

**Problem 8-16**

**Goal:** Determine discounted cash flow rate of return and net present worth

Given:	Batch	Continuous
Fixed Capital Investment	\$20,000	\$30,000
Annual Cash Flow, \$/yr	\$5,600	\$7,650
Project Life	10	years
Discount rate	10%	

**Approach:** check PW & DCFROI values by both tabulating and using *Excel* NPV & IRR functions

Since both systems exceed minimum acceptable rate of return, compare with incremental investment

**Calculations:** **Batch System** 0.249915 IRR

Year	Cash Flow	PW Factor	Present Worth at 10%	PW at IRR
0	(\$20,000)	1.00000	(\$20,000.00)	(\$20,000.00)
1	\$5,600	1.10000	\$5,090.91	\$4,480.30
2	\$5,600	1.21000	\$4,628.10	\$3,584.49
3	\$5,600	1.33100	\$4,207.36	\$2,867.78
4	\$5,600	1.46410	\$3,824.88	\$2,294.38
5	\$5,600	1.61051	\$3,477.16	\$1,835.63
6	\$5,600	1.77156	\$3,161.05	\$1,468.61
7	\$5,600	1.94872	\$2,873.69	\$1,174.96
8	\$5,600	2.14359	\$2,612.44	\$940.04
9	\$5,600	2.35795	\$2,374.95	\$752.08
10	\$5,600	2.59374	\$2,159.04	\$601.70

**Answer a)** **Net Present Worth** \$14,410 **\$14,410** **IRR** **24.99%** **(\$0.02)**

Year	Cash Flow	PW Factor	Present Worth at 10%	PW at IRR	Present Worth
0	(\$30,000)	1.00000	(\$30,000.00)	(\$30,000.00)	
1	\$7,650	1.10000	\$6,954.55	\$6,269.84	
2	\$7,650	1.21000	\$6,322.31	\$5,138.68	
3	\$7,650	1.33100	\$5,747.56	\$4,211.59	
4	\$7,650	1.46410	\$5,225.05	\$3,451.77	
5	\$7,650	1.61051	\$4,750.05	\$2,829.02	
6	\$7,650	1.77156	\$4,318.23	\$2,318.63	
7	\$7,650	1.94872	\$3,925.66	\$1,900.32	
8	\$7,650	2.14359	\$3,568.78	\$1,557.48	
9	\$7,650	2.35795	\$3,244.35	\$1,276.49	
10	\$7,650	2.59374	\$2,949.41	\$1,046.19	

**Answer b)** **Net Present Worth** \$17,006 **\$17,006** **IRR** **22.01%** **(\$0.01)**

Year	Cash Flow	PW Factor	Present Worth at 10%	PW at IRR	Present Worth
0	(\$10,000)	1.00000	(\$10,000.00)	(\$10,000.00)	
1	\$2,050	1.10000	\$1,863.64	\$1,771.02	
2	\$2,050	1.21000	\$1,694.21	\$1,530.00	
3	\$2,050	1.33100	\$1,540.20	\$1,321.78	
4	\$2,050	1.46410	\$1,400.18	\$1,141.90	
5	\$2,050	1.61051	\$1,272.89	\$986.50	
6	\$2,050	1.77156	\$1,157.17	\$852.25	
7	\$2,050	1.94872	\$1,051.97	\$736.26	
8	\$2,050	2.14359	\$956.34	\$636.07	
9	\$2,050	2.35795	\$869.40	\$549.50	
10	\$2,050	2.59374	\$790.36	\$474.72	

**Answer c)** **Net Present Worth** \$2,048 **\$2,596** **IRR** **15.75%** **(\$0.01)**

Additional \$10,000 investment in continuous system produces additional \$2,050/yr return  
 This produces a POSITIVE Net Present Worth at 10% MARR and means Continuous is acceptable  
 Additional investment produces 15.75% Discounted Cash Flow Rate of Return which exceeds MARR

**Final Answer** **Recommend CONTINUOUS SYSTEM**