



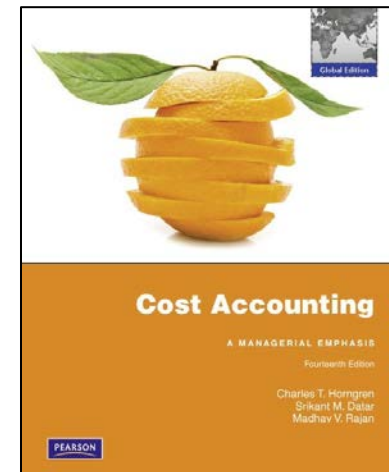
Institute of Accounting, Control
and Auditing

University of St.Gallen

MAccFin – Master of Arts in Accounting and Finance
Pflichtwahlfach
7,116,1.00 Techniken im Management Accounting

Cost Allocation: Joint Products and Byproducts Theorie & Cases

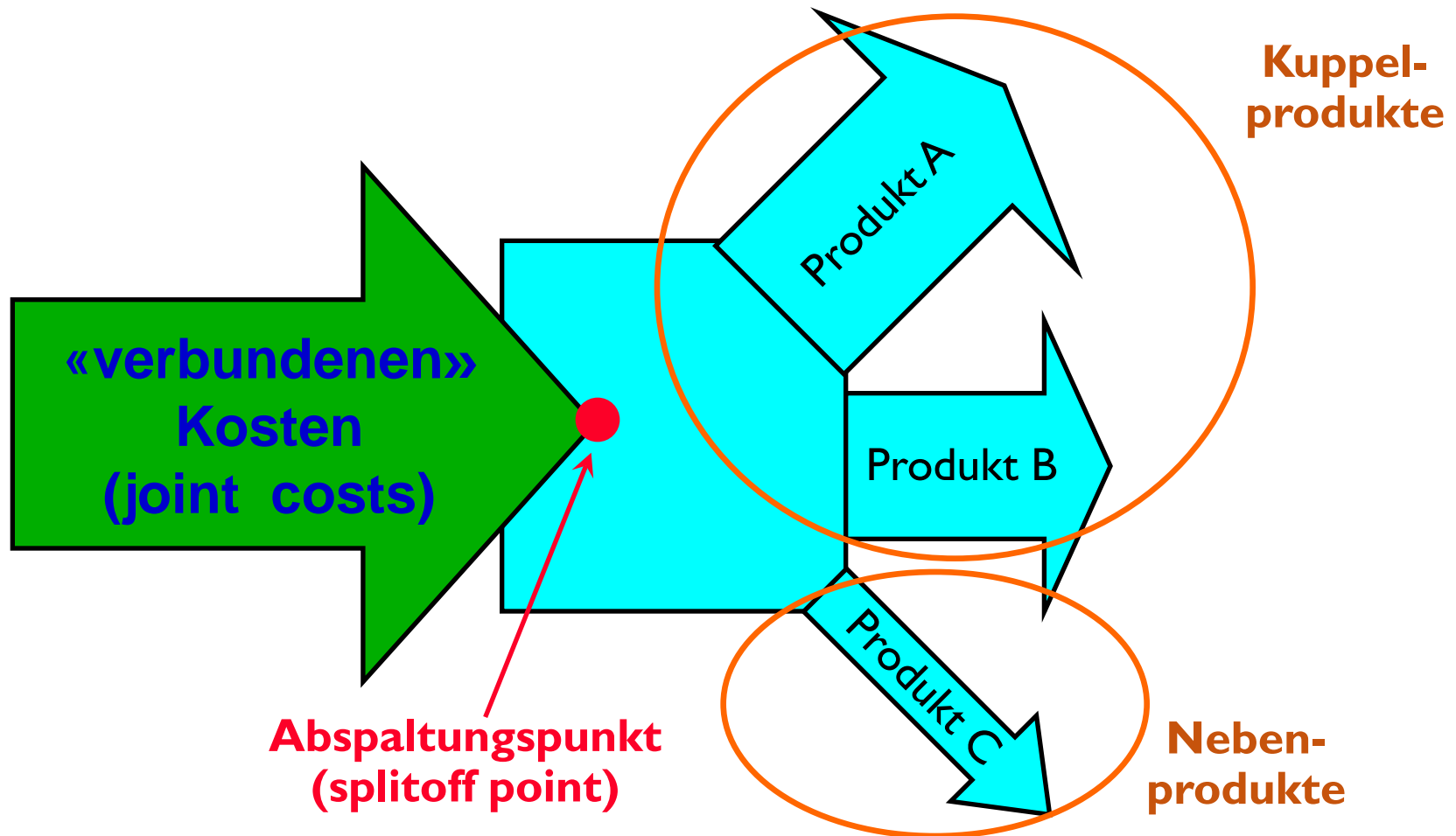
HDR, 14ed, Chapter 16



Kosten-Allokation bei Kuppelprodukten (joint products) und Nebenprodukten (byproducts)

Input: 1 Prozess

Output: mehrere Produkte



Begriffe

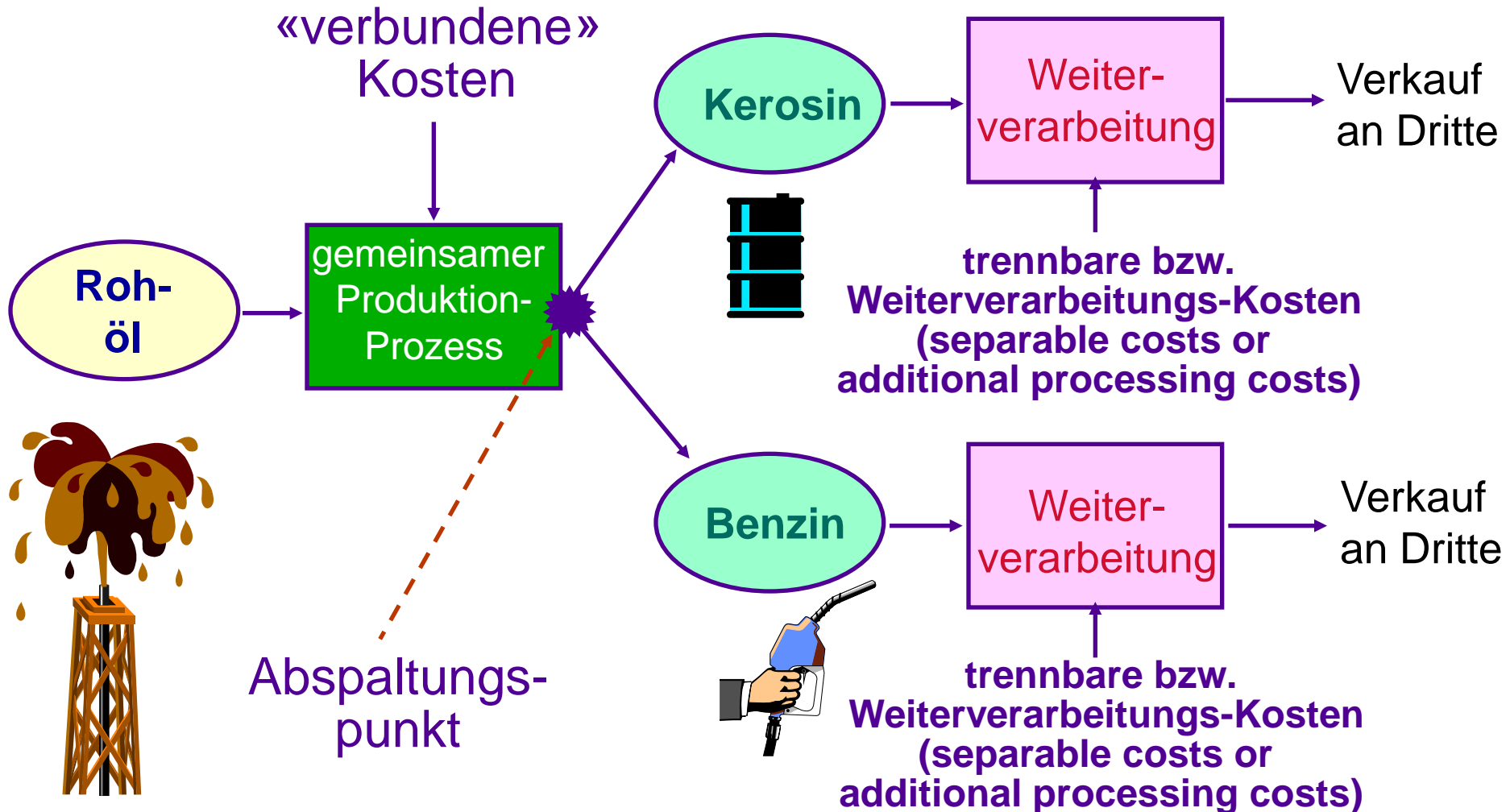
- ❖ «Verbundene» Kosten (**joint costs**): Dies sind die Kosten eines Produktionsprozesses, bei welchem gleichzeitig mehrere Produkte erzielt werden.
- ❖ Abspaltungspunkt (**splitoff point**): Dieser befindet sich dort, wo zwei oder mehrere Produkte einzeln identifiziert werden können.
- ❖ Kuppelprodukte (**joint products**): Dies sind die Produkte aus einem gemeinsamen Produktionsprozess, welche je einen **relativ grossen Umsatz-Wertanteil** aufweisen.
- ❖ Nebenprodukte (**byproducts**): Die sind Produkte, welche im Vergleich zu den Kuppelprodukten einen **geringen Umsatz-Wertanteil** aufweisen.

Beispiele von «Joint-Cost»-Situationen

HORNGREN, DATAR, FOSTER. ¹²2005. Cost Accounting. Exhibit 16-1, S. 566.

Industry	Separable Products at the Splitoff Point
<i>Agriculture and Food Processing</i>	
Cocoa beans	Cocoa butter, cocoa powder, cocoa drink mix, tanning cream
Lambs	Lamb cuts, tripe, hides, bones, fat
Hogs	Bacon, ham, spare ribs, pork roast
Raw milk	Cream, liquid skim
Lumber	Lumber of varying grades and shapes
Turkeys	Breast, wings, thighs, drumsticks, digest, feather meal, and poultry meal
<i>Extractive Industries</i>	
Coal	Coke, gas, benzol, tar, ammonia
Copper ore	Copper, silver, lead, zinc
Petroleum	Crude oil, natural gas, raw LPG
Salt	Hydrogen, chlorine, caustic soda
<i>Chemical Industries</i>	
Raw LPG (liquefied petroleum gas)	Butane, ethane, propane
Crude oil	Gasoline, kerosene, benzene, naphtha
<i>Semiconductor Industry</i>	
Fabrication of silicon-wafer chips	Memory chips of different quality (as to capacity), speed, life expectancy, and temperature tolerance

Weiterverarbeitung (additional processing)



Ansätze zur Kosten-Allokation der «Joint Costs»

Die Allokation der «Joint Costs» wird üblicherweise anhand zweier Ansätze vorgenommen:

❖ Markt-basierter Ansatz

- Methode gemäss **Umsatz-Anteilen** zum Abspaltungszeitpunkt (sales value at splitoff)
- Methode gemäss **netto-realisierbarer Werte** zum Abspaltungszeitpunkt (net realizable value (NRV))
- Methode gemäss **konstanter, prozentualer Bruttogewinn-Quote** bezüglich NRV (constant gross-margin percentage (NRV))

❖ Ansatz mit Verwendung von **physischen Kennzahlen**, z.B. gemäss Gewichts- oder Volumenanteilen

HDFRI, 13ed, Problem 16-27, Palmer Oil

- ❖ The Palmer Oil Company buys crude vegetable oil. Refining this oil results in four products at the splitoff point: A, B, C, and D.
- ❖ Product C is fully processed by the splitoff point.
- ❖ Products A, B, and D can individually be further refined into Super A, Super B, and Super D.
- ❖ In the most recent month (December), the output at the splitoff point was:
 - Product A, 375,000 gallons
 - Product B, 125,000 gallons
 - Product C, 62,500 gallons
 - Product D, 62,500 gallons
- ❖ The joint costs of purchasing and processing the crude vegetable oil were \$125,000.
- ❖ Palmer had no beginning or ending inventories.
- ❖ Sales of product C in December were \$62,500.

HDFRI, 13ed, Problem 16-27, Palmer Oil - Forts.

- ❖ Products A, B, and D were further refined and then sold. Data related to December are:

	Separable Processing Costs to Make Super Products	Revenues
Super A	\$250,000	\$375,000
Super B	100,000	125,000
Super D	112,500	150,000

- ❖ Palmer had the option of selling products A, B, and D at the splitoff point. This alternative would have yielded the following revenues for the December production:
 - Product A, \$62,500
 - Product B, \$37,500
 - Product D, \$87,500

HDFRI, 13ed, Problem 16-27, Palmer Oil - Forts.

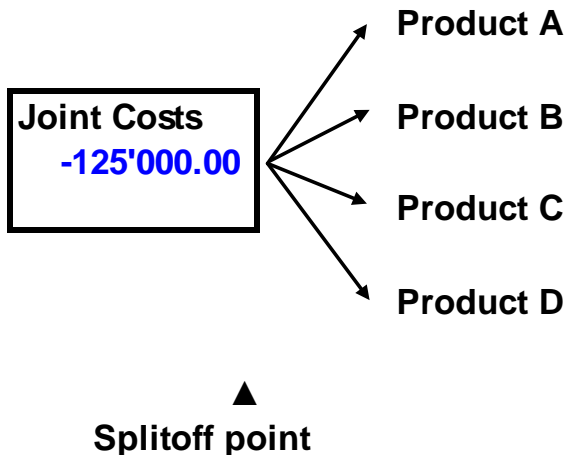


Required

1. Compute the gross-margin percentage for each product sold in December, using the following methods for allocating the \$125,000 joint costs:
 - a. Sales value at splitoff
 - b. Physical measure
 - c. NRV
2. Could Palmer have increased its December operating income by making different decisions about the further processing of products A, B, or D? Show the effect on operating income of any changes you recommend.

HDFRI, 13ed, Problem 16-27, Palmer Oil - Lösungsvorschlag für 1.

Palmer Oil



Output in gallons at splitoff point	Revenues at splitoff point		Further- Processing Costs		Revenues for Super Products
375'000	62'500.00	→	-250'000.00	→	375'000.00
125'000	37'500.00	→	-100'000.00	→	125'000.00
62'500	62'500.00				
62'500	87'500.00	→	-112'500.00	→	150'000.00

HDFRI, 13ed, Problem 16-27, Palmer Oil - Lösungsvorschlag für 1. a. - Sales value at splitoff

a.

	Sales Value of Total Production at Splitoff	Weighting	Allocation of Joint Costs	Gross Margin with Sales Value at Splitoff	Gross Margin % with Sales Value at Splitoff
A	62'500.00	25.0%	-31'250.00	31'250.00	50.0%
B	37'500.00	15.0%	-18'750.00	18'750.00	50.0%
C	62'500.00	25.0%	-31'250.00	31'250.00	50.0%
D	<u>87'500.00</u>	<u>35.0%</u>	<u>-43'750.00</u>	<u>43'750.00</u>	<u>50.0%</u>
	250'000.00	100%	-125'000.00	125'000.00	50.0%

a.

	Final Sales Value of Total Production	Separable Costs (Further- processing costs)	Net Realizable Value at Splitoff	Weighting (Sales Value at splitoff)	Allocation of Joint Costs	Gross Margin with Final Sales Value	Gross Margin % with Final Sales Value
A	375'000.00	-250'000.00	125'000.00	25.0%	-31'250.00	93'750.00	25.0%
B	125'000.00	-100'000.00	25'000.00	15.0%	-18'750.00	6'250.00	5.0%
C	62'500.00	-	62'500.00	25.0%	-31'250.00	31'250.00	50.0%
D	<u>150'000.00</u>	<u>-112'500.00</u>	<u>37'500.00</u>	<u>35.0%</u>	<u>-43'750.00</u>	<u>-6'250.00</u>	<u>-4.2%</u>
	712'500.00	-462'500.00	250'000.00	100.0%	-125'000.00	125'000.00	17.5%

HDFRI, 13ed, Problem 16-27, Palmer Oil - Lösungsvorschlag für 1. b. - Physical-measure

b.

	Physical Measure of Total Production	Weighting	Allocation of Joint Costs	Gross Margin with Sales Value at Splitoff	Gross Margin % with Sales Value at Splitoff
A	375'000	60.0%	-75'000.00	-12'500.00	-3.3%
B	125'000	20.0%	-25'000.00	12'500.00	10.0%
C	62'500	10.0%	-12'500.00	50'000.00	80.0%
D	<u>62'500</u>	<u>10.0%</u>	<u>-12'500.00</u>	<u>75'000.00</u>	<u>120.0%</u>
	625'000	100%	-125'000.00	125'000.00	20.0%

b.

	Final Sales Value of Total Production	Separable Costs (Further- processing costs)	Net Realizable Value at Splitoff	Weighting (Physical measure)	Allocation of Joint Costs	Gross Margin with Final Sales Value	Gross Margin % with Final Sales Value
A	375'000.00	-250'000.00	125'000.00	60.0%	-75'000.00	50'000.00	13.3%
B	125'000.00	-100'000.00	25'000.00	20.0%	-25'000.00	-	0.0%
C	62'500.00	-	62'500.00	10.0%	-12'500.00	50'000.00	80.0%
D	<u>150'000.00</u>	<u>-112'500.00</u>	<u>37'500.00</u>	<u>10.0%</u>	<u>-12'500.00</u>	<u>25'000.00</u>	<u>16.7%</u>
	712'500.00	-462'500.00	250'000.00	100.0%	-125'000.00	125'000.00	17.5%

HDFRI, 13ed, Problem 16-27, Palmer Oil - Lösungsvorschlag für 1. c. - NRV

c.

	Final Sales Value of Total Production	Separable Costs (Further- processing costs)	Net Realizable Value at Splitoff	Weighting (NRV)	Allocation of Joint Costs	Gross Margin with Final Sales Value	Gross Margin % with Final Sales Value
A	375'000.00	-250'000.00	125'000.00	50.0%	-62'500.00	62'500.00	16.7%
B	125'000.00	-100'000.00	25'000.00	10.0%	-12'500.00	12'500.00	10.0%
C	62'500.00	-	62'500.00	25.0%	-31'250.00	31'250.00	50.0%
D	<u>150'000.00</u>	<u>-112'500.00</u>	<u>37'500.00</u>	<u>15.0%</u>	<u>-18'750.00</u>	<u>18'750.00</u>	<u>12.5%</u>
	712'500.00	-462'500.00	250'000.00	100%	-125'000.00	125'000.00	17.5%

Summary of Gross Margin % with Final Sales Value

Joint Cost Allocation Method	Super A	Super B	C	Super D	Total
a. Sales value at splitoff	25.0%	5.0%	50.0%	-4.2%	17.5%
b. Physical measure	13.3%	0.0%	80.0%	16.7%	17.5%
c. Net realizable value	16.7%	10.0%	50.0%	12.5%	17.5%

Sofortverkauf oder Weiterverarbeitung

- ❖ Falls die Kuppelprodukte weiterverarbeitet werden können und dadurch ein höherer Verkaufspreis erlangt wird, stellt sich die Frage, ob dies wirtschaftlich ist oder nicht.
- ❖ Bei dieser Entscheidung sind die «Joint Costs» irrelevant, da sie «Sunk Costs» sind.
- ❖ **Relevant sind nur noch die sich unterscheidenden Kosten und Erlöse bei Sofortverkauf oder Weiterverarbeitung.**

HDFRI, 13ed, Problem 16-27, Palmer Oil - Lösungsvorschlag für 2.

❖ Further Processing of A into Super A:

■ Incremental revenue, \$375,000 – \$62,500	\$312,500
■ Incremental costs	<u>250,000</u>
■ Incremental operating income from further processing	<u>\$ 62,500</u>

❖ Further processing of B into Super B:

■ Incremental revenue, \$125,000 – \$37,500	\$ 87,500
■ Incremental costs	<u>100,000</u>
■ Incremental operating loss from further processing	<u>\$ (12,500)</u>

❖ Further Processing of D into Super D:

■ Incremental revenue, \$150,000 – \$87,500	\$ 62,500
■ Incremental costs	<u>112,500</u>
■ Incremental operating loss from further processing	<u>\$ (50,000)</u>

❖ **Operating income can be increased by \$62,500 if both B and D are sold at their splitoff point rather than processed further into Super B and Super D.**

Nebenprodukte-Buchhaltung (accounting for byproducts)

- ❖ Da die Nebenprodukte (byproducts) definitionsgemäss Produkte sind, die im Vergleich zu den Kuppelprodukten (joint products) einen geringen Umsatz-Wertanteil aufweisen, entsteht auch die Frage, wie und wann diese «Nebenprodukte» in der Erfolgsrechnung erfasst werden.
- ❖ Dabei werden üblicherweise zwei Methoden unterschieden:
 - «**Production Method**»: Die Nebenprodukte werden - sobald der Produktionsprozess abgeschlossen ist - Lager-seitig zum Sales-Wert erfasst und zum NRV-Wert als Reduktion der «verbundenen» Kosten (joint costs). Beim Verkauf der Nebenprodukte erfolgt de facto lediglich eine Umbuchung innerhalb der Aktiv-Seite [Cash/Debitoren an Lager Byproduct]
 - «**Sales Method**»: Bei dieser Methode wird der Umsatz der Nebenprodukte erst zum Zeitpunkt des Verkaufs entweder als übriger Ertrag oder als Reduktion der Herstellkosten der verkauften Fabrikate erfasst [Cash/Debitoren an übriger Ertrag bzw. COGS]. Im Lager werden die Nebenprodukte nicht geführt, und deren Kosten werden der Erfolgsrechnung als Periodenkosten belastet.

Nebenprodukte-Buchhaltung (accounting for byproducts) - Forts.

- ❖ Die «**Production Method**» ist eigentlich die richtige Methode, da sie gemäss Accrual-Accounting das Nebenprodukt periodengerecht im Lager aktiviert und gleichzeitig die Produktionskosten bzw. «Joint Costs» reduziert.

Dadurch wird auch das Matching-Prinzip bei den Kuppelprodukten gut umgesetzt.

- ❖ Die «**Sales Method**» ist hingegen einfacher und kann anhand des Wesentlichkeits-Prinzips (materiality principle) auch vertreten werden.

Anhand dieser Methode ist es aber dem Management möglich, den Erfolgsausweis durch «Timing» der Nebenprodukteverkäufe zu beeinflussen.

HDR, 14ed, Exercise 16-25, Royston, Inc.

16-25 Joint costs and byproducts. (W. Crum adapted) Royston, Inc., is a large food processing company. It processes 150,000 pounds of peanuts in the peanuts department at a cost of \$180,000 to yield 12,000 pounds of product A, 65,000 pounds of product B, and 16,000 pounds of product C.

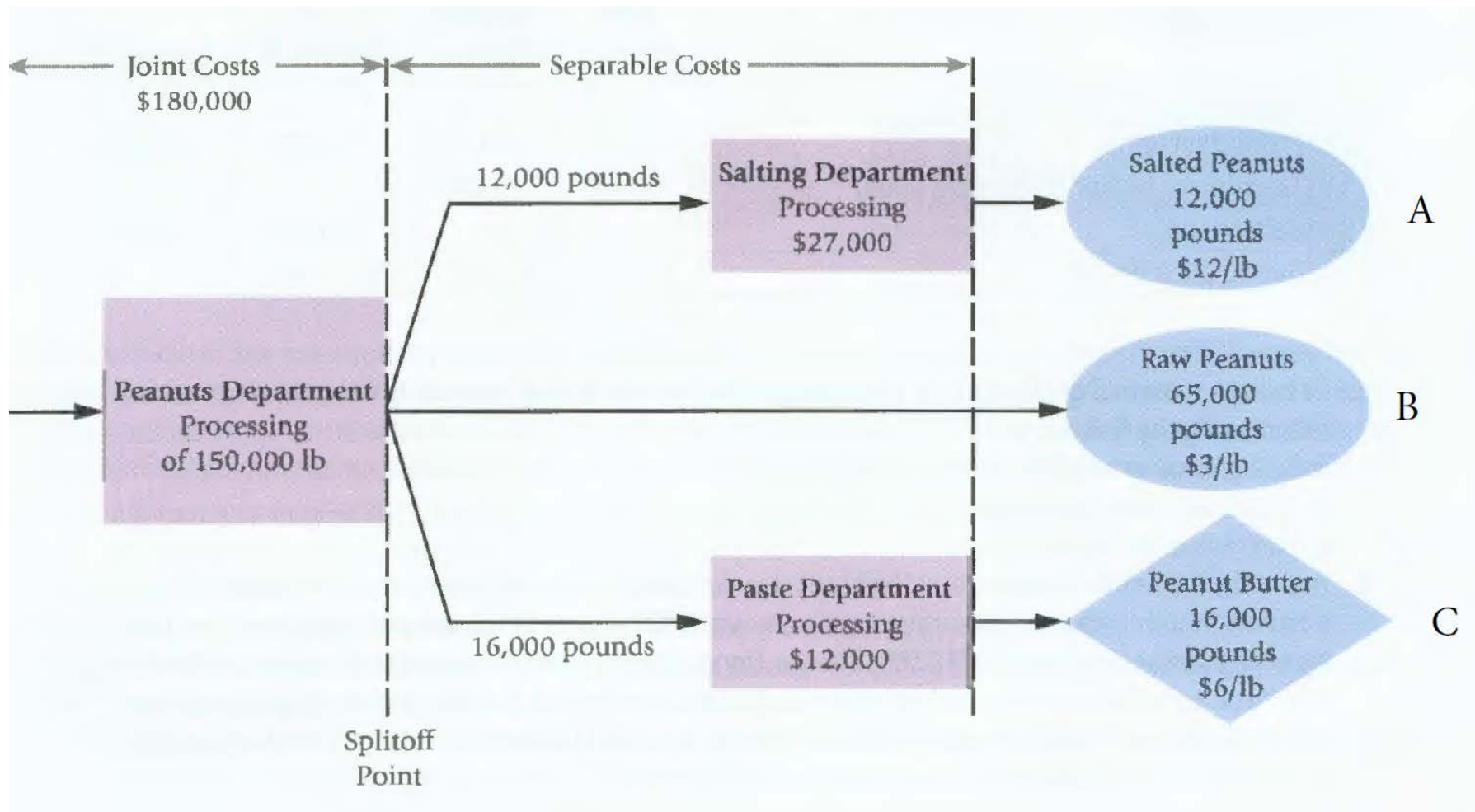
- Product A is processed further in the salting department to yield 12,000 pounds of salted peanuts at a cost of \$27,000 and sold for \$12 per pound.
- Product B (raw peanuts) is sold without further processing at \$3 per pound.
- Product C is considered a byproduct and is processed further in the paste department to yield 16,000 pounds of peanut butter at a cost of \$12,000 and sold for \$6 per pound.

The company wants to make a gross margin of 10% of revenues on product C and needs to allow 20% of revenues for marketing costs on product C. An overview of operations follows:

❖ Required

1. Compute unit costs per pound for products A, B, and C, treating C as a byproduct. Use the NRV method for allocating joint costs. Deduct the NRV of the byproduct produced from the joint cost of products A and B.
2. Compute unit costs per pound for products A, B, and C, treating all three as joint products and allocating joint costs by the NRV method.

HDR, 14ed, Exercise 16-25, Royston, Inc. - Forts.



HDR, 14ed, Exercise 16-25, Royston, Inc. - Lösungsvorschlag zu 1. (siehe auch nächste Folie)

Roystone, Inc. - Verkauf Nebenprodukt sofort

Computing byproduct C deductions to joint costs:

			per pound
Revenues of C	16'000 units at 6.00	96'000.00	6.00
- Peanut Butter separable cost (Paste Dep.)		-12'000.00	-0.75
= Net realizable value at splitoff point		84'000.00	5.25
- Gross margin	10% of revenues of C	-9'600.00	-0.60
- Marketing costs	20% of revenues of C	-19'200.00	-1.20
= NRV of byproduct C after wanted coverage of costs		55'200.00	3.45
	per pound (unit) costs for byproduct C inventory		4.20

Calculation of joint costs after NRV contribution of byproduct C:

Joint costs	180'000.00
- NRV of byproduct C after wanted coverage of costs	-55'200.00
= Net joint costs after NRV deduction of byproduct C	124'800.00

Income Statement for joint product A & B and sold byproduct C

	A	B	C	Total
Revenues of A	12'000 units at 12.00			144'000.00
Revenues of B		65'000 units at 3.00		195'000.00
Revenues of C			16'000 units at 6.00	96'000.00
- Separable processing cost	-27'000.00			-27'000.00
= Net realizable value at splitoff point	117'000.00	195'000.00	96'000.00	408'000.00
Weighting for the allocation of joint cost (net)	37.50%	62.50%		100%
- Allocation of joint costs after NRV deduction of byproduct C	-46'800.00	-78'000.00		-124'800.00
- Calculated cost	16'000 units at 4.20			-67'200.00
= Contribution	70'200.00	117'000.00	28'800.00	216'000.00
	per pound (unit) cost for product A & B	6.15	1.20	

Roystone, Inc. - Verkauf Nebenprodukt später

Computing byproduct C deductions to joint costs:

			per pound
Revenues of C	16'000 units at 6.00	96'000.00	6.00
- Peanut Butter separable cost (Paste Dep.)		-12'000.00	-0.75
= Net realizable value at splitoff point		84'000.00	5.25
- Gross margin	10% of revenues of C	-9'600.00	-0.60
- Marketing costs	20% of revenues of C	-19'200.00	-1.20
= NRV of byproduct C after wanted coverage of costs		55'200.00	3.45
	per pound (unit) costs for byproduct C inventory		4.20

Calculation of joint costs after NRV contribution of byproduct C:

Joint costs	180'000.00
- NRV of byproduct C after wanted coverage of costs	-55'200.00
= Net joint costs after NRV deduction of byproduct C	124'800.00

Income Statement for joint product A & B

	A	B	Total
Revenues of A	144'000.00		144'000.00
Revenues of B		195'000.00	195'000.00
- Separable processing cost	-27'000.00	n.a.	-27'000.00
= Net realizable value at splitoff point	117'000.00	195'000.00	312'000.00
Weighting for the allocation of joint cost (net)	37.50%	62.50%	100%
- Allocation of joint costs after NRV deduction of byproduct C	-46'800.00	-78'000.00	-124'800.00
= Contribution	70'200.00	117'000.00	187'200.00
	per pound (unit) cost for product A & B	6.15	1.20

Income Statement for byproduct C if sold later

	C
Revenues of C	96'000.00
- Calculated cost	-67'200.00
= Contribution	28'800.00
- Gross margin	-9'600.00
- Marketing costs	-19'200.00
= Contribution, net	-

216'000.00

HDR, 14ed, Exercise 16-25, Royston, Inc. - Lösungsvorschlag zu 2.

Roystone, Inc.

Joint costs

180'000.00

Income Statement

			A	B	C	Total
Revenues of A	12'000 units at	12.00	144'000.00			144'000.00
Revenues of B	65'000 units at	3.00		195'000.00		195'000.00
Revenues of C	16'000 units at	6.00			96'000.00	96'000.00
- Separable processing cost			-27'000.00	n.a.	-12'000.00	-39'000.00
= Net realizable value at splitoff point			117'000.00	195'000.00	84'000.00	396'000.00
Weighting for the allocation of joint cost (net)			29.55%	49.24%	21.21%	100%
- Allocation of joint costs after NRV deduction of byproduct C			-53'181.82	-88'636.36	-38'181.82	-180'000.00
= Contribution			63'818.18	106'363.64	45'818.18	216'000.00
per pound (unit) cost for product A & B			6.68	1.36	2.39	

HDF, 12ed, Problem 16-31, Harrison Corp.

- ❖ The Harrison Corporation produces three products: Alpha, Beta, and Gamma. Alpha and Gamma are joint products, and **Beta is a byproduct of Alpha.**
- ❖ No joint costs are to be allocated to the byproduct.
- ❖ The production processes for a given year are as follows:
 - a. In **Department 1**, 110,000 pounds of direct material, Rho, are processed at a total cost of \$120,000. After processing in Department 1, 60% of the pounds are transferred to Department 2, and 40% of the pounds (now Gamma) are transferred to Department 3.
 - b. In **Department 2**, the material is further processed at a total additional cost of \$38,000. Then 70% of the pounds (now Alpha) are transferred to Department 4; and 30% emerge as Beta, the byproduct, to be sold at \$1.20 per pound. Separable marketing costs for Beta are \$8,100.

HDF, 12ed, Problem 16-31, Harrison Corp. - Forts.

- c. In **Department 4**, Alpha is processed at a total additional cost of \$23,660. After this processing. Alpha is ready for sale at \$5 per pound.
- d. In **Department 3**, Gamma is processed at a total additional cost of \$165,000. In this department, a normal loss of Gamma occurs, which equals 10% of the good pounds of output. The remaining good pounds of output are then sold for \$12 per pound.

HDF, 12ed, Problem 16-31, Harrison Corp. - Forts.

❖ Required

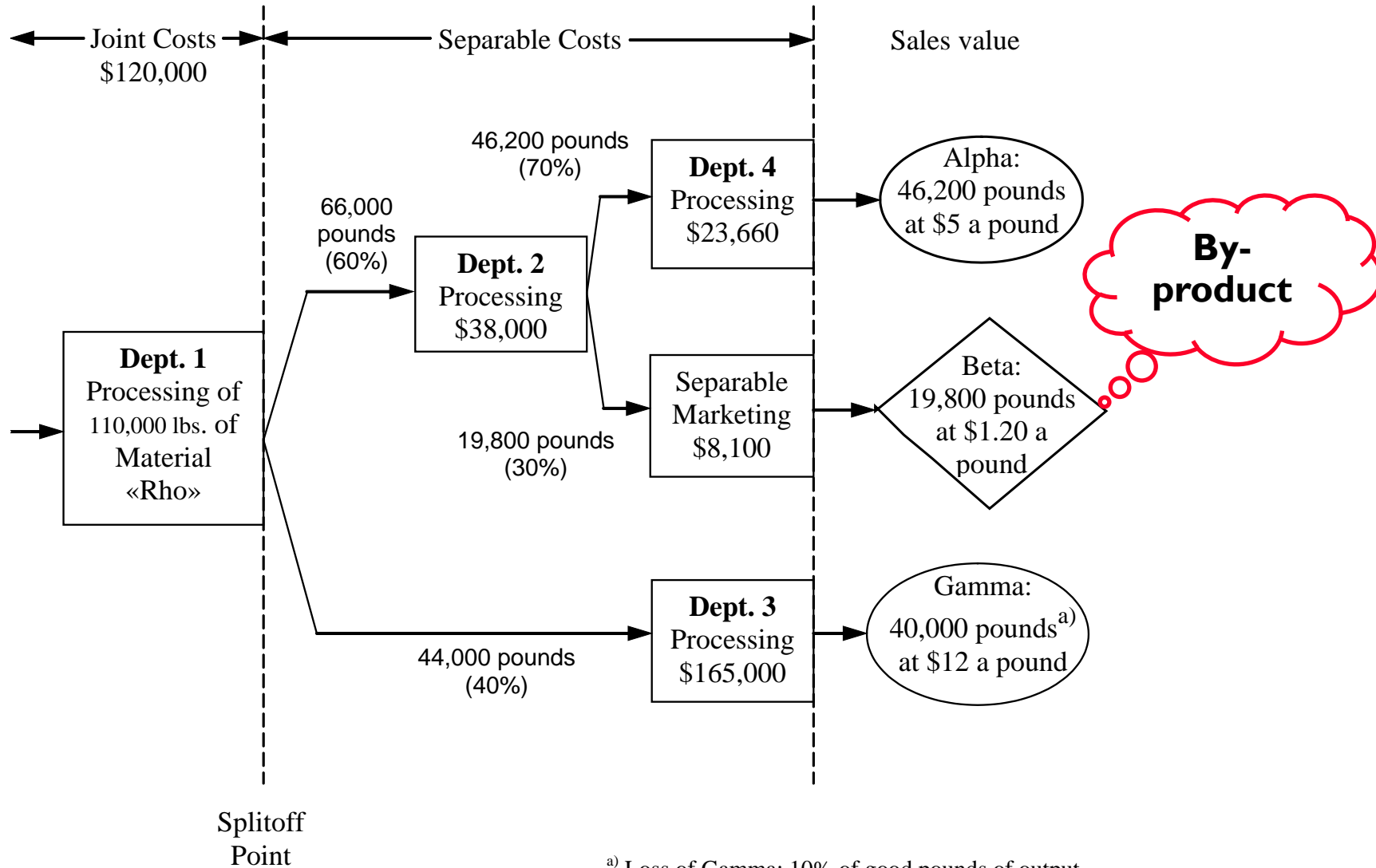
1. Prepare a schedule showing the allocation of the \$120,000 joint costs between Alpha and Gamma using the NRV method. **The NRV of Beta should be treated as an addition to the sales value of Alpha.**
2. Independent of your answer to requirement 1, assume that \$102,000 of total joint costs were appropriately allocated to Alpha. Assume also that there were 48,000 pounds of Alpha and 20,000 pounds of Beta available to sell. Prepare an income statement through the gross-margin line item for Alpha using the following facts:
 - a. During the year, sales of Alpha were 80% of the pounds available for sale. There was no beginning inventory.
 - b. **The NRV of Beta available for sale is to be deducted from the cost of producing Alpha.** The ending inventory of Alpha is to be based on the net costs of production.
 - c. All other cost and selling-price data are listed in a. through d. in the text of the case.

joint-cost
allocation
using NRV

Accounting
for
byproducts:
Production
Method

HDF, 12ed, Problem 16-31, Harrison Corp.

Lösungsvorschlag - Schematische Übersicht



^{a)} Loss of Gamma: 10% of good pounds of output

HDF, 12ed, Problem 16-31, Harrison Corp. Lösungsvorschlag für 1.

ALPHA

• Sales value of Alpha (joint product)	46'200	pounds @	5.00	231'000.00
• Sales value of Beta (byproduct)	19'800	pounds @	1.20	23'760.00
- Separable marketing costs of Beta				<u>-8'100.00</u>
= Net realizable value (NRV) of Beta				<u>15'660.00</u>
• Total Sales value of total production				246'660.00
• - Separable processing costs Dept. 2				-38'000.00
- Separable processing costs Dept. 4				<u>-23'660.00</u>
= Total separable costs of Alpha				<u>-61'660.00</u>
• NET REALIZABLE VALUE (NRV) of Alpha AT SPLITOFF POINT				<u><u>185'000.00</u></u>

GAMMA

• Sales value of Gamma (joint product)	40'000	pounds @	12.00	480'000.00
• - Separable processing costs Dept. 3				<u>-165'000.00</u>
• NET REALIZABLE VALUE (NRV) of Gamma AT SPLITOFF POINT				<u><u>315'000.00</u></u>

HDF, 12ed, Problem 16-31, Harrison Corp. Lösungsvorschlag für 1. - Forts.

Allocation of joint costs between Alpha and Gamma using the NRV method

	NRV at Splitoff	Weighting	Allocation of Joint Costs
Alpha	185'000.00	37.0%	-44'400.00
Gamma	<u>315'000.00</u>	<u>63.0%</u>	<u>-75'600.00</u>
Total	500'000.00	100.0%	-120'000.00

HDF, 12ed, Problem 16-31, Harrison Corp.

Lösungsvorschlag für 2.

80% von 48'000 pounds

\$1.20 · 20'000 pounds
available for sale minus
\$8'100 marketing costs

Income Statement through Gross Margin of ALPHA

• Revenues (80% of Alpha available for sale)	38'400 pounds @	5.00	192'000.00	100%
• Cost of Goods Sold (COGS)				
- Allocated joint costs		-102'000.00		
- Separable processing costs Dept. 2		-38'000.00		
- Separable processing costs Dept. 4		-23'660.00		
= Total cost of production of Alpha			-163'660.00	
+ Net realizable value (NRV) of Beta	20'000 pounds @		15'900.00	
= Total cost of production, net			-147'760.00	
+ Increase in ending inventory	9'600 pounds @	-3.07833	29'552.00	
= COGS			-118'208.00	61.6%
• GROSS MARGIN			73'792.00	38.4%

an Lager Beta

20% of 48'000 pound
available for sale

147'760 / 48'000 pounds