BUSINESS GAME
COMPANY

Appendicies 1-10

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Contents

Appendix 1: *Game scenario - values*

1. Buildings

1. Purchase price =1 800 000 [PLN]
2. Expected useful life of buildings =600 [months].

2. Purchase and disposal of machines and their maximum capacity

1. Maximum number of machines that can be installed in the COMPANY =200
2. Maximum number of machines that can be ordered in one month =20
3. Coefficient of financial penalties for refused delivery of machines =1 [% of purchase price]
4. Unit purchase price of a new machine =80 000 [PLN]
5. Maximal production capacity of one machine =4 [pcs/MH] (MH=Machine Hour)
6. Machine operators' attendance necessary to reach maximum capacity of a machine =2 [ManH/MH] (ManH=Man Hour)
7. No. of casings that can be produced by a machine in its expected useful life =40 000 [pcs].

3. Machine maintenance

1. Coefficient determining the minimal repair cost of one machine =1 [% of purchase price]
2. Coefficient determining the maximal repair cost of one machine =10 [% of purchase price]
3. Maintenance contracts

Table 1. Maintenance contracts characteristics

Contract number	Preventive maintenance included?	Breakdown repair time [days (24 hours)]	Unit maintenance price [PLN/machine]
1	NO	2	100
2	NO	1	400
3	YES	2	700
4	YES	1	1000

4. Personnel

1. Cost of employment of one production worker (external service) =1200 [PLN/worker]
2. Dismissal cost of one worker =800 [PLN/worker]
3. Level of professional skills of a newly employed assembly worker =60 [s.u.] (s.u.=skill units)
4. Increase in skills level after the first month of work =10 [s.u.]
5. Increase in skills level after each professional training =5 [s.u.]
6. Unit cost of professional training per assembly worker =500 [PLN/worker]
7. Minimal monthly salary =500 [PLN/month]
8. Number of working hours in a week =40 [H] (H=hours)
9. Maximal productivity of assembly workers =2 [pcs/ManH] (ManH=Man Hour)
10. Maximal number of workers which can be recruited each month for each Production Stage: 50 [workers].

5. Direct materials

Table 2. Standard usage, purchase prices, delivery conditions and storage

Description:	Granulate [kg]	Elekcronics [pcs]
1. Standard usage [(kg or pcs)/product]	0,50	1
2. Fixed charge per order [PLN]	0	30 000
3. Basic price [PLN/(kg or piece)]	64	500
4. Order level 1 [kg or pcs]	4 000	10 000
5. Price 1 [PLN/(kg or piece)]	56	480
6. Order level 2 [kg or pcs]	10 000	25 000
7. Price 2 [PLN/(kg or piece)]	48	450
8. Price multiplier for supplier EX	1,5	1,5
9. Selling price coefficient (COMPANY sells)	0,8	0,8
10. Maximal order - supplier ZW	120 000	60 000
11. Maximal order - supplier EX	60 000	30 000

Sale of raw materials by the COMPANY:
1. Max. amount of electronics to be sold by the COMPANY in a month: 50 000 [pcs]
2. Max. amount of granulate to be sold by the COMPANY in a month: 50 000 [kg].

Raw materials storage:
1. Capacity of COMPANY's own storerooms for electronics =20 000 [pcs]
2. Monthly rental for one module of external warehouse =4 000 [PLN/(month*module)]
3. Capacity of one external module =1 000 [pcs of electronics].

6. Additional Equipment (AE) facilities

Table 3. Purchase prices and operating costs

Type of Additional Equipment	Price [PLN]	Operating costs [PLN/month]
1. Shower facility	20 000	1 000
2. Canteen facility	25 000	1 400
3. Noise reduction facility	70 000	600
4. Automatic fire protection facility	60 000	800
5. Air conditioning facility	96 000	2 200

Other data concerning Additional Equipment facilities:
1. Coefficient of financial penalties for refused delivery of AE facilities =1 [% of purchase price]
2. Expected useful life of AE facilities with numbers 4 and 5 =96 [months].

Comment: the COMPANY can neither sell nor rent AE facilities.

7. Natural environment protection

1. Purchase price of a filter =36 000 [PLN]
2. Total filter capacity =12 000 [i.u.] (i.u.=impurity units)
3. Filter efficiency (rate of absorbing impurities) =1 000 [i.u./month]
4. Unit production of impurities =4 [i.u./casing]
5. Maximal number of filters which can be installed in the COMPANY =20
6. Lower rate of pollution tax =3 [PLN/i.u.]
7. Upper rate of pollution tax =5 [PLN/i.u.]
8. Emission threshold (above which upper rate of pollution tax is valid) =4 000 [i.u.]
9. Coefficient of financial penalties for refused deliveries of filters =1 [% of purchase price].

8. Product development

1. Quality of basic casing model (MODEL0) =100 [q.u.] (q.u.=quality unit)
2. Difference in quality of two successive models =10 [q.u.]
3. R&D expenditures necessary to develop a new model of casing (a very rough approximation) =100 000 [PLN].

9. Transportation costs

1. Unit transportation cost of full quality finished products to customers =15 [PLN/piece].

10. Storage of full quality finished products

1. Capacity of COMPANY's own storerooms for finished products =10 000 [pcs]
2. Monthly rental for one module of external warehouse =4 000 [PLN/(month*module)]
3. Capacity of one external module of warehouse =500 [pcs of finished product].

11. Credits

1. Long-term credit line limit =12 000 000 [PLN]
2. Long-term credit interest rate =12 [%/year]
3. Short-term credit interest rate =36 [%/year].

12. Special Reports prices

1. IBP Report = 30 000 [PLN]
2. IBR1 Report =25 000 [PLN]
3. IBR2 Report =20 000 [PLN]
4. IBR3 Report =24 000 [PLN]
5. IBR4 Report =26 000 [PLN].

13. Other costs

1. Other costs in Production Stage 1 =5 [PLN/piece]
2. Other costs in Production Stage 2 =8 [PLN/piece]
3. Remaining period costs (no depreciation included) =200 000 [PLN/month].

14. Income tax and shareholders' equity

1. Income tax on COMPANY's profit =40 [%]
2. Share capital - initial value =2 000 000 [PLN]
3. Share capital - minimal value =200 000 [PLN]
4. Max. value of extra capital inflow during a month =9 000 000 [PLN].

Appendix 2: *IBR1 Report (Report of the IBR Institute)*

A. Factors influencing demand for products

As a result of our investigations it was possible to identify the following main factors influencing the demand for full quality finished products manufactured by the COMPANY:

1. COMPANY's Image
2. Product Quality (determined by model of casing)
3. Product Price
4. Advertising

In order to determine the importance of each factor, we have prepared a special questionnaire and used it in further, more detailed investigations carried out on a randomly selected sample of potential clients. The respondents were asked to assign a weight (natural number from the interval [0; 5]) to each factor, assuming that 0=unimportant factor, 5=the most important factor. Basing on the answers, we have divided the respondents into two separate groups A and B, named segments. To the first segment (numbered with 1) all these respondents were classified, who have assigned a greater weight to the selling price than to the quality, and to the second (numbered with 2) – the rest of the respondents (price < = quality). An example of respondents' answers and resulting segments (A and B) are given in Table 1.

Table 1. An example of respondents' answers

Respondent identifier (i)	Image (Im)	Quality (Q)	Selling price (P)	Advertising (Ad)	Segment to which the respondent was classified
1	0	0	5	0	A
2	1	4	0	1	B
3	0	4	3	0	B
…					
960	1	0	3	1	A
961	1	3	0	0	B
…					
N	4	5	4	4	B

Further analysis was made **separately for each segment**.

It has been assumed, that the importance of a given factor (for demand for the COMPANY's products) can be measured by dividing the sum of weights assigned to this factor into the sum of weights assigned to all factors. The following formula exemplifies the calculation of the importance of the COMPANY's image (Im) in segment A (segment number 1).

$$ImpIm1 = \frac{\sum_{i=1}^{N1} Im_i}{\sum_{i=1}^{N1} (P_i + Q_i + Im_i + Ad_i)} \qquad (0)$$

where:

ImpIm1 – measure of the importance of COMPANY's image for demand in segment A (segment number 1),

N1 – number of respondents in segment A,

other symbols – see Table 1.

The values of the measure *ImpIm1* are real numbers from the interval [0;1]. Final results of our investigations obtained with the help of the idea described by the formula (0) are presented in Table 2.

Table 2. Characteristics of market segments

No. *j*	Factors influencing demand	Importance of factor "*j*" for demand in segment "*l*" *Imp[j, l]*	
		Segment A (*l*=1)	Segment B (*l*=2)
1	Company`s image	0,05	0,15
2	Product quality	0,05	0,55
3	Product price	0,75	0,10
4	Advertising	0,15	0,20
	Segment size (relative value) *SegS[l]*	0,70	0,30

One of our important findings is the fact, that if the selling price for one quality unit (C1Q) offered by the COMPANY (quotient: product price divided by product quality) is substantially greater than the average calculated for all companies (SRC1Q), than the demand for products offered by the COMPANY is - in each segment - relatively low. A rapid decrease in demand can be observed for C1Q/SRC1Q>1,15 and it is greater for greater values of the quotient C1Q/SRC1Q.

B. The influence of advertising expenditures on demand

In our investigations the following main advertising media used by companies were analysed:

1. Television
2. Radio
3. Popular magazines
4. Internet
5. Billboards
6. Special journals.

The main aim of the investigations was to estimate the unit exposure cost for each medium as well as the coverage of each market segment (segments: A and B) with a particular medium. A *unit exposure cost* - for a given medium - is understood as the amount of money enabling the COMPANY to "reach" (once) an audience member with an advertisement using this medium. In other words it is the cost necessary - to be incurred by the COMPANY - to enable an audience member to see/hear once an advertisement in a particular medium. The main results of our investigations are presented in Table 3.

Table 3. Unit exposure costs and market segment coverage for different advertising media

Medium number *k*	Type of medium	Unit exposure cost for medium *k* *UEC[k]* [PLN]	Segment coverage *SCO[k,l]* (*k* - medium number, *l*- segment number)	
			Segment A *SCO[k,1]*	Segment B *SCO[k,2]*
1	Television	1,40	0,70	0,15
2	Radio	0,95	0,45	0,15
3	Popular magazines	1,05	0,42	0,19
4	Internet	0,85	0,38	0,22
5	Billboards	0,65	0,35	0,25
6	Special journals	1,25	0,01	0,55

It has appeared, among other things, that advertising expenditures less than 200 PLN (in a month) will not bring any results. The additional finding of our investigations is an approximate model showing the influence of advertising expenditures allocated by the COMPANY to various media, on the motivation of clients to buy its products. The model is presented in equations 1-9, and its idea is described below.

If the COMPANY allocates in a given month a certain amount **for advertising in Radio** (Table 3, medium number 2), the advertisement will allow the COMPANY to reach the audience from both market segments: A and B (assuming that SCO*[1,1]* and *SCO[1,2]* are not equal zero). The number of all „advertising contacts" in both segments (*NAdC[2;1&2]*) can be calculated according to the following formula:

$$NAdC[2;1\&2]=AdEx[2]/UEC[2] \qquad (1)$$

where:

NAdC[2;1&2] - total number of „advertising contacts" in both segments (1&2), resulting from advertising in Radio (medium number 2)

AdEx[2] - expenditures for advertisement in Radio (medium number 2)

UEC[2] - unit exposure cost for medium number 2 (Radio).

The number of „advertising contacts" in segment A (*NAdC [2,1]*) will be equal to:

$$NAdC\ [2,1] = NAdC[2;1\&2] * SCO[2,1] \qquad (2)$$

And in the segment B (segment number 2):

$$NAdC[2,2] = NAdC[2;1\&2] * SCO[2,2] \qquad (3)$$

Our investigations have revealed that - in a given month - the total demand for products is distributed between the two market segments – approximately - proportionally to their sizes. If the total demand is equal to *TotDem*, than the demand in the segment *l* can be calculated according to the following equation:

$$DEM[l] = TotDem * SegS[l] \qquad (4)$$

where:

DEM[l] - demand for products in segment *l*,

SegS[l] - size of the segment *l* (Table 2, last raw).

Let us assume that the COMPANY uses in its advertising campaign not one but all six media specified in the Table 3. The number of all „advertising contacts" in segment *l* can be calculated according the following equation:

$$NAdC[1\text{-}6;\ l] = \sum_{k=1}^{6} NAdC[k,l] \qquad (5)$$

where:

NAdC[1-6; l] - number of all „advertising contacts" in segment *l*, resulting from advertisement in all 6 media

NAdC[k,l] - number of all „advertising contacts" in segment *l*, resulting from advertisement in one medium (numbered with *k*)

The value of *NAdC[k,l]* is computed according to the formula:

$$NAdC\ [k,l] = AdEx[k]/UEC[k] * SCO[k,1] \qquad (6)$$

where:
AdEx[k] - expenditures for advertisement in medium number *k*
UEC[k] - unit exposure cost for medium number *k*
SCO[k,1] - coverage of the market segment *l* with advertising medium number *k*.
Let us now divide the number of all „advertising contacts" in segment *l* by demand in this segment. The quotient will be named a *relative number of advertising contacts in segment l* (*RNAdC[l]*):

$$RNAdC[l] = NAdC[1\text{-}6;\ l] / DEM[l] \qquad (7)$$

For measuring the effectiveness of all „advertising contacts" of the COMPANY with potential clients from segment *l* (in a given month) the following function *BK[l]* has appeared to be useful:

$$BK[l] = \begin{cases} -2*\left[\left(\frac{RNAdC[l]}{3}\right)^3 - 1{,}5*\left(\frac{RNAdC[l]}{3}\right)^2\right] & for\ RNAdC[l] \le 3 \\ 1 & for\ 3 < RNAdC[l] \le 4 \\ -2*\left[\left(\frac{RNAdC[l]-1}{3}\right)^3 - 1{,}5*\left(\frac{RNAdC[l]-1}{3}\right)^2\right] & for\ 4 < RNAdC[l] \le 4{,}7 \\ 0{,}8 & for\ RNAdC[l] > 4{,}7 \end{cases} \qquad (8)$$

BK[l] is a growing function in the interval [0;3], a constant function assuming value 1 in the interval [3;4], a decreasing function in the interval [4; 4,7], and again - a constant function (with value of 0,8) for arguments greater than 4,7. Analysing this function we can see that the greatest advertising effects can be reached when the number of „advertising contacts" with one potential client belongs to the interval [3;4].
It is to be remembered that *BK[l]* is a measure of effectiveness (only) of these „advertising contacts" which result from the advertising campaign in one (last) month. As a more comprehensive measure, comprising all advertising efforts of the COMPANY in all months, the following index $WOR_j[L]$ can be used:

$$WOR_j[l] = 0{,}1 * WOR_{j-1}[l] + BK_j[l] \qquad (9)$$

where:
$BK_j[l]$ - effectiveness of „advertising contacts" of the COMPANY, with potential clients from segment *l*, resulting from the advertising campaign in month *j*,
$WOR_j[l]$ - index of the influence in month *j* of all advertising efforts made by the COMPANY in all months (from 1 to *j* inclusive), on demand for its products in segment *l*.

The data presented in Tables 1, 2 and 3 were collected and processed last month. It is to be expected that they will be valid **at least** for the next two months (for month number 1 and 2). We would like to assure you that we continue our investigations and **as soon as we have new data, the companies will be informed** and will have the possibility to purchase a new version of the report IBR1.

Appendix 3: *Decision sheets*

DECISION SHEET (Month No. = 0)

Comment: All decisions taken at the beginning of month zero will bring an effect in month number 1 (their consequences will be seen in month 1).

Company No. ..... Date..... Month No.: 0

No.	Decision description	Measure	Limitations	DECISION
22	Machine ordering	[pieces]	<=20	
23	Additional Equipment ordering [0=NO,1=YES]:	----------	----------	----------
23.1	-Shower facility	no measure	[0, 1]	
23.2	-Canteen facility	no measure	[0, 1]	
23.3	-Noise reduction facility	no measure	[0, 1]	
23.4	-Automatic fire protection facility	no measure	[0, 1]	
23.5	-Air conditioning facility	no measure	[0, 1]	
24	Filter ordering	[pieces]	<=100	
25	Granulate ordering (supplier ZW)	[kg]	<=120 000	
26	Electronics ordering (supplier ZW)	[pieces]	<=60 000	
27	Employment offer for Machine Operators (Stage 1)	[persons]	<=50	
28	Employment offer for Assembly Workers (Stage 2)	[persons]	<=50	
29	Dismissal: Machine Operators (Stage 1)	[persons]	<=No. of employed	0
30	Dismissal: Assembly Workers (Stage 2)	[persons]	<=No. of employed	0

DECISION SHEET (Month No. > 0)

Company No. ... Date..... Month No. ....

DECISIONS WITH CONSEQUENCES IN CURRENT MONTH				
No.	Decision description	Measure	Limitations	DECISION
1	Model number of casings to be produced	no measure	Max. possible	
2	Production in Stage 1 (casings)	[pieces]	<= 100 000	
3	Production in Stage 2 (assembly)	[pieces]	<= 100 000	
4	Full quality finished products for sale	[pieces]	<= 9 000 000	
5	Selling price of full quality finished product	[PLN/piece]	<= 10 000	
6	Worker's salary (per month)	[PLN/person]	[500; 5 000]	
7	Advertising:	----------	----------	----------
7.1	-Television	[PLN]	<= 5 000 000	
7.2	-Radio	[PLN]	<= 5 000 000	
7.3	-Popular magazines	[PLN]	<= 5 000 000	
7.4	-Internet	[PLN]	<= 5 000 000	
7.5	-Billboards	[PLN]	<= 5 000 000	
7.6	-Special journals	[PLN]	<= 5 000 000	
8	Machine maintenance [Contract No.: 1, 2, 3 or 4]	no measure	[1, 2, 3, 4]	
9	Training of assembly workers [0=NO, 1=YES]	no measure	[0, 1]	
10	R&D expenditures	[PLN]	<= 900 000	
11	Granulate ordering (supplier EX)	[kg]	<= 60 000	
12	Electronics ordering (supplier EX)	[pieces]	<= 30 000	
13	New long-term credit	[PLN]	<= 12 000 000	
14	Repayment of long-term credit (principal without interest)	[PLN]	<=debt	
15	Purchase of Special Reports [0=NO, 1=YES]	----------	----------	----------
15.1	-Report IBP	no measure	[0, 1]	
15.2	-Report IBR1	no measure	[0, 1]	
15.3	-Report IBR2	no measure	[0, 1]	
15.4	-Report IBR3	no measure	[0, 1]	
15.5	-Report IBR4	no measure	[0, 1]	
16	Granulate for sale	[kg]	<= 50 000	
17	Electronics for sale	[pieces]	<= 50 000	
18	Machines for sale	[pieces]	<=machines owned	
19	Additional revenues (Trainer)	[PLN]		
20	Additional period costs (Trainer)	[PLN]		
21	Additional financial penalties (Trainer)	[PLN]		
DECISIONS WITH CONSEQUENCES IN THE NEXT MONTH				
No.	Decision description	Measure	Limitations	DECISION
22	Machine ordering	[pieces]	<= 20	
23	Additional Equipment ordering [0=NO,1=YES]:	----------	----------	----------
23.1	-Shower facility	no measure	[0, 1]	
23.2	-Canteen facility	no measure	[0, 1]	
23.3	-Noise reduction facility	no measure	[0, 1]	
23.4	-Automatic fire protection facility	no measure	[0, 1]	
23.5	-Air conditioning facility	no measure	[0, 1]	
24	Filter ordering	[pieces]	<= 100	
25	Granulate ordering (supplier ZW)	[kg]	<= 120 000	
26	Electronics ordering (supplier ZW)	[pieces]	<= 60 000	
27	Employment offer for Machine Operators (Stage 1)	[persons]	<= 50	
28	Employment offer for Assembly Workers (Stage 2)	[persons]	<= 50	
29	Dismissal: Machine Operators (Stage 1)	[persons]	<=No of employed	
30	Dismissal: Assembly Workers (Stage 2)	[persons]	<=No of employed	

Appendix 4: *Example: decisions and their consequences in months 0 and 1*

4.1. *Decisions taken in month number zero*

Comment: All decisions taken at the beginning of month zero will bring an effect in month number 1 (their consequences will be seen in month 1).

Company No.1 Date: 17.01.2019 Month No.: 0

No.	Decision description	Measure	Limitations	DECISION
22	Machine ordering	[pieces]	<=20	**8**
23	Additional Equipment ordering [0=NO,1=YES]:	----------	----------	**----------**
23.1	-Shower facility	no measure	[0, 1]	**0**
23.2	-Canteen facility	no measure	[0, 1]	**1**
23.3	-Noise reduction facility	no measure	[0, 1]	**1**
23.4	-Automatic fire protection facility	no measure	[0, 1]	**1**
23.5	-Air conditioning facility	no measure	[0, 1]	**1**
24	Filter ordering	[pieces]	<=100	**1**
25	Granulate ordering (supplier ZW)	[kg]	<=120 000	**4 000**
26	Electronics ordering (supplier ZW)	[pieces]	<=60 000	**25 000**
27	Employment offer for Machine Operators (Stage 1)	[persons]	<=50	**16**
28	Employment offer for Assembly Workers (Stage 2)	[persons]	<=50	**16**
29	Dismissal: Machine Operators (Stage 1)	[persons]	<=No of employed	**0**
30	Dismissal: Assembly Workers (Stage 2)	[persons]	<=No of employed	**0**

4.2. *Decisions taken in month number 1*

Company No. 1 Date: 17.01.2019 Month No. 1

DECISIONS WITH CONSEQUENCES IN CURRENT MONTH				
No.	Decision description	Measure	Limitations	DECISION
1	Model number of casings to be produced	no measure	Max. possible	**0**
2	Production in Stage 1 (casings)	[pieces]	<= 100 000	**5 120**
3	Production in Stage 2 (assembly)	[pieces]	<= 100 000	**4 000**
4	Full quality finished products for sale	[pieces]	<= 9 000 000	**3 000**
5	Selling price of full quality finished product	[PLN/piece]	<= 10 000	**800**
6	Worker's salary (per month)	[PLN/person]	[500; 5 000]	**600**
7	Advertising:	----------	----------	**----------**
7.1	-Television	[PLN]	<= 5 000 000	**0**
7.2	-Radio	[PLN]	<= 5 000 000	**0**
7.3	-Popular magazines	[PLN]	<= 5 000 000	**0**
7.4	-Internet	[PLN]	<= 5 000 000	**0**
7.5	-Billboards	[PLN]	<= 5 000 000	**1 000**
7.6	-Special journals	[PLN]	<= 5 000 000	**0**
8	Machine maintenance [Contract No.: 1, 2, 3 or 4]	no measure	[1, 2, 3, 4]	**1**
9	Training of assembly workers [0=NO, 1=YES]	no measure	[0, 1]	**1**
10	R&D expenditures	[PLN]	<= 900 000	**71 000**
11	Granulate ordering (supplier EX)	[kg]	<= 60 000	**1 000**
12	Electronics ordering (supplier EX)	[pieces]	<= 30 000	**1 000**
13	New long-term credit	[PLN]	<= 12 000 000	**1 000 000**
14	Repayment of long-term credit (principal without interest)	[PLN]	<=debt	**0**
15	Purchase of Special Reports [0=NO, 1=YES]	----------	----------	**----------**
15.1	-Report IBP	no measure	[0, 1]	**0**
15.2	-Report IBR1	no measure	[0, 1]	**1**
15.3	-Report IBR2	no measure	[0, 1]	**0**
15.4	-Report IBR3	no measure	[0, 1]	**0**
15.5	-Report IBR4	no measure	[0, 1]	**0**
16	Granulate for sale	[kg]	<= 50 000	**0**
17	Electronics for sale	[pieces]	<= 50 000	**0**
18	Machines for sale	[pieces]	<=machines owned	**0**
19	Additional revenues	[PLN]		**0**
20	Additional period costs	[PLN]		**0**
21	Additional financial penalties	[PLN]		**1 000**
DECISIONS WITH CONSEQUENCES IN THE NEXT MONTH				
No.	Decision description	Measure	Limitations	DECISION
22	Machine ordering	[pieces]	<= 20	**20**
23	Additional Equipment ordering [0=NO,1=YES]:	----------	----------	**----------**
23.1	-Shower facility	no measure	[0, 1]	**1**
23.2	-Canteen facility	no measure	[0, 1]	**1**
23.3	-Noise reduction facility	no measure	[0, 1]	**1**
23.4	-Automatic fire protection facility	no measure	[0, 1]	**1**
23.5	-Air conditioning facility	no measure	[0, 1]	**1**
24	Filter ordering	[pieces]	<= 100	**1**
25	Granulate ordering (supplier ZW)	[kg]	<= 120 000	**2 000**
26	Electronics ordering (supplier ZW)	[pieces]	<= 60 000	**3 000**
27	Employment offer for Machine Operators (Stage 1)	[persons]	<= 50	**37**
28	Employment offer for Assembly Workers (Stage 2)	[persons]	<= 50	**35**
29	Dismissal: Machine Operators (Stage 1)	[persons]	<=No of employed	**0**
30	Dismissal: Assembly Workers (Stage 2)	[persons]	<=No of employed	**0**

4.3. *Results of the COMPANY for month number 1*

4.3.1. *BALANCE SHEET*

GAME-SYMBOL: EXAMPLE5 *BALANCE SHEET* COMPANY:1 Mth: 1

ASSETS		SHAREHOLDERS EQUITY AND LIABILITIES	
A.FIXED ASSETS		A.SHAREHOLDERS EQUITY	
1.Buildings	1797000	1.Share capital	2000000
2.Machinery	629760	2.Spare Capital	0
3.Additional Equipment	154375	3.Retained earnings	0
4.Filters	33000		
		B.LIABILITIES	
B.CURRENT ASSETS		1.Long-term credit	1000000
I.STOCK		2.Short-term credit	10400069
1.Granulate	156160		
2.Electronics	10217308	C.PROFIT AFTER TAXATION	138585
3.Semi-finished goods	45607		
4.Finished products	505444		
II.CASH			
1.At bank/At hand	0		
SUM:	13538654	SUM:	13538654

Profit/Loss after taxation earned last month = 0. Profit was assigned:

1. To supplement share capital	0
2. To increase retained earnings	0
3. To pay out dividends	0

4.3.2. *PROFIT AND LOSS ACCOUNT*

GAME-SYMBOL: EXAMPLE5	*PROFIT AND LOSS ACCOUNT*	COMPANY:1	Mth: 1
A. REVENUE ON SALES AND SALES EQUIVALENTS			2960771
1. Revenue on sales of full quality products		2400000	
2. Revenue on sales of defective products		9720	
3. Change in stock: semifin. and finished products		551051	
4. Revenue on sales of raw materials		0	
B. OPERATING EXPENSES			2718797
1. Cost of raw materials sold		0	
2. Usage of granulate		163840	
3. Usage of electronics		1857692	
4. Wages (direct labour)		19200	
5. Depreciation		17865	
6. Remaining costs		660200	
C. GROSS PROFIT (LOSS) ON SALES (A-B)			241974
D. OTHER OPERATING REVENUE			0
1. Revenue on sale of machines		0	
2. Additional revenue (trainer`s decision)		0	
E. OTHER OPERATING EXPENSES			1000
1. Cost of machines sold		0	
2. Financial penalties (total)		1000	
F. OPERATING PROFIT (LOSS) (C+D-E)			240974
G. FINANCIAL EXPENSES (credit interest)			10000
H. PROFIT (LOSS) BEFORE TAXATION (F-G)			230974
I. INCOME TAX			92389
J. PROFIT (LOSS) AFTER TAXATION (H-I)			138585

GROUPS OF COSTS `B6` AND `E2`:

B6. "Remaining costs":	
1.Machine maintenance	800
2.Machine repairs	0
3.Employment of prod. workers	38400
4.Dismissal of production workers	0
5.Training of assembly workers	8000
6.Purchase of Add. Equipment (1-3)	95000
7.Operating costs of Add. Equipment	5000
8.Pollution tax	89400
9.R&D	71000
10.Advertising	1000
11.Purchase of Special Reports	25000
12.Setup costs (machines)	0
13.Transportation of products	45000
14.Warehouse rental	24000
15.Other costs in Prod. Stage 1	25600
16.Other costs in Prod. Stage 2	32000
17.Remaining period costs	200000
18.Additional period costs	0
TOTAL=	660200

E2. "Financial penalties":	
-inflicted by trainer (1),	
-inflicted for refused de-	
liveries (2, 3, 4):	
1.Trainer	1000
2.Machines	0
3.Filters	0
4.Add. Equipment	0
TOTAL=	1000

4.3.3. *CASH FLOW*

GAME-SYMBOL: EXAMPLE5 *CASH FLOW* COMPANY:1 Mth: 1

A. CASH AT THE BEGINNING OF MONTH		0
B. CASH INFLOWS:		5409720
1. Sale of full quality finished prod.	2400000	
2. Sale of defective finished products	9480	
3. Sale of defective semi-fin. products	240	
4. Sale of granulate	0	
5. Sale of electronics	0	
6. Sale of machines	0	
7. New long-term credit	1000000	
8. Owners` contributions to share capital	2000000	
9. Additional proceeds (revenues)	0	
10. Inflow of extra capital	0	
C. CASH OUTFLOWS		15809789
D. CASH SHORTAGE (necessary short-term credit!)		10400069
E. CASH AT THE END OF MONTH		0

C. CASH OUTFLOWS:	15809789		
1.Purchased machines	640000	19.Purchased buildings	1800000
2.Machine maintenance	800	20.R&D	71000
3.Machine repairs	0	21.Advertising	1000
4.Machines-delivery refusal	0	22.Special reports	25000
5.Employment of new workers	38400	23.Setup costs (machines)	0
6.Dismissal of workers	0	24.Product transportation	45000
7.Training of workers	8000	25.Warehouse rental	24000
8.Direct labour (workers)	19200	26.Repaid long-term credit	0
9.Purchased Add.Equipm. (1-5)	251000	27.Interest on LT credit	10000
10.Oper. costs of Add.Equipm.	5000	28.Repaid short-term credit	0
11.Add.Equipm.-delivery refusal	0	29.Interest on ST credit	0
12.Purchased filters	36000	30.Other costs in ProdStage1	25600
13.Pollution tax	89400	31.Other costs in ProdStage2	32000
14.Filters-delivery refusal	0	32.Paid dividends	0
15.Purchased granulate (ZW)	224000	33.Paid income tax	92389
16.Purchased granulate (EX)	96000	34.Remaining period costs	200000
17.Purchased electronics (ZW)	11280000	35.Additional period costs	0
18.Purchased electronics (EX)	795000	36.Add. financial penalties	1000

4.3.4. *ADDITIONAL INFORMATION ON COMPANY*

GAME-SYMBOL: EXAMPLE5 *ADDITIONAL INFO ON COMPANY* COMPANY:1 Mth: 1

A.PRODUCTION WORKERS:

	STAGE1	STAGE2
1.Number of all workers	16	16
2.New employed (this month)	16	16
3.Workers in the period of termination (total)	0	0
4.Workers` new notices of contract termination	0	0
5.Changes in the next month	(- 0)(- 0)(+ 37)	(- 0)(- 0)(+ 35)

Termination upon initiation by the COMPANY

Termination upon initiation by the workers

Employment offer made by the COMPANY at the beginning of current month (month 1). The exact number of workers who will take up a job in the COMPANY (in month 2) is yet not known.

6.Average skill level of assembly workers [s.u./person]	75.0
7.Skill development index (assembly workers) [0;100]	100

B.PRODUCTION MACHINES

1.No. of machines	8	6.Estimated physical life [mth]	17
2.Average age [mth]	1.0	7.No of breakdowns (this month)	0
3.Average relative age [0;1]	0.055	8.Duration of breakdowns [H]	0
4.Unit book value [PLN/M]	78720.0	9.Actual production time [MH]	1280.0
5.Market value [PLN/M]	60486.4	10.Real max. production	5120

C1.PRODUCTION [pcs]

	STAGE1	STAGE2
1.Required quantity	5120	4000
2.Produced quantity	5120	4000
3.Full quality production	5100	3980
4.Defectives	20	20
5.Product quality (GOOD)	100.00	100.00

C2.DELIVERY OF MATERIALS

1.Granulate ZW	4000
2.Granulate EX	1000
3.Electronics ZW	25000
4.Electronics EX	1000

D.INVENTORY

1.Granulate [kg]	2440.0	4.Finished products [pcs]	980
2.Electronics [pcs]	22000	5.Semi-products`quality [q.u.]	100.00
3.Semi-products [pcs]	1100	6.Fin. products`quality [q.u.]	100.00

E.ADDITIONAL EQUIPMENT

Facility number:	1	2	3	4	5
0=none; 1=installed	0	1	1	1	1

F.FILTERS

1.Number of filters [pcs]	1
2.Free capacity [i.u.]	11000

G.SALE OF FULL QUALITY PRODUCTS

1.Price offered [PLN/piece]	800	3.Quantity offered [pcs]	3000
2.Quality offered [q.u.]	100.00	4.Quantity sold [pcs]	3000

H.QUALITY AND PRICE OF FINISHED PRODUCTS OFFERED BY EACH COMPANY

1.Company No.	1	2	3	4	5	6	7	8
2.Quality [q.u.]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
3.Unit price	800	800	800	800	800	800	800	800

I.R&D REPORT

Our design engineers developed a new model for your COMPANY (MODEL No 1).
The necessary setup costs (machines) will come to 1000 [PLN/1 machine].

Appendix 5: *Calculation of the necessary number of machines and personnel (example)*

I. Calculation of the necessary number of machines and machine operators (Prod. Stage 1)

Assumptions:
- no machine breakdowns occur
- machine operators work with their maximal productivity.

Please note, that these assumptions are during the game not always fulfilled.

Symbols used in the calculations:
[ManH] - man hours: hours of work of a man (worker)
[MH] - machine hours: hours of work of a production machine
MaxCap1Ma - maximal capacity of one machine [pcs/MH] (game scenario)
MaxPr1Ma - maximal number of casings that can be produced on one machine in a month [pcs]
MonthH - number of working hours in a month [H/month] (game scenario)
NecMa - number of necessary machines [pcs] (to be calculated)
NecMaH - necessary working hours of machines to produce the required number of casings [MH]
NecOp - number of necessary machine operators [persons] (to be calculated)
NecOpH - necessary operators' working hours to produce the required number of casings [ManH]
OpAt - machine operators' attendance necessary to reach maximal capacity of a machine [ManH/MH] (game scenario)
PRST1 - required production in Production Stage 1 (casings) [pcs of casings/month]
WeekH - number of working hours in a week: [H/week] (game scenario)
Weeks - number of weeks in a month [weeks/month] (game scenario).

Data:
PRST1=3000 [pcs of casings/month] Weeks=4 [weeks/month] WeekH=40 [H/week]
OpAt=2 [ManH/MH] MaxCap1Ma=4 [pcs/MH]

I.1. Calculation of the necessary number of machines

1. Working hours in a month:

$$MonthH = WeekH * Weeks = 40 * 4 = 160 \text{ [H/month]}$$

2. Max. number of casings that can be produced on one machine in a month:

$$MaxPr1Ma = MonthH * MaxCap1Ma = 160 * 4 = 640 \text{ [pcs/month]}$$

3. Number of machines necessary to produce the required monthly production:

$$NecMa = PRST1 / MaxPr1Ma = 3000/640 = 4{,}6875 \text{ [pcs]}$$

The necessary number of machines is equal to 5.

I.2. Calculation of the necessary number of machine operators

1. Machine working hours necessary to produce the required number of casings:

NecMaH=PRST1/ MaxCap1Ma =3000/4=750 [MH]

2. Necessary number of machine operators' working hours:

NecOpH= NecMaH ∗OpAt=750∗2=1500 [ManH]

3. Number of necessary machine operators:

NecOp= NecOpH /MonthH=1500/160=9,375 [persons]

The necessary number of machine operators is equal to 10.

II. Calculation of the necessary number of assembly workers (Production Stage 2)

Assumption: all the time assembly workers work with their maximal productivity.
Please note, that this assumption is during the game not always fulfilled.

Symbols used in the calculations:

MaxPdvAs - maximal productivity of assembly workers [pcs/ManH]
MinAsH - min. number of working hours of assembly workers, necessary to assemble one piece of final product [ManH/piece of product]
NecAs - number of the necessary assembly workers [persons]
NecAsH - necessary working hours of assembly workers to assemble the required number of finished products [ManH].
Other symbols - see: p.I. "Calculation of the necessary number of machines and machine operators".

Data:

PRST2=2000 [pcs of product/month] Weeks=4 [weeks/month] WeekH=40 [H/week]
MaxPdvAs=2 [pcs/ManH]

Calculation:

1. Working hours in a month:

MonthH=WeekH∗Weeks=40∗4=160 [H/month]

2. Min. number of working hours of assembly workers, necessary to assemble one piece of final product - MinAsH [ManH/piece of product] :

$$MinAsH = \frac{1}{MaxPdvAs}$$

3. Necessary working hours of assembly workers to assemble the required number of finished products:

NecAsH = PRST2*MinAsH = PRST2/MaxPdvAs=2000/2=1000 [ManH]

4. Necessary number of assembly workers:

NecAs=NecAsH/MonthH=1000/160=6,25 [persons]

The necessary number of assembly workers is equal to 7.

Appendix 6: *Direct labour standard*

I. Direct labour standard in Production Stage 1 - **DirLSt1** [PLN/piece of casing]

Assumptions:

- machines are working with their maximum capacity
- machine operators work with their maximum productivity.

1. Min. number of machine working hours necessary to manufacture one casing - MinMaH [MH/piece]

$$MinMaH = \frac{1}{MaxCap1Ma}$$

2. Min. number of working hours of machine operators, necessary to manufacture one casing - MinOpH [ManH/piece of casing]:

$$MinOpH = MinMaH * OpAt = \frac{OpAt}{MaxCap1Ma}$$

3. Operators' wages calculated for minimum number of their working hours, necessary to manufacture one casing - DirLSt1 [PLN/ piece of casing]:

$$DirLSt1 = OpWage1H * MinOpH = OpWage1H * \frac{OpAt}{MaxCap1Ma}$$

where:

MaxCap1Ma - maximal capacity of one machine [pcs/MH] (game scenario)
OpAt - machine operators' attendance necessary to reach maximal capacity of a machine [ManH/MH] (game scenario)
OpWage1H - operator's wages calculated for one working hour [PLN/ManH] (to calculate it the following data should be used: monthly wages of one operator, number of working hours in a week and number of weeks in a month).

II. Direct labour standard in Production Stage 2 – **DirLSt2** [PLN/piece of final product]

Assumption: assembly workers work with their maximal productivity.

1. Minimum number of working hours of assembly workers, necessary to assemble one piece of final product - MinAsH [ManH/piece of product] :

$$MinAsH = \frac{1}{MaxPdv1As}$$

2. Assembly workers' wages calculated for minimum number of working hours, necessary to assemble one piece of product – DirLSt2 [PLN/ piece of product]:

$$DirLSt2 = AsWage1H * MinAsH = \frac{AsWage1H}{MaxPdvAs}$$

where:
MaxPdvAs - max. productivity of assembly workers [pcs/ManH] (game scenario)
AsWage1H - assembly workers' wages calculated for one working hour [PLN/ManH] (to calculate it - the following data should be used: monthly wages of an assembly worker, number of working hours in a week and number of weeks in a month).
Comment: monthly wages of operators and assembly workers are during the game equal.

III. Example of direct labour standards calculation

Data:
MaxCap1Ma=4 [pcs/MH] OpAt=2 [ManH/MH] MonthWage=600 [PLN/month]
WeekH=40 [h/week] Weeks=4 [weeks/month] MaxPdvAs=2 [pcs/ManH]

1. Direct labour standard in Production Stage 1 - DirLSt1

1. Operator's wages calculated for one working hour:

$$OpWage1H = \frac{MonthWage}{WeekH * Weeks} = \frac{600}{40 * 4} = 3,75 \quad [PLN/ManH]$$

2. Direct labour standard in Production Stage 1:

$$DirLSt1 = OpWage1H * \frac{OpAt}{MaxCap1Ma} = 3,75 * \frac{2}{4} = 1,875 \ [PLN/ \text{ piece of casing}]$$

2. Direct labour standard in Production Stage 2 - DirLSt2

1. Assembly worker's wages calculated for one working hour:

$$AsWage1H = \frac{MonthWage}{WeekH * Weeks} = \frac{600}{40 * 4} = 3,75 \quad [PLN/ManH]$$

2. Direct labour standard in Production Stage 2:

$$DirLSt2 = \frac{AsWage1H}{MaxPdvAs} = \frac{3,75}{2} = 1,875 \ [PLN/ \text{ piece of product}]$$

Comment: In the above example the values of DirLSt1 and DirLSt2 are equal. It is to be remembered that this is not a common case.

Appendix 7: *Depreciation on filters*

I. Depreciation method

It is assumed that filters are fixed assets, and are depreciated with the use of ***Units-of-Production Method***. As a unit of work (unit of production) of a filter, one unit of impurities caught (collected) by this filter is assumed. Further assumption is that all filters owned by the COMPANY are working equally (each absorbs the same number of impurities in a month). To calculate depreciation cost per unit of work of a filter, the following data are necessary: 1) the purchase price of a filter, 2) expected number of units of work of a filter in its useful life. The amount of monthly depreciation on all filters owned by the COMPANY can be calculated in the following four steps.

1. Number of impurities produced in current month:

$$ImpProd = PRST1 * UImpProd \ [i.u.] \ (i.u.=impurity\ units) \qquad (1)$$

PRST1 - number of casings produced in a given month [pcs] (pcs=pieces),
UImpProd - unit production of impurities in Production Stage 1 (number of impurities produced during the manufacturing of one casing) [i.u./casing].

2. Number of impurities that can be absorbed (collected) by all filters in current month [i.u.]. The following data will be helpful: number of filters owned by the COMPANY, efficiency of one filter (rate of absorbing impurities per month) and free "cubic" capacity of all filters (number of impurities that all filters can still absorb).

   2.1. Number of impurities that can be collected by all filters in current month, leaving out of account their free "cubic" capacity:

$$PosImpAbs1 = AllFil * Eff1Fil \ [i.u.] \qquad (2)$$

AllFil -total number of filters owned by the COMPANY in current month (with newly installed) [pcs],
Eff1Fil -filter efficiency (rate of absorbing impurities by one filter) [i.u./month].

   2.2. Number of impurities that can be absorbed by all filters in current month taking into consideration their free "cubic" capacity:

$$PosImpAbs = \min(PosImpAbs1; FreeCC) \ [i.u.] \qquad (3)$$

FreeCC - free "cubic" capacity of all filters (number of impurities that all filters can still catch) [i.u.].

3. Number of impurities really collected by all filters in current month:

$$ImpAbs = \min(ImpProd; PosImpAbs) \ [i.u.] \qquad (4)$$

4. The amount of monthly depreciation on all filters owned by the COMPANY:

$$FilDepr = ImpAbs * (UFilPrice/CC1Fil) \ [PLN] \qquad (5)$$

UFilPrice - purchase price of one filter [PLN/pcs],
CC1Fil- "cubic" capacity of one new filter [i.u.].

II. Example of calculation of monthly depreciation on filters

Assumptions:

1. Number of casings manufactured in Production Stage 1 - PRST1=2 000 [pcs]
2. Unit production of impurities (number of impurities produced during the manufacturing of one casing) - UImpProd = 4 [i.u./casing]
3. Filter efficiency (rate of absorbing impurities by one filter) - Eff1Fil = 1 000 [i.u./month]
4. Total number of filters in the COMPANY in current month (with newly installed) - AllFil = 3 [pcs]
5. Purchase price of one filter - UFilPrice = 36 000 [PLN/pcs]
6. "Cubic" capacity of one new filter CC1Fil = 12 000 [i.u.]
7. Free "cubic" capacity of all filters owned by the COMPANY - FreeCC = 36 000 [i.u.].

Calculation of monthly depreciation on filters:

1. Number of impurities produced in current month:

$$ImpProd = PRST1 * UImpProd = 2\,000 * 4 = 8\,000 \text{ [i.u.]}$$

2. Number of impurities that can be collected by all filters in current month [i.u.]:

   2.1. Number of impurities that can be absorbed by all filters in current month, leaving out of account their free “cubic” capacity:

$$PosImpAbs1 = AllFil * Eff1Fil = 3 * 1\,000 = 3\,000 \text{ [i.u.]}$$

   2.2. Number of impurities that can be absorbed by all filters in current month taking into consideration their free “cubic” capacity:

$$PosImpAbs = \min(PosImpAbs1; FreeCC) = \min(3\,000; 36\,000) = 3\,000 \text{ [i.u.]}$$

3. Number of impurities really absorbed by all filters in current month:

$$ImpAbs = \min(ImpProd; PosImpAbs) = \min(8\,000; 3\,000) = 3\,000 \text{ [i.u.]}$$

4. The amount of monthly depreciation on all filters owned by the COMPANY:

$$FilDep = ImpAbs * (UFilPrice/CC1Fil) = 3\,000*(36\,000/12\,000) = 3\,000*3 = 9\,000 \text{ [PLN]}$$

In this example the COMPANY has emitted 5 000 impurity units into the atmosphere:

$$ImpEmit = ImpProd – ImpAbs = 8\,000 - 3\,000 = 5\,000 \text{ [i.u.]}.$$

Appendix 8: *Worksheets*

8.1. *SELLING PRICE*

No	Description	Quantity [pcs]	Unit Value [PLN/pcs]	Total [PLN]
1	**Production Stage1** (Casings): quantities and manufacturing costs	5 120	41,461	212 280,00
1.1	-direct materials (plastic pellets referred to as granulate, taken from warehouse)	↑	32,000	163 840,00
1.2	-direct labour: machine operators (standard)	Production	1,875	9 600,00
1.3	-depreciation on filters	in Stage 1	0,586	3 000,00
1.4	-depreciation on machines (injection presses)		2,000	10 240,00
1.5	-other costs (these costs do not include any depreciation)		5,000	25 600,00
1.A	Production of full quality casings (GOOD1): quantities and manufacturing costs	5 100	41,461	211 450,78
1.B	Production of defective casings (DEF1) quantities and manufacturing costs	20	41,461	829,22
2	**Full Quality Casings Together** (initial inventory+production in current month)	5 100	41,461	211 450,78
3	**Prod. Stage2 (Assembling):** quantities and manuf. costs (**including value of casings**)	4 000	515,759	2 063 036,06
3.1	-casings used in Production Stage 2 (in Assembly)	↑	41,461	165 843,75
3.2	-direct materials (electronics)	Production	464,423	1 857 692,31
3.3	-direct labour: assembly workers (standard)	in Stage 2	1,875	7 500,00
3.4	-other costs (these costs do not include any depreciation)		8,000	32 000,00
3.A	Full Quality Finished Products (GOOD2)	3 980	515,759	2 052 720,88
3.B	Defective Finished Products (DEF2)	20	515,759	10 315,18
4	**Full Quality Finished Products Together** (initial inventory+production)	3 980	515,759	2 052 720,88
5	**Assumable Sale of Full Quality Products (sale of GOOD2)**	3 000	515,759	1 547 277,04
6	**General and Administrative Costs** (incurred in this month)	↑	191,442	574 325,00
6.1	-machine maintenance (without repair costs)	Sales	0,267	800,00
6.2	-machine repairs	Forecast	0,000	0,00
6.3	-employment of new production workers (external service)	(>=0)	12,800	38 400,00
6.4	-dismissal of production workers (dismissal compensation)		0,000	0,00
6.5	-training of assembly workers (external service)		2,667	8 000,00
6.6	-purchase of "Additional Equipment" facilities (only No. 1, 2 and 3)		31,667	95 000,00
6.7	-operating costs of all "Additional Equipment" facilities (No. 1-5)		1,667	5 000,00
6.8	-pollution tax		29,800	89 400,00
6.9	-R&D costs		23,667	71 000,00
6.10	-purchase of Special Reports (sum of purchasing prices)		8,333	25 000,00
6.11	-setup costs (production machines)		0,000	0,00
6.12	-warehouse rental (cost of storage outside the COMPANY)		8,000	24 000,00
6.13	-depreciation on buildings and "Additional Equipment" No. 4 and 5		1,542	4 625,00
6.14	-direct labour over standard (Production Stages: 1 and 2)		0,700	2 100,00
6.15	-financial penalties for refused deliveries		0,000	0,00
6.16	-additional financial penalties		0,333	1 000,00
6.17	-remaining period costs (these costs do not include any depreciation)		66,667	200 000,00
6.18	-additional period costs		0,000	0,00
6.19	-interests on long- and short term credits		3,333	10 000,00
7	**Selling costs (of full quality finished products GOOD2)**		15,333	46 000,00
7.1	-advertising		0,333	1 000,00
7.2	-transportation (of full quality finished products to customers)		15,000	45 000,00
8	**Total: CostOfGoodsSold+General&AdministrCost+SellingCost** (5+6+7)		722,534	2 167 602,04
9	**Additional revenues (Trainer)** (-)		0,000	0,00
10	**Profit/Loss on sale of granulate** (-)		0,000	0,00
11	**Profit/Loss on sale of electronics** (-)		0,000	0,00
12	**Profit/Loss on sale of defective casings DEF1** (-)		-0,196	-589,22
13	**Profit/Loss on sale of defective finished products DEF2** (-)		-0,278	-835,18
14	**Profit/Loss on sale of production machines** (-)		0,000	0,00
15	**Full quality product price by which company's profit/loss=0**		723,009	2 169 026,44
16	**Selling price of full quality product oferred by COMPANY**		800,000	2 400 000,00
17	**Profit/Loss before taxation**		76,991	230 973,56

Product costs

Period Costs

8.2. *DIRECT MATERIALS (granulate and electronics)*

A. DIRECT MATERIALS PRICES

No.	Description	Granulate	Electronics
1.	Fixed charge per order [PLN]	0	30 000
2.	Basic purchase price [PLN/kg or PLN/piece]	64	500
3.	Order level 1 (Price break 1) [kg or piece]	4 000	10 000
4.	Purchase price 1 [PLN/kg or PLN/piece]	56	480
5.	Order level 2 (Price break 2) [kg or piece]	10 000	25 000
6.	Purchase price 2 [PLN/kg or PLN/piece]	48	450
7.	Purchase price multiplier for supplier EX	1,50	1,50
8.	Selling price coefficient (COMPANY sells materials)	0,80	0,80

B. GRANULATE INVENTORY

1. Quantity of granulate [kg]

Standard usage in production [kg/casing]= **0,5**

Month	Granulate beginning inventory [kg]		- Granulate sold **(Issue 1)** [kg]	+ Granulate purchased **(Receipts)** [kg]		= Inventory after Issue1 and Receipts [kg]	Production in Stage 1 (casings) [pcs]	- Granulate issued for production **(Issue 2)** [kg]	= Granulate ending inventory [kg]
				Ex	1 000				
1	0	XXX	0	Zw	4 000	5 000	5 120	2 560	2 440

2. Inventory value of granulate [PLN] or [PLN/kg]

Month	Granulate beginning value (total) [PLN]	Beginning unit inventory value [PLN/kg]	- Value of granulate sold [PLN]	+Value of granulate purchased (purchase price) [PLN]		=Granulate value after sale and purchases [PLN]	Unit inventory value (after sale and purchases) [PLN/kg]	- Value of granulate issued for production [PLN]	= Granulate ending value (at the end of month) [PLN]
				Ex	96 000,0				
1	0,0	0	0,0	Zw	224 000,0	320 000,0	64,0	163 840,0	156 160,0

C. ELECTRONICS INVENTORY

1. Quantity of electronics [pcs]

Standard usage in production [pcs/product]= **1**

Month	Electronics beginning inventory [pcs]		- Electronics sold **(issue 1)** [pcs]	+ Electronics purchased **(Receipts)** [pcs]		= Inventory after Issue1 and Receipts [pcs]	Production in Stage 2 (final products) [pcs]	- Electronics issued for production **(Issue 2)** [pcs]	= Electronics ending inventory [pcs]
				Ex	1 000				
1	0	XXX	0	Zw	25 000	26 000	4 000	4 000	22 000

2. Inventory value of electronics [PLN] or [PLN/piece]

Month	Electronics beginning value (total) [PLN]	Beginning unit inventory value [PLN/piece]	- Value of electronics sold [PLN]	+Value of electronics purchased (purchase price) [PLN]		=Electronics value after sale and purchases [PLN]	Unit inventory value (after sale and purchases) [PLN/piece]	- Value of electronics issued for production [PLN]	= Electronics ending value (at the end of month) [PLN]
				Ex	795 000,0				
1	0,0	0	0,0	Zw	11 280 000,0	12 075 000,0	464,4	1 857 692,3	10 217 307,7

Appendix 9: *Requirements to be met by decisions taken in month number 2*[1].

Comment: these requirements are obligatory only in the trial run of the game (in the test-game).

To work out decisions for month number 2, each company must calculate its own value named ***IKS****:*

$$IKS = BASE + NO\_COMP*100$$

where:

BASE – number given by the Trainer (equal for the whole laboratory group)
NO_COMP – company's number assigned by the Trainer to each student/team participating in the game.

When working out decisions for month No. 2 each COMPANY must fulfil the following requirements:

1. Place orders with the supplier EX for the following quantities of direct materials:
   a) granulate = 10 000 + ***IKS***/10 [kg]; b) electronics = 4 000 + ***IKS***/10 [pcs]
2. Sell ***IKS***/10 [kg] granulate and ***IKS***/10 [pcs] of electronics
3. Sell (dispose of) **1** production machine
4. Start with the production of a new model of casing (**MODEL 1**)
5. Manufacture the following number of casings (Production Stage 1): PRF1 = **IKS** [pcs]
6. Assume 10% defectives in each production stage
7. Assemble such a number of finished products (Production Stage 2), so that to have in stock 100 pieces of full quality casings at the end of month 2
8. Sell such a number of full quality finished products, so that to have in stock 100 pieces of full quality products at the end of month 2
9. Set such a price for its full quality finished products, so that the COMPANY's profit before taxation earned in month No. 2 will be a number from the interval [100 000; 200 000] [PLN]
10. Train the assembly workers
11. Assign for R&D two thousand (2 000) [PLN]
12. Take long-term credit in amount of **IKS*600** [PLN].
13. Purchase (any) two Special Reports
14. Assign for advertising **in each medium** the amount of **100 000** [PLN]
15. Set monthly salary for a production worker in amount of **500** [PLN/worker]
16. Make the following assumptions: no machine breakdown will occur and all production workers will work with their maximal productivity
17. Each decision to be taken must (also) fulfil the requirements (limitations) specified in the last but one column of the decision sheet (see Appendix 3: „*DECISION SHEETS*").

[1] All decisions to be taken are listed in the Appendix ***„DECISION SHEETS".***

Appendix 10: *Indices and financial ratios*

I. List of indices and financial ratios

1. Performance measure (W1)

W1- COMPANY's net profit (average per month) [PLN/month]

$$W1 = \frac{\sum_{i=1}^{n} NetProfit_i}{n}$$

where:

$NetProfit_i$ - Net profit (loss) earned (incurred) by the COMPANY in month '*i*'

n - Number of months.

2. Profitability ratio (W2)

W2 - return on equity (average per month) [%/month]

$$W2 = \frac{\sum_{i=1}^{n} \frac{NetProfit_i}{ShEquity_i}}{n} * 100\%$$

where:

$ShEquity_i$ -Shareholders' equity in month '*i*'.

3. Market share index (W3)

W3 - COMPANY's market share measured by the revenues on sale [%]

$$W3 = \frac{\text{COMPANY's revenues on sale of full quality products (total in all months)}}{\text{All companies' revenues on sale of full quality products (total in all months)}} * 100\%$$

4. Proprietary ratio (W4)

W4 - shareholders' equity to total of shareholders' equity and liabilities (average per month) [%]

$$W4 = \frac{\sum_{i=1}^{n} \frac{ShEqutiy_i}{ShEqutiy_i + Liabilities_i}}{n} * 100\%$$

where:

$Liabilities_i$ - COMPANY's liabilities in month '*i*' (short and long term credits).

5. Image index

W5 - COMPANY's image (average per month); number from the interval [0; 10 000].

II. Rules for assigning weights to indices and financial ratios:

1. The total of all weights must be equal 30.
2. Weights are natural numbers from the interval [2; 9].
3. The max. possible weight assigned to ratio W4 is 4.