

BUDGET MASTER

The simple and most accurate software package for the exaction of the industrial cost of ceramic tiles

M. Paganelli: Expert System Solutions/Modena, Italy

This article describes the "Budget Master" software package conceived by Expert System Solutions and specially designed for the production of ceramic tiles.

Created by experts of the sector, the system allows for the acquisition of on-line information concerning production costs and in particular the costs of each single product.

The great popularity the software is registering in the ceramic industries highlights the efficiency of the system.

1 - FOREWORD

Budget Master is a powerful software package tailored on the ceramic tile manufacturing industry. It is available on the market since ten years ago and it is used by many companies around the world for the exact calculation of the cost of the finished product. Recently it was entirely redesigned, in order to completely integrate with the software package Tile Master Pro 32, which can handle all the production steps. The program Budget Master is the simplest and most effective solution for the exact calculation of the industrial cost of each individual item, accounting for all the resources needed for its production.

2 - THE COMPLEXITY OF THE PRODUCTION CYCLE

The knowledge of the cost per production unit is, with no doubt, a fundamental need of any industrial activity, but the value of the calculated cost may differ a lot depending on the algorithm calculation.

Since the production cycle of ceramic tiles is intrinsically characterized by a big complexity and a certain degree of uncertainty, it is indeed very difficult to exactly measure all the resources used for the production of each specific

item.

The high complexity of the production cycle favored the development of highly simplified algorithms, where the most of the resources are blindly spread over all the products, considering as variable costs only the costs of the raw materials theoretically used. On the other side we find the integrated industrial management systems (IRP, RPM etc.), which are very complex and expensive. Furthermore, these systems require a long time to be configured since they were not developed specifically for the ceramic tile industry.

Budget Master is an immediate and simple alternative, since it guarantees very reliable results, which reflect the production reality. All this at a very reasonable price and with virtually no time needed for the configuration and customization. Since the available production technologies are, now a day, practically standardized, Budget Master comes already configured for all the possible setups of the production process.

The system is ready to handle all the product typology, is even produced at the same time in the same plant. In fact, the plant can be divided in different production sectors, and each of these may have different characteristics from the others. For example a first sector could be glazed single firing buying the dried spray body from

an external supplier, a second sector could be a traditional twice firing with its own biscuit production, and a third sector manufacturing decoration with a third firing technology, both on a twice fired and single fired product.

3 - THE CALCULATION METHOD

The management of different production typologies increases the complexity of the system and makes more and more difficult the correct attribution of the resources necessary for the production of each single item.

In order to give a correct interpretation of the production reality, which enables to correctly distribute the need of resources, Budget Master uses a combined method:

- the costs that can be directly attributed to each single production item are exacted from the materials list and corrected with the dispersions
- the costs that can not be directly attributed are partitioned, using a multiple level algorithm. The main advantage of this approach is the balance with the initial input values.

The partitioning algorithm is surely an accurate method, since it is based on the division of the real costs over the product delivered to the warehouse. If the factory is manufacturing only one product, or several products but very similar to each other, then, dividing the costs over the product delivered to the warehouse gives reasonable results (considering the ease of the method). But, nowadays, the products are very much different, not only as far as the cost of the raw material is concerned, but mainly as far as the productivity is concerned.

In such a situation it is not possible any longer to manage the costs with a simple subdivision over the total production. It is advisable, instead, to use a combined algorithm with direct attribution and multiple level partitioning, that can take in account the difference of resources used by each product.

4 - THE ATTRIBUTED COSTS

The attribution of costs is carried out starting from the data sheets daily used in production. The use of the very same data, which is contained in the production data sheets, is the best warranty that this data is correct and up-dated. For example: the glaze cost is exacted starting from the ball mill loading chart. The system uses the same data sheet to print out the ball mill loading cart and to calculate the cost per Kg of the glaze. Then, in order to exact the cost of the glaze per square meter, the system uses the information contained in the glaze line data sheet, automatically accounting for changes in dry weight due to changes in the application density (liter weight). All this information contained in the glaze line application data sheet must be always up-dated to ensure the quality of the production, then this becomes the most updated information that can be used to exact the cost of the product.

The same concept is applied for the exaction of the cost of the printing media and of the packaging: Budget Master gets the information directly from the production data sheets.

The costs, which are directly attributed, are as follows:

1. Cost of the body, which can be defined as:
 - internal production biscuit (in this case it is a finished product of a biscuit production sector)
 - external supply biscuit (in this case it is a raw material)
 - internal production powder (in this case it is a Semi-Manufactured Product)
 - external supply powder (in this case the powder is a raw material)
 - finished product (in this case it is a finished product of a different production sector; i.e. glazed tile to be decorated)
2. Cost of the packaging, which is exacted as a function of:
 - number of pieces per box
 - number of boxes per pallet
 - cost of each component of

the packaging, saved in packaging material database together with the material list of each packaging type for each grade of selection.

- Waste losses for each packaging component
3. Cost of the glaze, which is exacted from:
 - raw material cost
 - glaze formula (ball mill loading chart)
 - processing cost (milling, micronizing)
 - dry percentage, exacted directly from the application liter weight (density)
 - dispersion for each application step
 - dispersion associated to each production step as waste: glazed green waste on the glaze line, fired waste at the kiln exit and in selection
 4. Cost of the printing media, calculated taking into account:
 - correct identification of each printing media for each finished product on the production data sheet
 - unit cost for each printing media (screen or roller)
 - average service life of each printing media
 5. Cost of additional processing: it is attributed directly on the finished product:
 - cutting of pre-scored product
 - polishing, lapping, satining rectifying

5 - THE PARTITIONED COSTS

The multiple partitioning algorithm adopted by Budget Master enables the partitioning over three different levels: first over the production Sectors, second over the production departments, third over the Finished products, as a function of specific productivity parameters.

The partitioning levels are the following:

1. Production Sectors: Fixed Costs and Indirect costs are divided between the sectors. Each Sector receives:
 - a fraction of Fixed Costs (de-

preciation) proportional to the amount of investments

- fraction of Indirect Costs proportional on the need of supervision and factory services. This number is then divided over the total square meter delivered to the warehouse from each Sector.

2. Production Departments: each department is configured with its own personnel and its own specific consumption factors, which are used as partitioning factors for the relative costs. Each Sector can be configured with several Departments:
 - Pressing & Drying
 - Glazing
 - Firing
 - Selection
 - Body Preparation
 - Glaze preparation

3. Finished Products:

each finished product is characterized by the production data sheets, which contains all the parameters for the calculation of the cost of the body, of the glaze, of the packaging, of the printing media and the additional processing. In addition to this information each finished product is characterized by the productivity factor also, which describes how many pieces per minute are produced, how much waste is generated, and how many people are needed in the glazing line. These parameters are necessary to calculate the **working time** for each production lot in each department. The algorithm uses the working time to exact the quantity of resources used by each product in each department during the production of each production lot. It is also possible to add to the calculated working time and waste, additional quantities each time the product is set up on the line. In this way a short production run with a long set up time will be much more expensive than a long production run (everyone in the factory knows it, but no one was able to prove it in an easy way with the numbers until now).

The costs which are subject to partitioning are as follows:

	Direct Labor	Gas	Energy	Maintenance	Material	Miscellaneous	Water	Water Cost	Total
Body					\$ 1.400				\$ 1.400
Press.Dry	\$ 0.000	\$ 1.100	\$ 0.001	\$ 0.000	\$ 0.000	\$ 0.000	1.00	\$ 0.000	\$ 1.101
Glazing	\$ 0.367	\$ 0.000	\$ 0.017	\$ 0.000	\$ 0.071	\$ 0.000	0.30	\$ 0.124	\$ 0.568
Firing	\$ 0.114	\$ 0.147	\$ 0.020	\$ 0.012	\$ 0.024	\$ 0.001	1.00	\$ 0.011	\$ 0.329
Selection	\$ 0.304	\$ 0.000	\$ 0.020	\$ 0.014	\$ 0.022	\$ 0.000	1.73	\$ 0.000	\$ 0.360
Additional					\$ 0.000				\$ 0.000
Packaging					\$ 0.400				\$ 0.400
Factory									\$ 0.000
TOTAL	\$ 0.885	\$ 1.247	\$ 0.040	\$ 0.026	\$ 1.527	\$ 0.001	4.03	\$ 0.135	\$ 3.838

Price	\$ 10.000	\$ 1.700		
Fuel	4200	80.25%	0.75%	
Average price	\$ 10.200			

General expenses	\$ 1.204
Sale Expenses	\$ 0.747
Total	\$ 1.951
Contribution	\$ 1.884
Depreciation	\$ 0.007
Objective margin	\$ 1.877

1. Direct Labor: this cost is first partitioned over the departments as a function of the personnel, and then over the finished products as a function of the working time in each department. In the glazing department the system accounts for the number of people needed on the glazing line.
2. Indirect Costs: these costs include all the supervision, the product development, the general plant services. The indirect costs are partitioned first on the Sectors and then on the square meter delivered to the warehouse, keeping the same ratio of the Direct Labor. If one product requires twice as much direct labor compared to another one in the same Sector, it will receive twice as much indirect costs as well. The partitioning parameter on the Sectors is completely arbitrary.
3. Power: it is partitioned as a function of a specific consumption factor in each department and then over the finished product depending on the working time
4. Fuel: it is partitioned as a function of the specific consumption in each department and then over the finished product depending on the working time
5. Maintenance Materials: if the factory is organized with costs centers, this value is directly attributed and not partitioned. The partitioning over the finished product is always carried as a function of the working time
6. Maintenance hours: in the case that the factory has a centralized maintenance shop it is possible to attribute to each department a fraction of the total cost, based on the number of maintenance hours requested by each department.
7. Miscellaneous: all the general expenses of the factory: i.e. environmental costs, internal transportation costs, general maintenance. Again the partitioning on the finished product is carried out as a function of the working time in each department.
8. Depreciation: the depreciation is first partitioned over the Sectors and then over the finished product dividing the amount attributed to each Sector by the number of square meter delivered to the warehouse. The resulting value is then corrected taking into account the productivity in the kiln. This algorithm is very useful because it gives a penalty to the product with low productivity, even if they have a low cost of raw material. Reducing the productivity of the plant, most of the time, adversely affect the operative margin of the whole company. This situation often

	Pressing	Glazing	Firing	Selection
Speed	60.00	60.00	54.00	60.00
Waste %:	1.00	6.50	1.50	
Down time [min]:	30.00	30.00		
Waste [sqm]:	10.00	10.00		
Waste [kg]:		50.00		
n. Operators:		3.00		
Shrinkage %:				

occurs with highly thick products, which may have a low cost of raw materials because most of it is body raw material, but they may lower the productivity of the plant to 50 % or less.

6 - THE RESULT OF THE CALCULATION

The result of the application of this combined algorithm with direct attribution and multiple partitioning is very effective in showing the effective resource usage of each individual product. The most amazing part of it is the ease of the procedure, which

starts from production data already available on the production data sheet of each product.

Once the system contains all the information in the database (the same is used to print out the production data sheet), it is enough to input each month the total value of the costs to be partitioned, and the total of each product delivered to the warehouse. All the attribution and partitioning algorithm is completely automated and does not require experience at all. It is enough to specify the time lap for the cost analysis and the results are available in few minutes. All the tables with the cost analysis can be printed out as they are or, instead, directly tran-

sferred to EXCEL for further usage.

All the information is saved as a function of the date, then each change in a cost of a raw material, in the personnel, in the product data sheet, are effective from the date of the change. Because of this architecture (which is very accurate indeed) the cost of a product may vary from time to time (which, by the way it is what really happens), but it becomes stable over long period of analysis.

7 - CONCLUSIONS

Budget Master is a highly specialized software package, tailored upon the specific needs of the ceramic tiles manufacturing. It is with no doubt the product with the best quality/cost ratio available on the market. A unique feature of this product is the fact that it is already perfectly configured, and this makes it possible to immediately exact the results as soon the data sheets are loaded. If the data sheets are already available in electronic format, they can be directly loaded into the database, reducing virtually to zero the start-up time. If the data is in a paper format, Expert System is available to help for the data input and to give all the possible assistance through the Internet.

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