Development of European Ecolabel and Green Public Procurement Criteria for Imaging Equipment

BACKGROUND REPORT

COST CONSIDERATIONS

Working Document

for

2nd AHWG MEETING FOR THE

REVISION OF GPP CRITERIA

FOR IMAGING EQUIPMENT

Jiannis Kougoulis, Renata Kaps, Oliver Wolf

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1 INTRODUCTION

The following section amends the Economic and Market analysis[1] undertaken in the frame of the project "Development of EU Ecolabel and GPP criteria for imaging equipment" covering life cycle cost considerations related to the purchase of imaging equipment devices from the perspective of public authorities. This working document on cost considerations is provided as input for the 2nd AHWG for the revision of GPP criteria on imaging equipment and can be downloaded via the project website:

http://susproc.jrc.ec.europa.eu/imaging-equipment/stakeholders.html

2 COST CONSIDERATIONS

2.1 Imaging equipment life cycle costing overview

In order to allow public procurers to select which products will be most cost-effective it is recommended to use a product life cycle perspective and apply a life cycle cost (LCC) approach. LCC considers the entire (physical) life cycle of a product, from production to disposal. Depending on the perspective taken in the LCC assessment, costs of different stages can be calculated with more or less detail. The use phase of the life cycle is very relevant for the public procurers as e.g. the production cost of the product to be purchased does not need to be calculated in detail, as the relevant cost element for the purchasing authority would be integrated in the final product price. In this respect for imaging equipment we can identify (taking into account the LCC approach) the following costs categories:

- Purchase cost
- Running costs for operation (i.e. costs for electricity, paper and toner/ink)
- Running costs for repair and maintenance
- Installation costs (if applicable)
- Costs for disposal

[1] J. Kougoulis, O. Wolf, Preliminary Report "Development of European Ecolabel and Green Public Procurement Criteria for Imaging Equipment JRC IPTS Preliminary Study Task 2. Economic and Market Analysis (draft 1)" European commission, Joint Research Centre, Institute for Prospective Technological Studies, Sustainable Production and Consumption Unit. February 2011, available online at: http://susproc.jrc.ec.europa.eu/imaging-equipment/docs/Ecolabel%20GPP%20Imaging%20Equipment%20Task%202.pdf.

- Costs due to inflation and interest rates (if applicable)

It is important to highlight that the actual running costs of operation of imaging equipment shall be calculated on the basis of average time for different operation modes as well as the average amount of consumables (i.e. paper and toner or ink cartridges) needed for their specific operation and the actual specific printout images produced (e.g. a colour image differs from a monochrome one and not every colour printout needs the same amount of ink etc).

Further, power consumption depends on the product and on the time period the product is in each mode (ready-mode, sleep mode, off mode etc). The total energy consumption can be calculated summing up the multiplied assumed operation times for which each single mode with their respective power consumption. The resulting electricity consumption in kWh then needs to be multiplied with the electricity costs in order to determine the running costs for operation (as regards electricity). For procurers a good practical solution for getting an approximation on this issue is to use, when applicable, the assumptions and the user patterns applied in the Energy Star label and the calculated TEC values.

As mentioned above, imaging equipment devices can usually enter various power modes with different power consumption values. According to Energy Star, one can differentiate between:

- Active mode: Power state in which the product is connected to a power source and is actively producing output, as well as performing any of its other primary functions.
- Ready mode: Power state when the product is not producing output, has reached operating conditions, has not yet entered into any low-power modes, and can enter ‘active mode’ with minimal delay. All product features can be enabled in this mode and the product is able to return to active mode by responding to any potential inputs. Potential inputs include external electrical stimulus (e.g. network stimulus, fax call or remote control) and direct physical intervention (e.g. activating a physical switch or button).
- Sleep mode: Reduced power state entered automatically after a period of inactivity. All product features can be enabled in this mode and the product must be able to enter ‘active mode’ by responding to any potential inputs; however, there may be a delay. The product must maintain network connectivity while in ‘sleep mode’, waking up only if necessary.
- Stand-by mode: Lowest power consumption mode which cannot be switched off (i.e. influenced) by the user and that may persist for an indefinite time when the product is connected to the main electricity supply and used in accordance with the manufacturer’s instructions. For imaging equipment products, the stand-by power level usually occurs in the ‘off mode’, but can occur in ‘ready’ or ‘sleep mode’. A product cannot exit the ‘stand-by mode’ and reach a lower power state

unless it is physically disconnected from the main electricity supply as a result of manual manipulation.

- Off mode: Power state that the product enters when it has been manually or automatically switched off but is still plugged in and connected to the mains. This mode is exited when stimulated by an input, such as a manual power switch or clock timer to bring the unit into 'ready mode'.

The distribution (i.e. how much time a printer spends in each mode) depends on the power management presetting of the device (how fast it changes into or 'wakes up' from a lower power mode) and on the user behaviour (frequency, distribution and volume of print jobs).

The definitions of the standardised Energy Star test procedure for the 'Typical Electricity Consumption' (TEC) can be used for the calculations. The TEC focuses on the quantity of electricity consumed by a product during a representative period of time (one week). For measuring the TEC, Energy Star defines a certain number of jobs per day and images per job depending on the imaging speed of the printer, a test image and a measurement procedure. To take into account power management default-delay times, the product has to be measured according to the configuration as shipped and recommended for use. The TEC-specifications might differ from real usage; however, they guarantee different imaging equipment devices being measured under same conditions and thus being comparable. To qualify for the Energy Star label, certain limit values have to be met by the devices.

In order to calculate the running costs for consumables, the average amount of produced imaging output over a certain period of time needs to be defined. In this respect efficient paper management and high energy efficiency of the device becomes very important.

Functionalities of the imaging equipment which allow the user:

- printing on both sides of a paper sheet,
- multiple pages printing on one side of a paper sheet (N-up printing function),
- which support quick cancellation of unwanted printout,

support reduced use of paper. This has economical and environmental savings (the greatest contribution to the overall environmental impacts of imaging equipment devices in Life cycle assessment are related to the consumption of paper).

Similarly energy-efficient products allow decreasing running costs and also contribute to reduction of various environmental impacts related to energy generation.

Consumption of both these resources is also the most cost-intensive for this product group, depending on the application of the device (e.g. whether it is a personal or professional, i.e. office equipment).

Further significant costs are related to the product consumables like inks and toners, which also have high share in the overall costs and at the same time are associated with certain environmental impacts (e.g. use of hazardous substances). It is considered that ink and toner cartridges contribute significantly to the overall waste volume produced in the lifecycle of the imaging equipment devices. The number of ink and toner cartridges which end up in the waste over the life cycle of an imaging device depends from several parameters, e.g. user environmental awareness, take-back system by tenders etc.

Considering a certain demand of printouts along the product life cycle for the calculation of the waste volume associated with the use of cartridges it is important to know how many times the ink and toner cartridges are re-used. It is not considered resource efficient to use the cartridges only once while this also raises the overall costs for disposal.

Regarding the costs for disposal these are often not directly linked to the purchaser but to the manufacturer. Part of these costs is eventually carried out from the municipality authorities responsible for the waste disposal as a certain number of products and product parts (cartridges) ends up in municipal waste.

The presence of certain substances in imaging equipment is of importance for the overall disposal costs. Following a sound environmental management the presence of hazardous substances causes need of separate treatment i.e. separation of mercury contained in backlights. Another example is the use of brominated flame retardants. Following the WEEE directive (which is the case if the imaging equipment is treated within the EU) the parts containing brominated flame retardants need to be separated from the waste stream. Further, in case of incineration (under best available practice (BAT) conditions) the plastic parts containing brominated flame retardants and PVC affect negatively the costs of the incinerator operational costs due to the high costs related to the treatment of the created flue gas. However, these costs are often not covered by the procurer therefore will not be further analysed in this phase.

2.2 Imaging equipment life cycle costing calculation

A user friendly tool for calculating the life cycle costs for public procurers of imaging equipment is available in the EU Energy Star website under http://www.eu-energystar.org/en/en_009.shtml

Imaging equipment devices are divided into numerous classes based on their functionalities and performance characteristics. The life cycle costs for the typical classes of imaging equipment can be calculated directly using the default settings. Moreover, the performance of alternative choices can be compared.

Several parameters related to the equipment functionalities, to the product operation mode and the user behaviour (i.e. use of double side printing option), to the product life time, to the overall number of printouts (and other aspects) are incorporated in this calculation. The procurers, depending on their needs, may determine these parameters in order to make the lifecycle costing calculation more appropriate for a particular undertaken procurement. The use of average values is also possible (i.e. use of the default assumptions) when procurers find difficulty on determining all these parameters.

The following listed parameters are calculated in the LCC calculator toolbox:

1. Total direct life time costs
    a. Equipment life time costs
    b. Energy costs
    c. Paper and toner/ink costs
2. Energy consumption
    a. Total energy costs
    b. Overall electricity consumption in kWh/year
    c. Watt consumption in different modes:
        i. Printing mode

ii. Sleep mode

3. Purchase cost:
    a. Buying the device in EUR/device
    b. Leasing cost per device in EUR/year
4. Electricity rate in EUR/kWh
5. Paper consumption
    a. Overall number of pages
    b. Number of monochrome printouts
    c. Cents per page for monochrome printing
    d. Number of colour printouts
    e. Cents per page for colour printing
6. Optionally if air-conditioning of the room is affected (in months /year)

Based on the selection of the equipment type many of these parameters can also be determined. For example the exact consumption in the sleep and in the printing mode can be changed based on the performance of the particular device.

However, some parameters in the energy calculation tool are set as default. For more precise cost calculation these values need to be computed separately and then the overall calculation costs provided by the toolkit can be adjusted respectively.

A relevant aspect here is the cost of the ink or toner cartridges and the cost of paper (one paper sheet is assumed to cost 0.01 EUR). The price of ink and toner cartridges can vary for each devise. We shall highlight that the costs for the purchase of the equipment are much lower than the overall costs related to ink or toner cartridges and paper.

Further, many ink and toner cartridges can be reused which has not only environmental savings but also economical savings. In the available calculator toolbox only pre-set prices on paper and ink/toner are used. As analysed later the price of the paper and ink or toner is the most crucial one related to the overall costs of ownership (see also Figure 3).

As in this toolbox the database of Energy Star label is used, it shall be highlighted that all of the equipment options are products which are energy efficient within their product category (Energy Star label is awarded to the top 25 % energy efficient models of the market). Therefore, the comparison of different models regarding the energy consumption is related in this sense either to determine the lifecycle costs of products which are in the same category i.e. working group laser device with duplex function and speed 32 ipm or for comparing products which are in different categories i.e. a value inkjet device with duplex function and speed 11/4 ipm versus a value multifunctional device with speed 6/10 ipm etc.

Practical points in the comparison of the life cycle costs of the equipment are:

1. The costs related to the paper and ink or toner along the product life time is much higher than the costs related to the energy consumed or the product purchase (see Figure 2). Therefore, the potential of the overall costs reduction via the purchase of ink or toner cartridges of lower price is considered high.

2. The price per printout out is also a cost that varies significantly among the different devices (see Figure 1). This parameter is important to be taken in to account.

3. The Watt consumption in different modes varies among different devises. The consumption of the printing mode ranges and in electrophotographic (laser) technology an average of over 400 Watt can be expected whereas in inkjet devices the average can lay in 15 Watt (values based on energy star toolbox calculator).

4. The situation is similar for the sleep mode. There are devices with a sleep mode consumption of 1 watt to 4 watt other in the range of 7 to 15 Watt whereas devices with sleep mode consumption of 40 Watt (3 to 10 times more than the previous ones) can be also found in case of MFD working group laser 32 ipm.

In the following figures, based on the settings of EU energy star cost calculator for the several imaging equipment devices the, following parameters are modelled:

a. Costs of printing for monochrome and colour printing for several imaging equipment

b. Comparison of the overall lifetime costs related to paper and ink or toner consumption versus the purchase cost of the equipment.

c. Comparison of the overall lifetime costs related to energy consumption versus the purchase cost of the equipment.

d. Comparison of the overall lifetime costs related to related to paper and ink or toner consumption versus energy consumption.

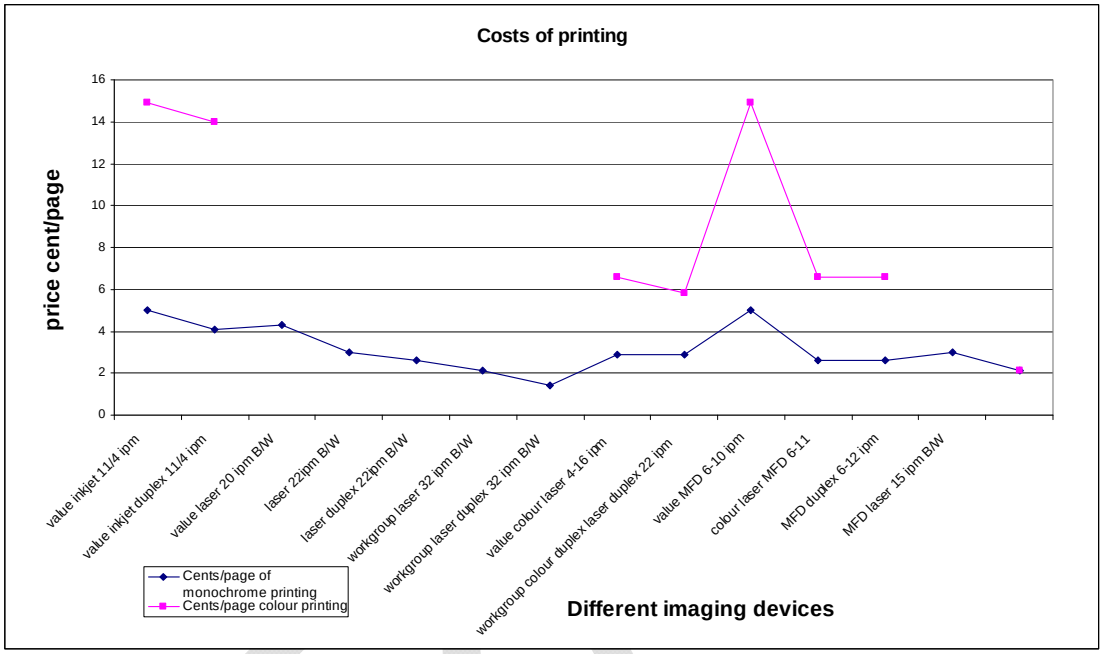

Figure 1 Costs of printing for monochrome and colour printing for several imaging equipment

Source: EU Energy Star calculator: http://www.eu-energystar.org/en/en_009.shtml

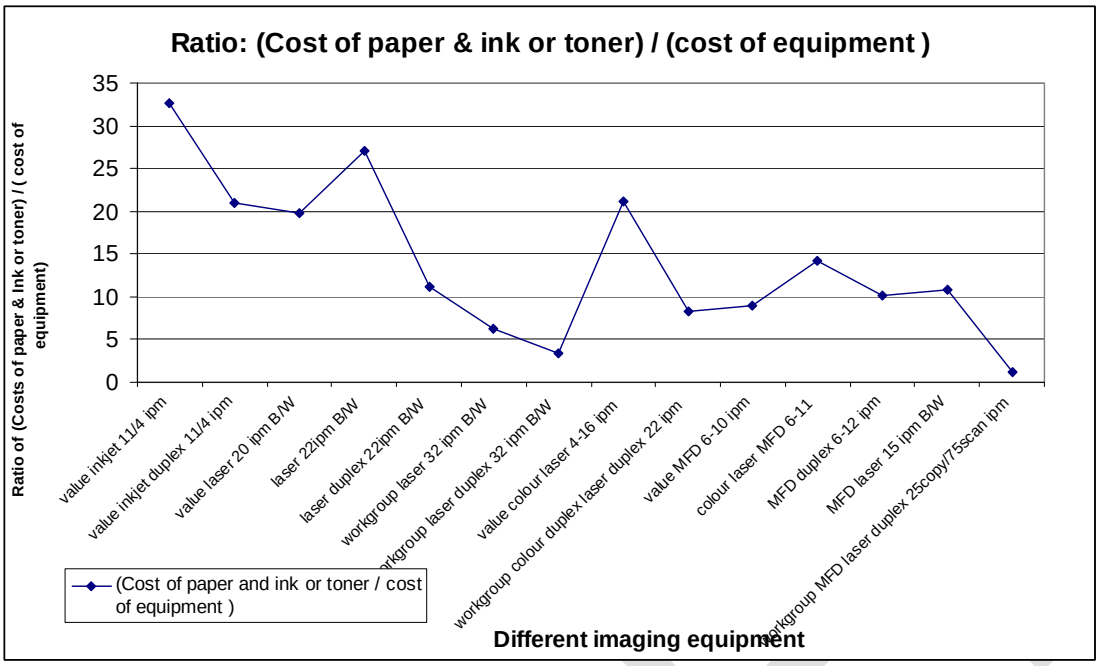

Figure 2. Comparison of the overall lifetime costs related to paper and ink or toner consumption versus the purchase cost of the equipment.

Lifetime is modelled with the default assumptions undertaken in EU Energy Star costs calculator

Source: EU Energy Star calculator: http://www.eu-energystar.org/en/en_009.shtml

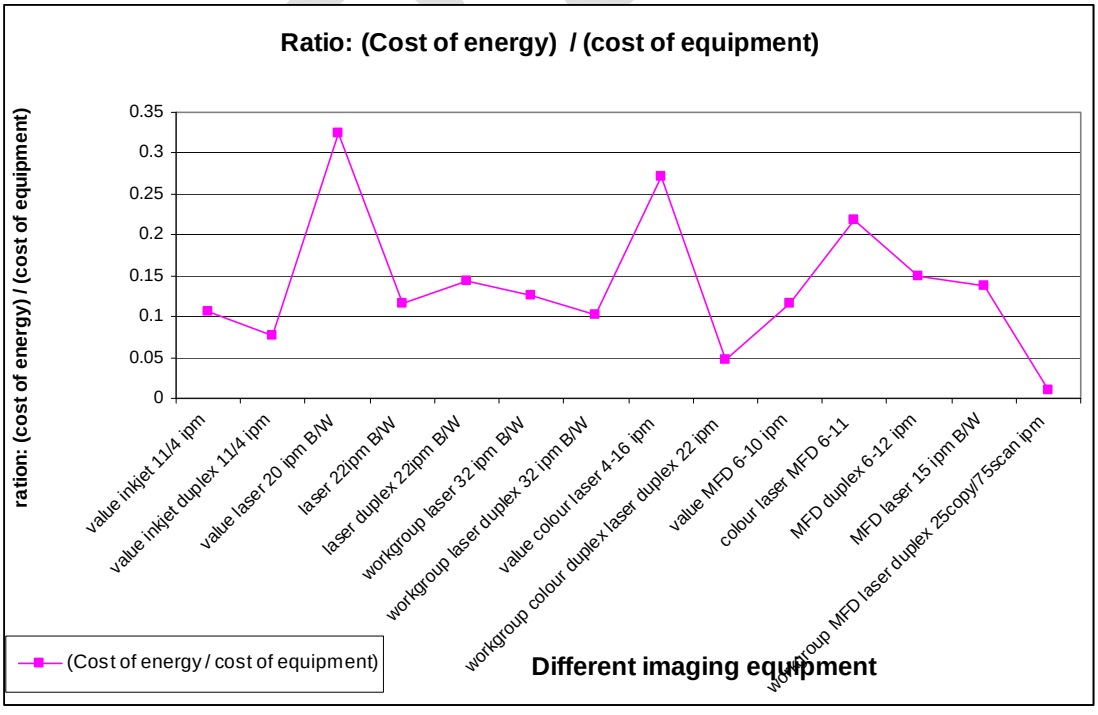

Figure 3. Comparison of the overall lifetime costs related to electricity consumption versus the purchase cost of the equipment.

Life time is modelled with the default assumptions undertaken in EU Energy Star costs calculator

Source: EU Energy Star calculator: http://www.eu-energystar.org/en/en_009.shtml

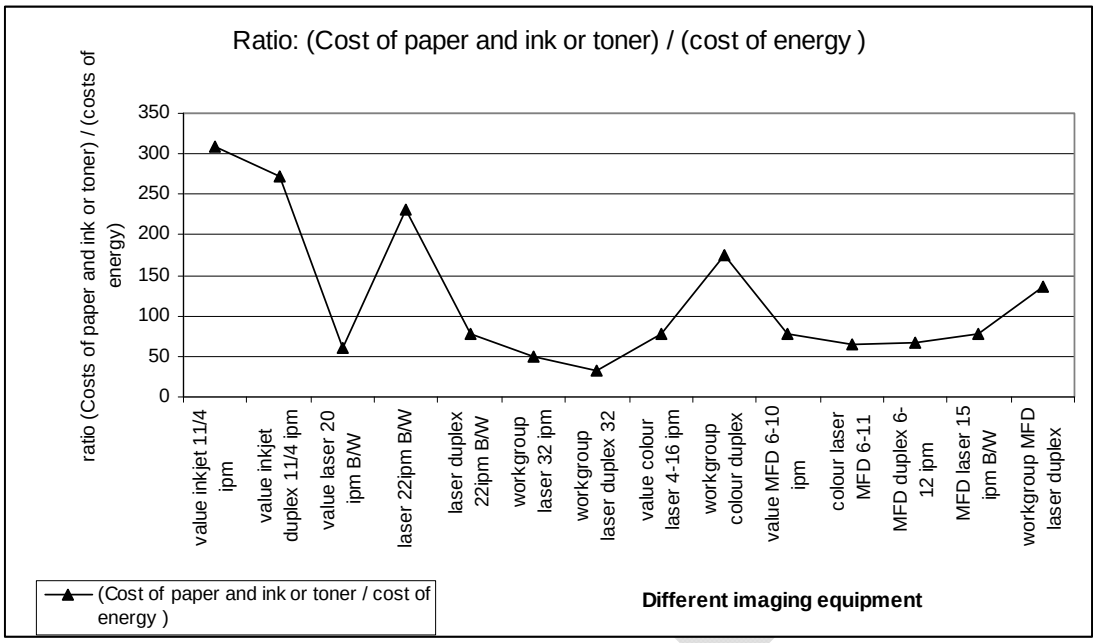

Figure 4 Comparison of the overall lifetime costs related to related to paper & ink or toner consumption versus electricity consumption.

(Life time is modelled with the default assumptions undertaken in EU Energy Star costs calculator)

Source: EU Energy Star calculator: http://www.eu-energystar.org/en/en_009.shtml