Oleg Maslennikov[1], Lyudmila Shirokikh[2], Aziya Ibrayeva[3]

SYSTEMS OF THE PRODUCT PRIME COST AND LOSS ACCOUNTING IN MANUFACTURING OF PRECIOUS METAL COINS

The article describes the methods of the product prime cost and loss accounting improvement in the process of AgCu 92,5 alloy coins manufacturing at the Kazakhstan mint for the more exact accounting of normative losses record and, consequently, of the product prime cost.

Keywords: *precious metals; product prime cost; process cost calculation; equivalent units.*

Олег Масленніков, Людмила Широких, Азія Ібраєва

СИСТЕМИ ОБЛІКУ СОБІВАРТОСТІ ПРОДУКЦІЇ ТА ОБЛІКУ ВТРАТ ПРИ ВИРОБНИЦТВІ МОНЕТ З ДОРОГОЦІННИХ МЕТАЛІВ

У статті розглянуто способи обліку собівартості продукції і вдосконалення обліку втрат при виробництві монет сплаву CpM 92,5 Казахстанським монетним двором для підвищення достовірності обліку нормативних втрат, а, отже, і собівартості продукції.

Ключові слова: *дорогоцінні метали; собівартість продукції; післяпроцесна калькуляція; еквівалентні одиниці.*

Табл. 8. Форм. 6. Літ. 10.

Олег Масленников, Людмила Широких, Азия Ибраева

СИСТЕМЫ УЧЁТА СЕБЕСТОИМОСТИ ПРОДУКЦИИ И УЧЁТА ПОТЕРЬ ПРИ ПРОИЗВОДСТВЕ МОНЕТ ИЗ ДРАГОЦЕННЫХ МЕТАЛЛОВ

В статье рассмотрены способы учёта себестоимости продукции и совершенствования учёта потерь при производстве монет сплава CpM 92,5 Казахстанским монетным двором для повышения достоверности учёта нормативных потерь, а, следовательно, и себестоимости продукции.

Ключевые слова: *драгоценные металлы; себестоимость продукции; попроцессная калькуляция; эквивалентные единицы.*

Problem statement

Manufacturing of precious metal coins is a complex process. So, it is impossible to avoid manufacturing defects in it. The defect ratio is set through the experiment laboratory research on the basis of pilot-line production. The correction of the normative quantity of defect production is performed via the detailed study of the production process statistics including the changes in the production technical process. The cost of goods made of precious metals and their alloys is quite high, that is why it is very important to determine the product prime cost accurately. This problem is considered to be confidential information in the precious metals and alloys industry, but manufacturers and researchers are constantly interested in it (Roche, 2004). The accurate determination of the product cost and defect cost is especially important for managerial decision-making (Maslennikov, 2013).

[1] Doctorate PhD, Mining and Metallurgical Department, D. Serikbayev East Kazakhstan State Technical University, Ust-Kamenogorsk, Kazakhstan.

[2] Senior Lector, Enterprise Economy Sub-department, D. Serikbayev East Kazakhstan State Technical University, Ust-Kamenogorsk, Kazakhstan.

[3] Deputy Director for Commerce questions, Republican State Enterprise "Kazakhstan Mint of the National Bank of Kazakhstan", Ust-Kamenogorsk, Kazakhstan.

Latest research and publications analysis

Economy and accounting experts pay a great attention to the issue of the accuracy of the product prime cost record. Works of the following foreign and national researchers are devoted to that: K. Druri (2003), C. Horngren and G. Foster (2002), B. Nidlz, H. Anderson and D. Kolduell (1999), V.K. Radostovec, V.V. Radostovec (1998). The works of these scientists show theoretical basics for the application of different types of the prime cost calculation for accounting and managerial decision-making. Various approaches to production overhead costs record are considered. These expenses influence the accuracy of determination of product prime cost, and, therefore, the accuracy of products profitability.

Unresolved issues

All the above mentioned research doesn't define the problems of practical application of the methods of the prime cost and the loss records. In manufacturing of precious metal coins the product prime cost is calculated on the whole, excluding the cost of processes and the exact record of normative losses. Now the product prime cost in coins manufacturing is calculated without the division into processes, without the division of expenses into variable and fixed ones. Besides, equivalent units aren't used for losses record.

Key research findings

It is better to use the calculation according to processes (PC) in coins manufacturing, which allows determining the production cost on each process according to cost elements. It allows monitoring expenses by the cost of accounts per each process.

PC gives an opportunity to determine the cost of finished and unfinished products at the period's end (to distribute the incurred expenditures between the work in process and finished products).

When using PC for managerial decision-making, it is better to apply it within the framework of direct-costing and absorption-costing. Direct-cost calculations requires the division of expenses into variable and fixed ones. Precious metal coins production expenses can be easily divided into variable and fixed by means of the accounts analysis method.

There are two basic approaches of the product prime cost calculation in PC – the method of weighted average and the "fifo" method.

The method of weighted average assumes that the units of work in process are treated equally with the units entered again into production. Product prime cost is calculated according to the formula:

$$Unit prime\,\text{cost} = \frac{WIPb + Current\,\text{exp}enses}{FP + Equivalent units of WIPe}, \quad (1)$$

where *FP* – are finished products units;

WIPe – work in process at the period's end.

Table 1. **Prime cost calculation scheme using the method of weighted average**

Name	Cost of work in process at the beginning	Current expenses	Sum of expenses	Finished products (units)	Equivalent units of the work in process at the end	Sum of units	Prime cost
1	2	3	4=(2+3)	5	6	7=(5+6)	8=(4/ 7)

Source: Authors.

In the subsequent processes after the first one, one more line in the name of expenditures should be added – the prime cost of the previous process.

The cost of the finished products and the cost of the work in process are calculated by the formulas:

$$FP\,\text{cost} = (\sum Unitprime\,\text{cost}._i) \times FPunit. \quad (2)$$

$$WIPe = \sum (Unitprime\,\text{cost}._i \times EquivalentunitWIPe)a \quad (3)$$

The method of the weighted average – is a simple method, but not absolutely exact. Because usually first of all the work in process is finished at the beginning of the period (WIPb), and then the production of new lots of products is started, so it is better to use the "fifo" method for the calculation of the semi-finished product prime cost and finished product cost in coins manufacturing.

This method assumes that the units of the work in process at the beginning are treated first of all, i.e. they will be the finished products.

Therefore, the cost of work in process at the beginning is not included in to the calculation scheme, but it is added to the finished product cost.

In accordance with the "fifo" method, the unit prime cost is calculated by the following formula:

$$Unitprime\,\text{cost} = \frac{\sum current\,\text{exp}enses}{FP - EquivalentunitsWIPb + EquivalentunitsWIPe}, \quad (4)$$

where *WIPb* is the work in process at the period's beginning

Table 2. **Prime cost calculation scheme using the FIFO method**

Name	Current expenses	Finished products (units)	Equivalent units of the work in process at the beginning	Finished products-Equivalent units of the work in process at the beginning	Equivalent units of the work in process at the end	Sum of units	Prime cost
1	2	3	4	5=(3-4)	6	7=(5+6)	8=(2/ 7)

Source: Authors.

The calculations are made only on the basis of the cost elements *i*.

The cost of finished products and the cost of work in process are calculated by the formulas:

$$Finishedproducts\,\text{cost} = \sum \begin{bmatrix} Unitprime\,\text{cost}._i \times (FPunit - \\ - EquivalentunitWIPb) \end{bmatrix} + WIPbCost, \quad (5)$$

$$WIPeCost = \sum (Unitprime\,\text{cost}._i \times EquivalentunitWIPe) \quad (6)$$

When using PC for managerial decision-making, i.e. direct-cost calculation, then variable manufacturing costs should be included into product prime cost. And the prime cost calculation scheme includes: base materials, salary of production and related workers and variable production overheads.

The absorption-cost calculation (AC) is necessary for accounting. According to this calculation, prime cost calculation includes variable and fixed manufacturing costs.

There are two approaches to normative losses record:

– the simplified calculation scheme assumes the following approach for the calculation of the product prime cost – the sum of expenses is divided by normative output;

– the specified calculation scheme is the calculation when equivalent units are used for the calculation of normative losses.

The specified calculation scheme assumes that if normative losses are found after the completion procedures of the work in process at the period's end, then normative losses cost should be added to the cost of finished products.

If normative losses are found before the completion procedures of the work in process at the period's end, then the normative losses cost should be divided between the cost of the finished products and the cost of the work in process in proportion to units (it is calculated according to cost elements). Losses are found at the end in manufacturing of silver coins; consequently, the cost of normative losses is added to finished products.

Equivalent units can be used for more precise product prime cost record in the same way as for normative losses. Defect cost is calculated separately and is charged to profits and losses.

The manufacturing process of coins consists of two basic processes – casting process (molding) and the final polishing process. Let us calculate the product prime cost by means of the method of weighted average using the AC calculation.

For simplicity we take a condition in the course of casting or molding – there is no other work in process at the beginning, the work in process is absent in the course of casting.

Table 3. **Simplified calculation scheme, melt and cast process**

Name of expenses	Sum of expenses, tenge	Finished products, kg	Prime cost, 1 kg/ tenge
Silver	5158689,92	55	93794,362
Copper	355240,23	55	6458,9133
Secondary materials	55139,3015	55	1002,5328
Salary of production and related workers (melter)	3956,04	55	71,928
Variable overhead costs	7,91208	55	0,143856
Fixed overhead costs	445842,672	55	8106,2304
Total	6018876,08		109434,11

Source: Authors.

Table 4. **Simplified calculation scheme, finishing treatment process**

Name of expenses	Sum of expenses, tenge	Finished products, pcs	Equivalent unit, WIPe, pcs	Sum of units, pcs	Prime cost, tenge/ pcs
Prime cost of the first process	6018876	924	126	1050	5732,263
Secondary materials	223650	924	126	1050	213,000
Salary of production and related workers:		924	88,2	1012,2	0,000
miller	366666,3	924	61,74	985,74	371,971
roller	11560,428	924	43,218	967,218	11,952
press operator	35897,4	924	30,253	954,253	37,618
heat-treater	334,61505	924	21,177	945,177	0,354
Fixed overhead costs	331566,994	924	14,824	938,824	353,173
Total	6988551,82				6720,331
FP cost					6209585,77
WIPe cost;					

Continuation of Table 4

Prime cost of the first process	722265,129
Secondary materials	26838
Salary of production and related workers:	0
miller	22965,4649
roller	516,552191
press operator	1138,05263
heat-treater	7,4970974
Fixed overhead costs	5235,35335
Total WIPe cost	778966,05

Source: Authors.

Table 5. **Specified calculation scheme, melt and cast process**

Name of expenses	Sum of expenses, tenge	Finished products, kg	Equivalent units of normative losses, kg	Sum of equivalent units, kg	Prime cost, 1 kg/ tenge
Silver	5158689,92	55	0,076005	55,076005	93664,926
Copper	355240,23	55	0,076005	55,076005	6450
Secondary materials	55139,3015	55	0,076005	55,076005	1001,1493
Salary of production and related workers (melter)	3956,04	55	0,076005	55,076005	71,8287
Variable overhead costs	7,91208	55	0,076005	55,076005	0,14366
Fixed overhead costs	668764,009	55	0,076005	55,076005	12142,5657
Total	6241797,41				113330,6134

Source: Authors.

Table 6. **Specified calculation scheme, finishing treatment process**

Name of expenses	Sum of expense, tenge	Finished products, pcs	Equivalent unit, WIPe, pcs	Equivalent units of normative losses, pcs	Sum of units, pcs	Prime cost, tenge/ pcs
Prime cost of the first process	6241797	578	126	346,0	1050	5944,569
Secondary materials	223650	578	126	346,0	1050	213,000
Salary of production and related workers		578	88,2	346,0	1012,2	0,000
miller	366666,3	578	61,74	346,0	985,74	371,971
roller	11560,428	578	43,218	346,0	967,218	11,952
press operator	35897,4	578	30,2526	346,0	954,2526	37,618
heat-treater	334,61505	578	21,17682	346,0	945,17682	0,354
Fixed overhead costs	331566,9934	578	14,823774	346,0	938,823774	353,173
Total	7211473,15					6932,637

Source: Authors.

Table 7. **Normative losses calculation**

Name of expenses	Total (sum of expenses), tenge
Prime cost of the first process	2059793,15
Secondary materials	73804,5
Salary of production and related workers:	0
miller	128887,813
roller	4141,45343
press operator	13034,7553
heat-treater	122,669232
Fixed overhead costs	122374,365
Total normative losses	2402158,7

Finished products cost: $578 \times 6932,637 + 2402159 = 6405756,5$

Source: Authors.

Table 8. **Calculation of WIPe**

Name of expenses	WIPe, tenge
Prime cost of the first process	749015,69
Secondary materials	26838
Salary of production and related workers:	0
miller	22965,465
roller	516,55219
press operator	1138,0526
heat-treater	7,4970974
Fixed overhead costs	5235,3534
Total WIPe	805716,61

Source: Authors.

Conclusions

As it is seen from the calculations, the coins prime cost is different in two approaches of the losses record, because normative losses are divided between the work in process and finished products. Consequently, it is better to use the specified calculation scheme – the direct costing calculation, because it allows defining the product prime cost more precisely. This approach can be used for managerial decision-making. The product prime cost and losses calculation scheme will be simpler and clearer since there will be no fixed overhead costs in calculations. This calculation scheme can be applied to any number of processes and account costs.

References:

Друри К. Введение в управленческий и производственный учет. – М., 1998. – 783 с.

Друри К. Производственный и управленческий учет – М., 2003.

Кирьянова З.В. Теория бухгалтерского учета. – М.: Финансы и статистика, 1996. – 192 с.

Котляров С.А. Управление затратами. – СПб.: Питер, 2005.

Либерман В.В. Управление затратами. – М., 2006.

Масленников О. Применение современных методов контроля качества в процессе изготовления монет из драгоценных металлов как условие оптимизации и эффективности производства // Актуальные проблемы экономики. – №2. – 2013. – С. 141–148.

Нидлз Б., Андерсон Х., Колдуэл Д. Принципы бухгалтерского учета. – М.: Финансы и статистика, 1999. – 495 с.

Радостовец В.К., Радостовец В.В. Бухгалтерский учет на предприятии. – Алматы: Центраудит – Казахстан, 1998. – 771 с.

Хонгрен Ч.Т., Фостер Дж. Бухгалтерский учёт, управленческий аспект. – М.: Финансы и статистика 2002. – 410 с.

Roche, M.T. (2004). Improved Tarnish Resistant Sterling Silver. BHP Billiton, Townsville, Queensland, Australia. International Lead Zinc Research Organization, Inc., Research Triangle Park, NC, USA. URL: http://www.ilzro.org/src/Documents/SM1.

Стаття надійшла до редакції 09.11.2013.