looks like. Up until the development of modern informatics we could acquire data only by means of manual measuring, by inserting data and then statistically processing measured data, and that was a rather lengthy procedure. A second reason for searching for quick solutions in foot measuring was the fact that Alpina provides running footwear for many top ski runners and biathlon runners, for which competition shoes have to be custom made. Based on several thousand foot measurements [1], it was found that feet differ in length and width, in finger and heel area, in instep height and also in volume. It was also found that the span between the narrowest and the widest foot amounts to more than 10 widths and that by only one width we cover a very small amount of customers. As well as 35 % of the population has a difference in width between left and right foot for half of the width, 14 % of the population for the whole width.

For customers that have different feet width/length, the following is valid: (1) If the difference in length/width is half of size-number, then purchasing an adjusted footwear according to the fit and comfort system is preferred, where customer can buy left and right shoe of different size or width, or each individual shoe is adjusted to the shape of each foot separately (by means of partial re-formation, we can adjust almost any footwear to a pre-determined shape, and (2) If the difference equals or is greater than one length/width number, then purchasing adjusted footwear is almost necessary. Customers that have such differences between feet and that are buying footwear in a classical way, have to always search for compromises – usually, one shoe is the right size, while the other is usually too big (too wide) or too small (too narrow), and this can lead to very severe foot damages.

Based on measurements, it was also found out that the most recurring size-numbers by men numbers are 41, 42 and 43 (between 7 and 9), whereas by women the most recurring are 37 and 38 (between 4^{1/2} and 6). The most recurring width-numbers by men are 5, 6, 7 and 8 (E, F, G and H), and by women 4, 5 and 6 (D, E and F). Measuring their feet is most preferred by children between 5 and 14 years old of age and young people between 25 and 35 years old of age.

Based on measurements Alpina has conducted [1], it was also found out that there can be substantial differences between individual residents inside a particular region. Residents that come from larger cities have wider feet than residents from remote places who are mainly engaged in forestry and farm labour. The reason for this is in the type of footwear that is being used by individuals. In cities, people wear wide and comfortable footwear in which a foot does not have sufficient support. In such cases, in order for a foot to achieve some stable state, a foot itself has to be strengthened by strengthening muscular structure. On the contrary, residents on farms use tight footwear that protects them in performing dangerous tasks. This footwear itself supports foot skeleton, and that is why they have narrower feet. From the above conclusion we can deduce that often it is very difficult to conclude how an average foot of a particular nation looks like.

4. ALPINA'S DEVELOPMENT OF NEW CUSTOMER ADJUSTED FOOTWEAR

Due to increasingly tough competition in a footwear market, Alpina was forced to search for additional market niches. Opportunities were sought mainly in the model of customer adjusted footwear. Inside this framework, Alpina has developed two completely separate systems of customer adjusted footwear, the first of which will be presented in the following.

4.1. Process of collecting information

By purchasing a first optical measuring instrument in 2001 (see *photo 1* above), Alpina started to purposefully and systematically investigate size, width, shape and differences between individual feet. Based on results, Alpina was later then able to decide for the right approach of producing and selling individual footwear collections. After around 6.000 measurements, certain results of foot shape began to form. Alpina's measurements showed that a lot of people have problems in buying ideal footwear – and this additionally motivated Alpina to develop customer adjusted collection. A customer could, in exchange for a certain additional premium, buy a different (in length and/or width) left and right shoe – it would depend on his/her needs.

4.2. Process of manufacturing the collection

Alpina made completely new lasts for the collection of customized footwear. These lasts were adjusted to the final purpose of using a shoe, which would be produced on these lasts. Widths and lengths of all measured feet were inserted into a graph. From this graph, medium widths for a particular length (values that would represent the most frequent foot shape by Slovenians) were then calculated.

In the framework of the first generation of customer adjusted footwear, the following models were made: men fashionable shoe, women fashionable shoe, trekking model Vision, walking shoe Tibet and men and women skiing shoe.

A difference between individual widths was between 1 and 2 width-numbers (depends on a model), which somewhat suffices for customers to feel the difference between individual widths, while at the same time, such span covers sufficiently large population of different foot widths of customers.

Questionnaire results in the framework of the EUROShoE project have shown that because of its inclination towards fashion, fashionable shoes are not very suitable for a customized footwear

production [3]. Sports footwear is more appropriate, since it is not so strictly subjected to fashion trends. For this purpose, both fashionable models are more classical and can be sold in several seasons.

Since three different widths require certain adjustments in production, Alpina was forced to adjust also the production. In order to avoid excessive costs, Alpina tried to use the same component parts by different widths as much as possible. Beside lasts in different widths, Alpina had to finally use only inner soles. In under soles, Alpina used flat soles that can also be polished or truncated and thereby adjusted to different widths. In this way, Alpina was able to use only one sole for all three widths.

In ski footwear, Alpina was forced to search for other solutions. Due to high costs of producing tools for jetting plastic component parts, Alpina had to use one tool for all widths. Instead, Alpina had to change thickness of foam in an inner shoe. For the narrowest model, thicker foams were used, and for the widest model, thinner foams were used. In this way, substantial differences between individual widths were gained.

Since a delivery term would be quite lengthy, if footwear was made only after Alpina had received a certain order, Alpina has made a certain amount of pairs in stock. In this way, stock in final warehouse was increased, into which Alpina was forced due to the following simple reasons:

- if footwear was made only after receiving an order, then a delivery term would be longer for couple of days, maybe even more than a week, and
- this pair would have to be made during regular production (which would cause deadlocks – adjusting machines for production), or a special workshop for producing this footwear would have to be set up, where only adjusted footwear would be made (that is risky, since the amount of orders was not known in advance).

5. CONCLUSION

Success of Alpina's first generation of customer adjusted footwear was not as expected (more on this, see [5]) – Alpina therefore sought for new solutions. A new concept was developed – a second generation of customer adjusted footwear »Binom« (4 new adjusted models were developed). For this new generation, a completely new optical measuring device (see *photo 2* above) was developed with the help of the Faculty of Engineering (University of Ljubljana) that is much cheaper, smaller and more mobile than all former measuring devices. Therefore, more shops are now equipped with this optical measuring device which will also help in advising customers.

6. REFERENCES

- [1] Alpina: Poročilo meritev stopal, Interno gradivo, Alpina, 2008.,
- [2] Bonham N. J., Burt W. J., Hughes T., Loader C., Page E. J. in Dunthorn K. C.: Manual of shoemaking, C&J Clark, Somerset, 1976.,
- [3] EUROShoE: The Market for Customized Footwear in Europe; Market Demand and Consumers' Preferences, EUROShoE project report, 2002.,
- [4] Gros J.: Tipizacija in standardizacija sestavnih delov obutve in kopita, Tržič Interno gradivo, Peko, 1991.,
- [5] Kacin J., Novak J., Kramperšek D., Lukančič B. in Kavčič F.: Pregled od leta 1998 do 2007, Delo življenje 45 (4): 19–27, 2007.