EG98
GUIDE

ENVIRONMENTAL
TECHNOLOGY
BEST PRACTICE
PROGRAMME

WATER USE IN TEXTILE DYEING AND FINISHING

ENVIRONMENTAL PERFORMANCE GUIDE: The benchmark for profitable environmental improvement

SURVEY OF UK TEXTILE DYERS AND FINISHERS

A survey of the amount of water used in the UK textile dyeing and finishing industry was carried out by the Environmental Technology Best Practice Programme with assistance from the UK textile trade associations. Representative information on water use was obtained for the following sectors.

- woven cloth
- fibre and yarn
- knitted cloth
- garments

WHY REDUCE WATER CONSUMPTION?

The UK textile dyeing and finishing industry uses over 60 million m^{3*} of water every year. Traditionally, water has been a cheap and plentiful resource for the textile industry. However, this situation is now changing. The survey identified that the main issues causing greatest concern to companies in the industry are:

- the increasing cost of mains water;
- supply shortages during periods of drought, eg falling borehole levels and restrictions on water abstraction from rivers;
- escalating effluent charges;
- stricter discharge consents;
- restrictions on the discharge of coloured effluents, residual detergents, organophosphates, mothproofing agents, etc;
- the expense of the possible future need to install effluent treatment plant.

***Water Volume Conversion**

1 m^3 = 1 000 litres = 220 gallons
To convert gallons to m^3, multiply by 0.004546

HOW THIS GUIDE WILL HELP YOU

This Environmental Performance Guide (which presents and analyses the results of the survey) will enable you to compare your water consumption with that of other companies in your sector **and** identify the savings you can achieve by adopting good practice methods and techniques. Reducing the amount of water you use will also reduce the volume of water discharged as effluent. Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry* - available free of charge from the Environmental Helpline on 0800 585794 - will help you develop an action plan to save water and thus reduce your costs.

*By implementing no-cost and low-cost measures you could **reduce** your water and effluent costs by **20%** or more.*

DO YOU KNOW HOW MUCH WATER YOUR COMPANY USES?

The best way to determine your water use is to compare meter readings over a period of, for example, four weeks or to check your bills. Water meters are usually fitted to the incoming supply, but may also be found at discharge points, on individual machines and after water treatment units. Details about different meters and their application are given in Good Practice Guide (GG67) *Cost-effective Water Saving Devices and Practices*, available free from the Environmental Helpline on 0800 585794.

Benefits of Monitoring

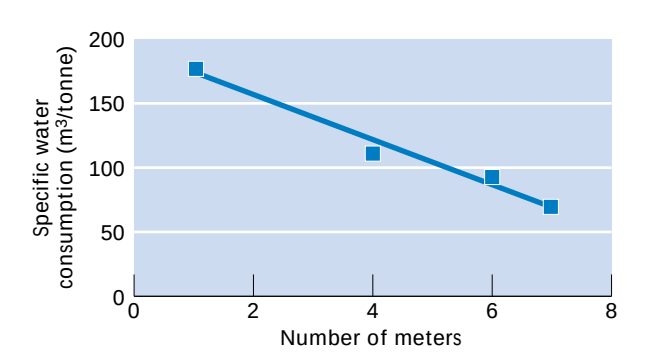
*A dyer in the woven cloth sector assumed that a scouring machine was using 120 litres/minute of water as stated in the manufacturer's specifications. However, when water consumption was monitored, **actual use** was found to be 240 litres/minute. **Setting the machine correctly halved the cost of water for this machine and saved the dyer around £15 000/year.***

Water meters allow you to:

- measure your actual water consumption accurately and thus manage water use;
- allocate water use between individual processes and machines;
- detect serious leaks by highlighting discrepancies between water use calculated from meter readings of incoming water and effluent (after allowing for losses during processing).

As a general rule, the survey found that the more meters at a site, the lower its specific water consumption (see Fig 1). **Could your company benefit from installing more meters?**

Fig 1 Number of meters compared to specific water consumption in the knitted cloth sector



HOW TO CALCULATE YOUR WATER CONSUMPTION

Specific water consumption is the volume of water used per unit of production. Establishing this figure will allow you to compare your own water use with that of other companies in your sector, regardless of company size and variations in throughput. From this you can gauge your efficiency of water use. It is also effective as a tool to track your own improvements and savings.

Use the Water Calculator Form to calculate the specific water consumption of your site or a particular process. If you photocopy the form, you can use it to repeat the calculation after water saving measures have been introduced or to determine the specific water consumption for different machines or processes.

Comparing your figures with the values for your sector given in this Guide will tell you if your company could do more to reduce the amount of water it uses and thus save money.

HOW MUCH MONEY COULD I SAVE?

The hypothetical example in Table 1 shows the significant savings that could be achieved by implementing best practice. In the knitwear sector, specific water consumption ranges from 70 m^3 to 206 m^3 per tonne of cloth produced. This example shows that the difference in water costs between the worst and best performance, for a company producing the sector's average output, is nearly **£474 000/year**.

WATER CALCULATOR FORM		
Date of first meter reading	..... m^3	A
Date of second meter reading	..... m^3	B
Volume of water used (difference between the two meter readings or from your water bill)	..... m^3	C = B - A
Number of working weeks during period of measurement	..... weeks	D
Weekly water consumption	..... m^3	$E = \frac{C}{D}$
Weekly output of product	..... tonnes or 1 000 metres* of cloth	F
Specific water consumption	..... m^3/tonne or m^3/1 000 metres of cloth	$\frac{E}{F}$

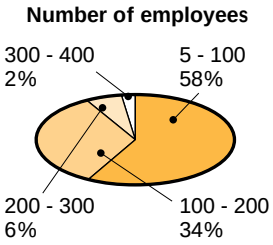
** Unit of production preferred by the woven cloth sector.*

Table 1 Hypothetical example showing water costs for worst and best performance

	Worst performance	Best performance
Specific water consumption	206 m^3/tonne	70 m^3/tonne
Average weekly output	66 tonnes	66 tonnes
Weekly water consumption	66 tonnes x 206 m^3/tonne = 13 596 m^3/week	66 tonnes x 70 m^3/tonne = 4 620 m^3/week
Weekly cost of water @ 60 pence/m^3	13 596 x 0.6 = £8 158/week	4 620 x 0.6 = £2 772/week
Annual cost of water*	£391 565/year	£133 056/year
Weekly disposal costs @ 50 pence/m^3	13 596 x 0.5 = £6 798/week	4 620 x 0.5 = £2 310/week
Annual disposal costs*	£326 304/year	£110 880/year
Total cost of water (excluding energy and chemicals)	**£717 869/year**	**£243 936/year**

** Assuming production is for 48 weeks/year.*

This sector, which makes up 64% of the UK dyeing and finishing industry, produces cloth for a wide range of applications, including the manufacture of clothing, furnishing and household items. The largest business involvement for the companies surveyed was apparel (two-thirds), followed by furnishing and household. Most use a combination of dyeing, bleaching, printing and finishing processes. The woven cloth manufacturers that responded to the survey produce an average of 136 000 metres/week.



Compared to the other sectors, fewer respondents (63%) use mains water as their entire or partial source of supply. About half of the companies with borehole or surface water supplies supplement their supply with mains water.

85% of respondents in this sector had at least one meter installed and 28% had four or more meters in use. The 15% without meters used water from boreholes or surface abstraction. Over half of the respondents treated some of their incoming water before use.

Specific Water Consumption

The survey showed that the average water consumption of the respondents in this sector is 3 912 m^3/week (based on 48 working weeks/year). Output, which is typically measured in metres of cloth,† varied from 5 000 - 400 000 metres/week, with an average of 136 000 metres/week.

The values obtained for specific water consumption for the whole site (ie process, domestic and boiler water) ranged from 1 - 173 m^3/1 000 metres of cloth, although the average was only 37 m^3/1 000 metres of cloth (see Fig 3). This wide variation is due, in part, to the differing water requirements of the different processes and fabric types.

† *To convert the weight of woven cloth to 1 000 metres of cloth, multiply the figure in tonnes by: 10.08 for light fabric; 4.69 for medium fabric; and 2.71 for heavy fabric.*

Water Use in Different Processes

The diversity of manufactured cloth operations and process water requirements in this sector means that you should look carefully at the specific water consumption of your different processes. Fig 2 shows the specific water consumption for six common processes.

How Does Your Performance Compare?

Once you have used the Water Calculator Form to work out your specific water consumption, you can compare your performance with that of other companies in the sector (see Fig 3). If your specific consumption is higher than average, you should examine how you could use less water to cut your costs and increase profitability.

With a high weekly output, even a small saving in specific water consumption of 5 m^3/1 000 metres of cloth would mean a saving of 250 m^3 on a weekly output of 50 000 metres of cloth.

Fig 2 Specific water consumption for different processes in the woven cloth sector

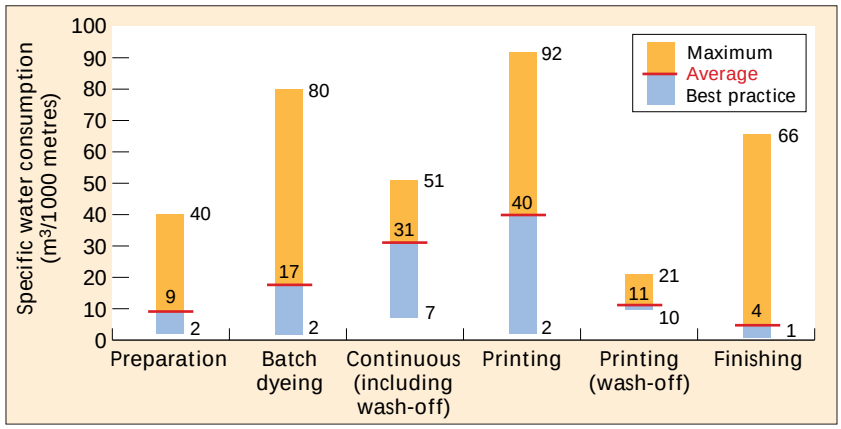
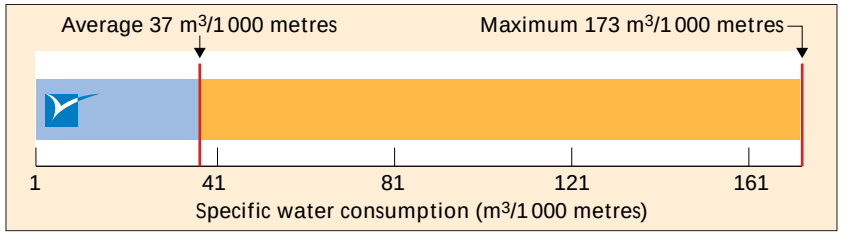


Fig 3 Range of values for specific water consumption in the woven cloth sector

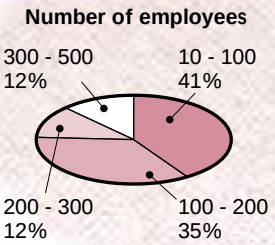


EXAMPLES OF WHAT CAN BE ACHIEVED BY IMPLEMENTING GOOD PRACTICE

- **Savings of 15% achieved by recycling cooling water between operations and modifying washing processes.**
- **Fitting flow restrictors and reducing valves produced 5% saving in water costs.**
- **Reducing rinse times saved 50 m^3/week.**
- **Fitting more efficient sprinkler nozzles to scouring machines and pumping final water back to water storage saved 210 m^3/week.**

More examples are given in Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry*.

This sector, which accounts for 18% of the UK dyeing and finishing industry, produces fibre and yarn for use in furnishing, household fabrics, clothing, carpets, medical materials and automotive textiles. The fibre and yarn manufacturers that responded to the survey produce an average of 66 tonnes/week.



Although most of the companies that responded to the survey have a mains water supply, only just over half rely completely on this source of water. The rest use either borehole or surface abstraction, supplemented with water from the mains. A small number of companies use surface abstraction only. Most companies in the sector have only one meter for monitoring water supply.

Specific Water Consumption

The survey showed that the average water consumption of the respondents in this sector is 1 890 m^3/week (based on 48 working weeks/year). Specific water consumption for the whole site (ie process, domestic and boiler water) is shown in Fig 4.

Water Use in Different Processes

The breakdown of processes operated by the respondent companies in this sector is as follows: 47% are involved only in dyeing activities; the others use a combination of dyeing, bleaching and finishing. Water use for batch dyeing and finishing is shown in Fig 5. It was found that on average, boilers use 14% of the site's total water consumption.

How Does Your Performance Compare?

Once you have used the Water Calculator Form to work out your specific water consumption, you can compare your performance with that of other companies in the sector (see Fig 6). If your specific consumption is higher than average you should examine ways you could use less water to cut your costs and increase profitability.

Fig 4 Specific water consumption in the fibre and yarn sector

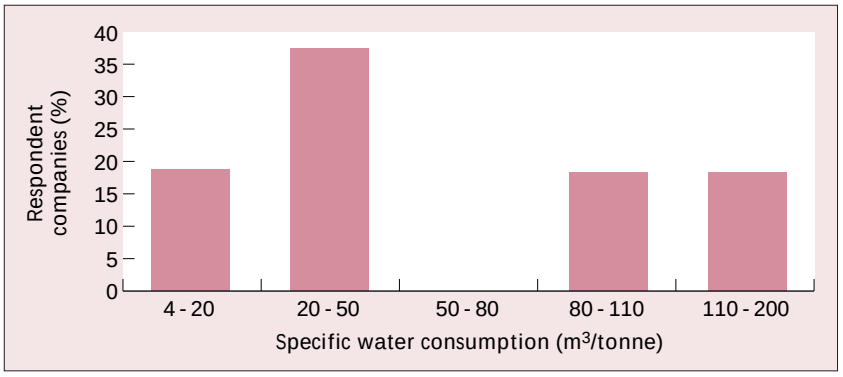


Fig 5 Specific water consumption for different processes in the fibre and yarn sector

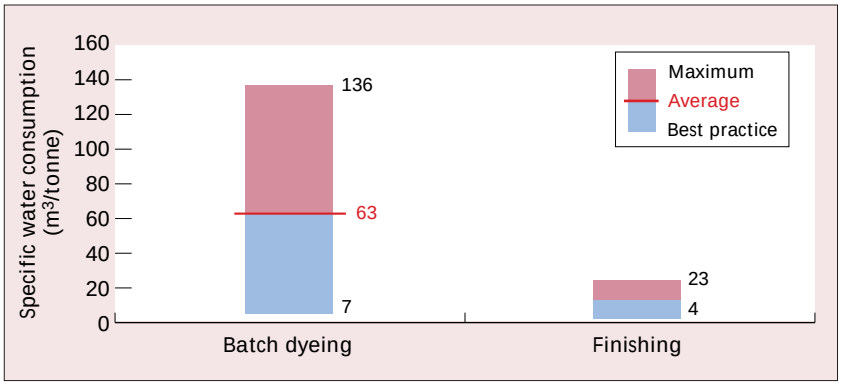
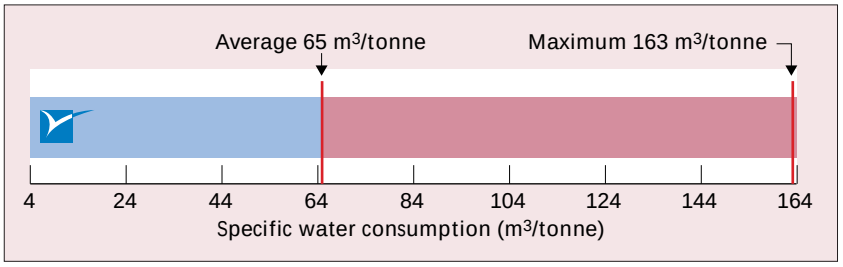


Fig 6 Range of values for specific water consumption in the fibre and yarn sector

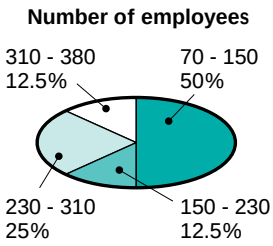


EXAMPLES OF WHAT CAN BE ACHIEVED BY IMPLEMENTING GOOD PRACTICE

- **Modifying dye recipes allowed one company to reduce its water use by 11%.**
- **Another company reduced its water consumption by 660 m^3/week and thus saved approximately £30 000/year by using countercurrent washing in the washing range, recycling rinsewater, collecting and re-using cooling water, and using wash-off water for dyeing.**

More examples are given in Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry*.

This sector accounts for 9% of the UK dyeing and finishing industry. All of the companies that took part in the survey were in the apparel business; half processed cotton only and half processed a mixture of synthetics and cotton. The knitted cloth manufacturers that responded to the survey produce an average of 59 tonnes/week.



All of the companies obtained all of their water from the mains, except for one which obtained most of its water from a borehole. The number of meters varied considerably, but had no relationship to company size.

Specific Water Consumption

The survey showed that the average water consumption of respondents in this sector is 714 m^3/week (based on 48 working weeks/year). Specific water consumption for the whole site (ie process, domestic and boiler water) is shown in Fig 7.

Water Use in Different Processes

All of the survey respondents carry out a combination of processes at their site. Water use for preparation, batch dyeing and finishing is shown in Fig 8. On average, boilers use less than 5% of the site's total water consumption.

How Does Your Performance Compare?

Once you have used the Water Calculator Form to work out your specific water consumption, you can compare your performance with that of other companies in the sector (see Fig 9). If your specific consumption is higher than average you should examine ways you could use less water to cut your costs and increase profitability.

Fig 7 Specific water consumption in the knitted cloth sector

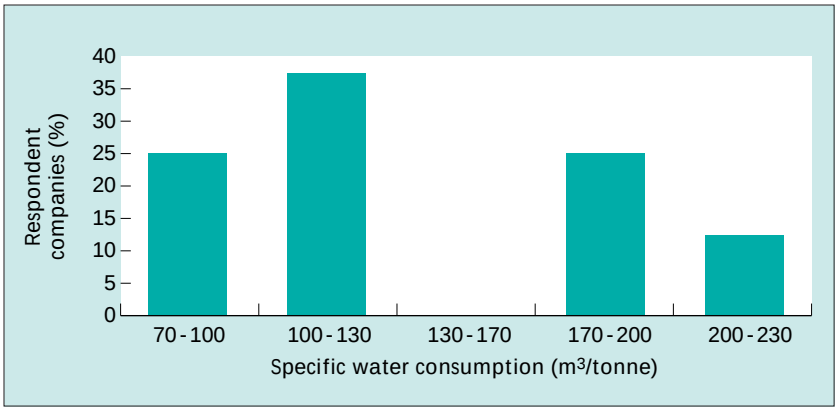


Fig 8 Specific water consumption for different processes in the knitted cloth sector

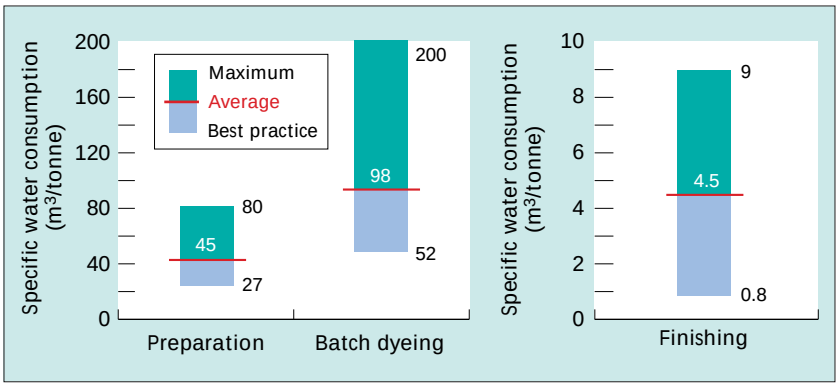
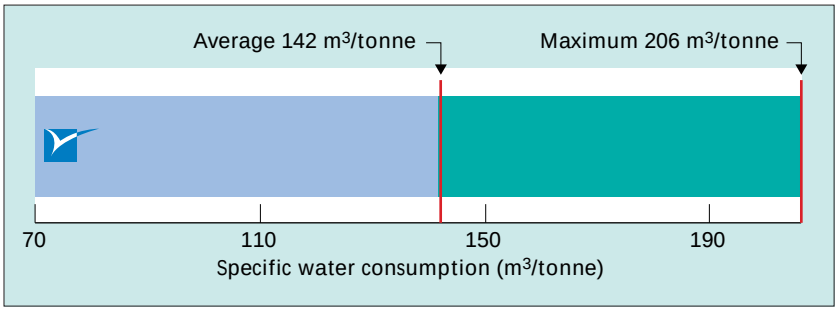


Fig 9 Range of values for specific water consumption in the knitted cloth sector

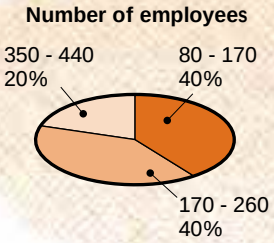


EXAMPLES OF WHAT CAN BE ACHIEVED BY IMPLEMENTING GOOD PRACTICE

- **Installing continuous wash-off reduced water consumption by 60%, saving one company £195 000/year.**
- **Changing the type of chemicals and dyestuffs used produced savings of 8%.**

More examples are given in Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry.*

This sector, which accounts for 9% of the UK dyeing and finishing industry, produces clothing from a range of fabric types including cotton, wool, synthetics and linen. All of the companies surveyed conducted preparation and dyeing processes with some companies also operating finishing processes. The garment manufacturers that responded to the survey produce an average of 22 tonnes/week. Few of the respondent companies in this sector monitor individual processes.



All of the companies surveyed had only mains water supply, with the exception of one company which obtains over three-quarters of its water by surface abstraction. The number of meters varied considerably, but had no relationship to company size. All of the companies employ some form of water treatment.

Specific Water Consumption

The survey showed that the average water consumption for the surveyed companies is 3 717 m^3/week (based on 48 working weeks/year). Specific water consumption for the whole site (ie process, domestic and boiler water) is shown in Fig 10.

How Does Your Performance Compare?

Once you have used the Water Calculator Form to work out your specific water consumption, you can compare your performance with other companies in the sector (see Fig 11). If your specific consumption is higher than average you should examine ways you could use less water to cut your costs and increase profitability.

Fig 10 Specific water consumption in the garments sector

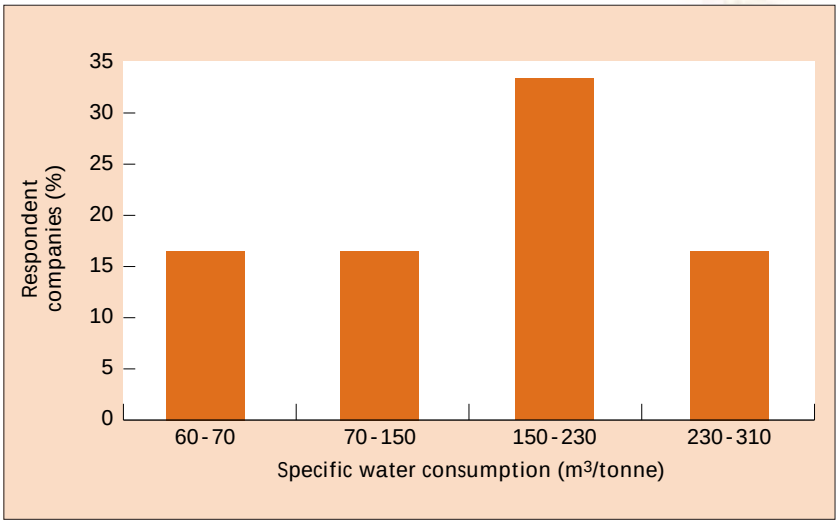
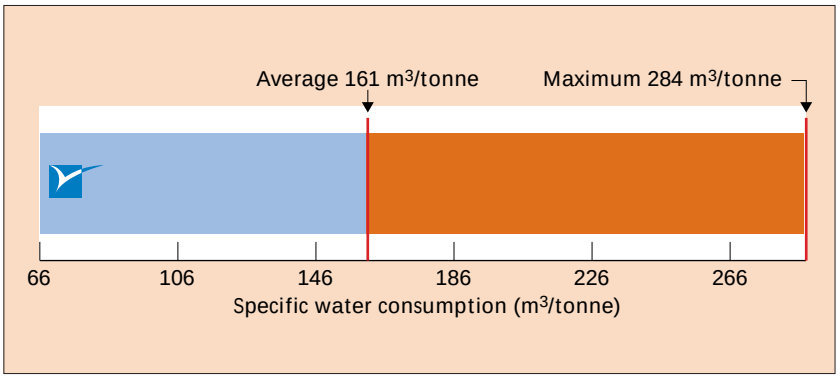


Fig 11 Range of values for specific water consumption in the garments sector



EXAMPLES OF WHAT CAN BE ACHIEVED BY IMPLEMENTING GOOD PRACTICE

- **Rationalising processes reduced water consumption by up to 25%.**
- **Investing in low-liquor machines reduced water use by 25 - 30%.**
- **Changing the type of chemicals and dyestuffs used produced savings of 8%.**

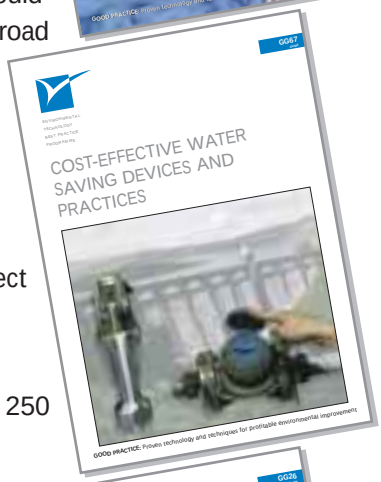
More examples are given in Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry.*

ACTION PLAN TO REDUCE WATER USE

- Calculate how much water your company uses from your water/effluent bills or by installing meters to monitor water use. Use the Water Calculator Form provided on page 3.
- Identify the water inputs and outputs for each process.
- Use this Environmental Performance Guide to compare your water use with that of companies performing similar operations/processes.
- Monitor processes/machines that have high water consumption.
- Consider no-cost and low-cost measures to save water, eg good housekeeping, modifying recipes and changing procedures. Further information can be obtained from Good Practice Guide (GG67) *Cost-effective Water Saving Devices and Practices* and Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry*.
- Follow the action plan given in Good Practice Guide (GG62) *Water and Chemical Use in the Textile Dyeing and Finishing Industry*.
- Identify and implement opportunities for reducing water use and improving efficiency as part of a water, chemicals and effluent management programme.

Remember: ***If you don't measure it, you can't manage it.***

The Environmental Technology Best Practice Programme has produced several free Guides which will help you to implement a waste minimisation strategy that should save your company at least 1% of turnover. This will set your company on the road to positive environmental management and increased profits.



To obtain free copies of these publications, phone the Environmental Helpline on 0800 585794.

The Environmental Helpline can also:

- tell you about relevant environmental and other regulations that could affect your operations;
- suggest other sources of information;
- arrange for a specialist to contact your company if you employ fewer than 250 people.

This Environmental Performance Guide can help you to:

- save money by reducing your water operating costs;
- improve your profit margins;
- enable you to compare your water use performance with that of other companies;
- identify opportunities for improving your water use and environmental performance.

This Guide was produced by the Environmental Technology Best Practice Programme. Prepared with assistance from The Textile Finishers' Association.

FOR MORE INFORMATION ABOUT THE ENVIRONMENTAL TECHNOLOGY BEST PRACTICE PROGRAMME AND HOW ITS FREE SERVICES CAN HELP YOU, PLEASE PHONE THE

ENVIRONMENTAL HELPLINE 0800 585794

World wide web: http://www.etsu.com/ETBPP/ **e-mail address: etbppenvhelp@aeat.co.uk**

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