Drill Time-Study - Drill Cost Analysis Workshop - Bill Hissem

QUARRY ACADEMY

Drilling & Blasting

- **Drilling and blasting are all about putting the right amount of energy in the right place at the right time at minimum cost to achieve *maximum control* over the shot rock volume and the resulting particle size distribution in the muck pile.**

QUARRY ACADEMY

Drilling & Blasting

QUARRY ACADEMY

Drilling & Blasting

QUARRY ACADEMY

"Optimality Zone"

+

Optimum

Total Cost

-

-

"What happens in the pit, stays in the pit."

"What happens in the plant, stays in the plant."

$

$

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Drilling & Blasting

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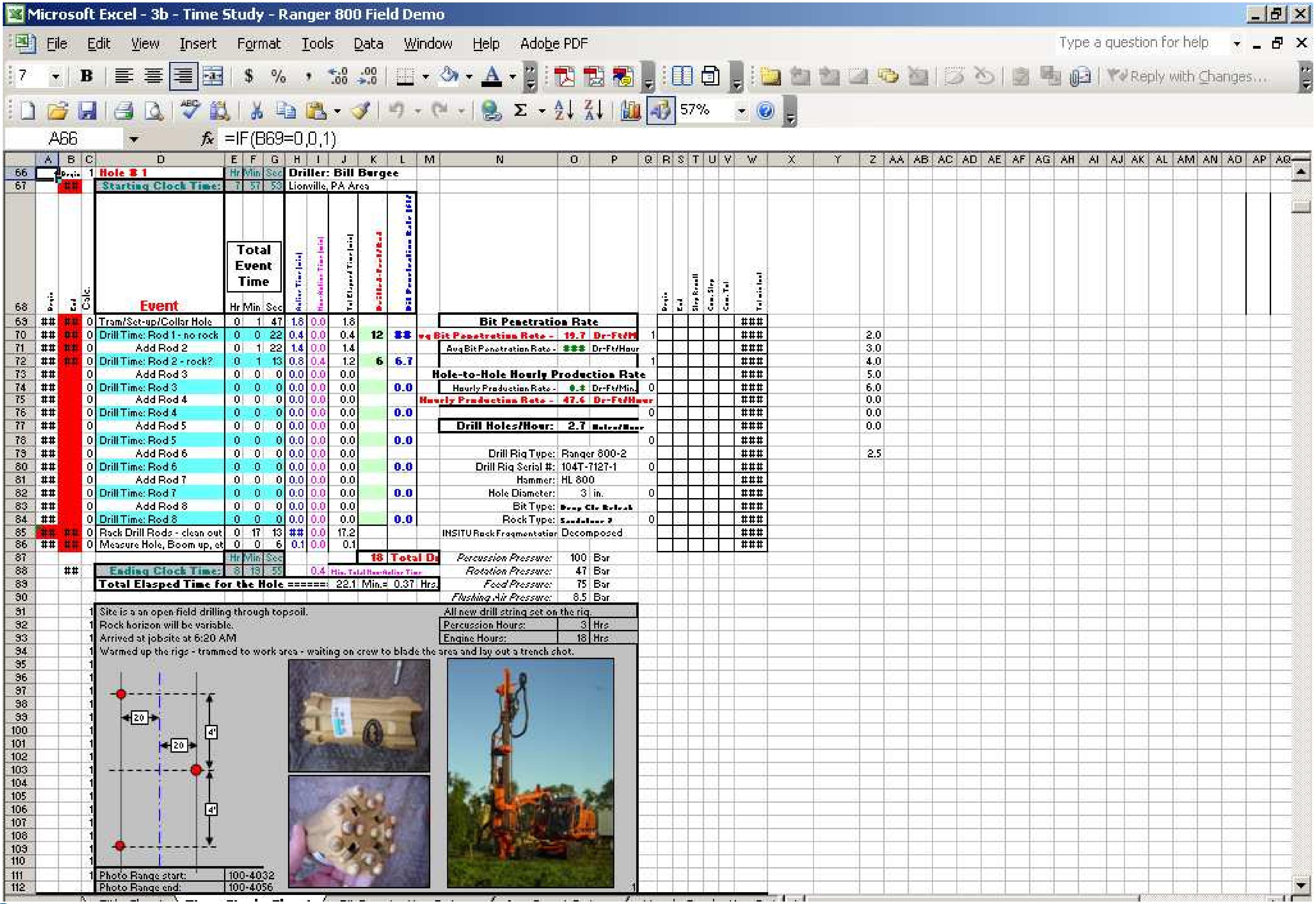
Drill Time-Study



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Microsoft Excel - 3b - Time Study - Ranger 800 Field Demo

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Type a question for help

Reply with Changes...

100%

A66 =IF(B69=0,0,1)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
66	1	Begin	1	**Hole # 1**	Hr	Min	Sec	**Driller: Bill Burgee**															
67		###		**Starting Clock Time:**	7	57	53	Lionville, PA Area															
68	Begin	End	Calc.	**Event**	**Total Event Time** Hr	Min	Sec	Active Time (min)	Non-Active Time (min)	Tot Elapsed Time (min)	Drilled-Feet/Rod	Bit Penetration Rate (ft/min)						Begin	End	Step Result	Cum. Step	Cum. Tot	
69	###	###	0	Tram/Set-up/Collar Hole	0	1	47	1.8	0.0	1.8				**Bit Penetration Rate**									0.0
70	###	###	0	Drill Time: Rod 1 - no rock	0	0	22	0.4	0.0	0.4	12	32.7		**Avg Bit Penetration Rate =**	**19.7**	**Dr-Ft/Min.**	1						0.0
71	###	###	0	Add Rod 2	0	1	22	1.4	0.0	1.4				Avg Bit Penetration Rate =	**1183.9**	Dr-Ft/Hour							
72	###	###	0	Drill Time: Rod 2 - rock?	0	1	13	0.8	0.4	1.2	5.5	6.7					1						0.0
73	###		0	Add Rod 3	0	0	0	0.0	0.0	0.0				**Hole-to-Hole Hourly Production Rate**									
74	###		0	Drill Time: Rod 3	0	0	0	0.0	0.0	0.0		0.0		Hourly Production Rate =	**0.8**	Dr-Ft/Min.	0						0.0
75	###		0	Add Rod 4	0	0	0	0.0	0.0	0.0				**Hourly Production Rate =**	**47.6**	**Dr-Ft/Hour**							
76	###		0	Drill Time: Rod 4	0	0	0	0.0	0.0	0.0		0.0					0						0.0
77	###		0	Add Rod 5	0	0	0	0.0	0.0	0.0				**Drill Holes/Hour:**	**2.7**	**Holes/Hour**							
78	###		0	Drill Time: Rod 5	0	0	0	0.0	0.0	0.0		0.0					0						0.0
79	###		0	Add Rod 6	0	0	0	0.0	0.0	0.0				Drill Rig Type:	Ranger 800-2								0.0
80	###		0	Drill Time: Rod 6	0	0	0	0.0	0.0	0.0		0.0		Drill Rig Serial #:	104T-7127-1		0						0.0
81	###		0	Add Rod 7	0	0	0	0.0	0.0	0.0				Hammer:	HL 800								0.0
82	###		0	Drill Time: Rod 7	0	0	0	0.0	0.0	0.0		0.0		Hole Diameter:	3	in.	0						0.0
83	###		0	Add Rod 8	0	0	0	0.0	0.0	0.0				Bit Type:	**Drop Ctr Retrak**								0.0
84	###		0	Drill Time: Rod 8	0	0	0	0.0	0.0	0.0		0.0		Rock Type:	**Sandstone ?**		0						0.0
85	###	###	0	Rack Drill Rods - clean out ho	0	17	13	17.2	0.0	17.2				INSITU Rock Fragmentation:	Decomposed								0.0
86	###	###	0	Measure Hole, Boom up, etc.	0	0	6	0.1	0.0	0.1													0.0
87					Hr	Min	Sec				17.5	Total Dr-Ft		*Percussion Pressure:*	100	Bar							
88		###		**Ending Clock Time:**	8	19	55		0.4	Min. Total Non-Active Time				*Rotation Pressure:*	47	Bar							

Title Sheet | Time Study Sheet | Bit Penetration Rates | Avg Penet Rates | Hourly Production Rat

Draw AutoShapes

Ready

Start | Prgm Sch for QA2007 - V5 | 3b - Time Study - Ran... | Files from W Hissem | QA PP Template - V5 | 7:46 PM

Microsoft Excel - 3b - Time Study - Ranger 800 Field Demo

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84	###		0	Drill Time: Rod 8	0	0	0	0.0	0.0	0.0		0.0		Rock Type:	Sandstone ?		0							0.0
85	###	###	0	Rack Drill Rods - clean out ho	0	17	13	17.2	0.0	17.2				INSITU Rock Fragmentation:	Decomposed									0.0
86	###	###	0	Measure Hole, Boom up, etc.	0	0	6	0.1	0.0	0.1														0.0
87					Hr	Min	Sec				17.5	Total Dr-Ft		*Percussion Pressure:*	100	Bar								
88		###		Ending Clock Time:	8	19	55		0.4	Min. Total Non-Active Time				*Rotation Pressure:*	47	Bar								
89				**Total Elasped Time for the Hole ==========>**						22.1	Min.=	0.37	Hrs.	*Feed Pressure:*	75	Bar								
90														*Flushing Air Pressure:*	8.5	Bar								
91			1	Site is a an open field drilling through topsoil.										All new drill string set on the rig.										
92			1	Rock horizon will be variable.										Percussion Hours:	3	Hrs								
93			1	Arrived at jobsite at 6:20 AM										Engine Hours:	18	Hrs								
94			1	Warmed up the rigs - trammed to work area - waiting on crew to blade the area and lay out a trench shot.																					
95			1																					
96			1																					
97			1																					
98			1																					
99			1																					
100			1																					
101			1																					
102			1																					
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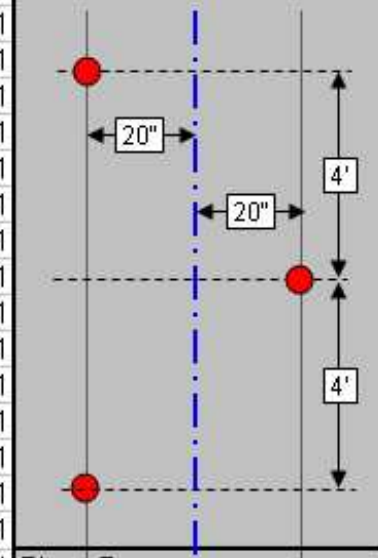
105			1																					
106			1																					
107			1																					
108			1																					
109			1																					
110			1																					
111			1	Photo Range start:	100-4032																			
112				Photo Range end:	100-4056																			
113	1	Begin	2	**Hole # 2**	Hr	Min	Sec							**Driller: Bill Burgee**										
114		###		Starting Clock Time:	8	19	55							**Lionville, PA Area**										



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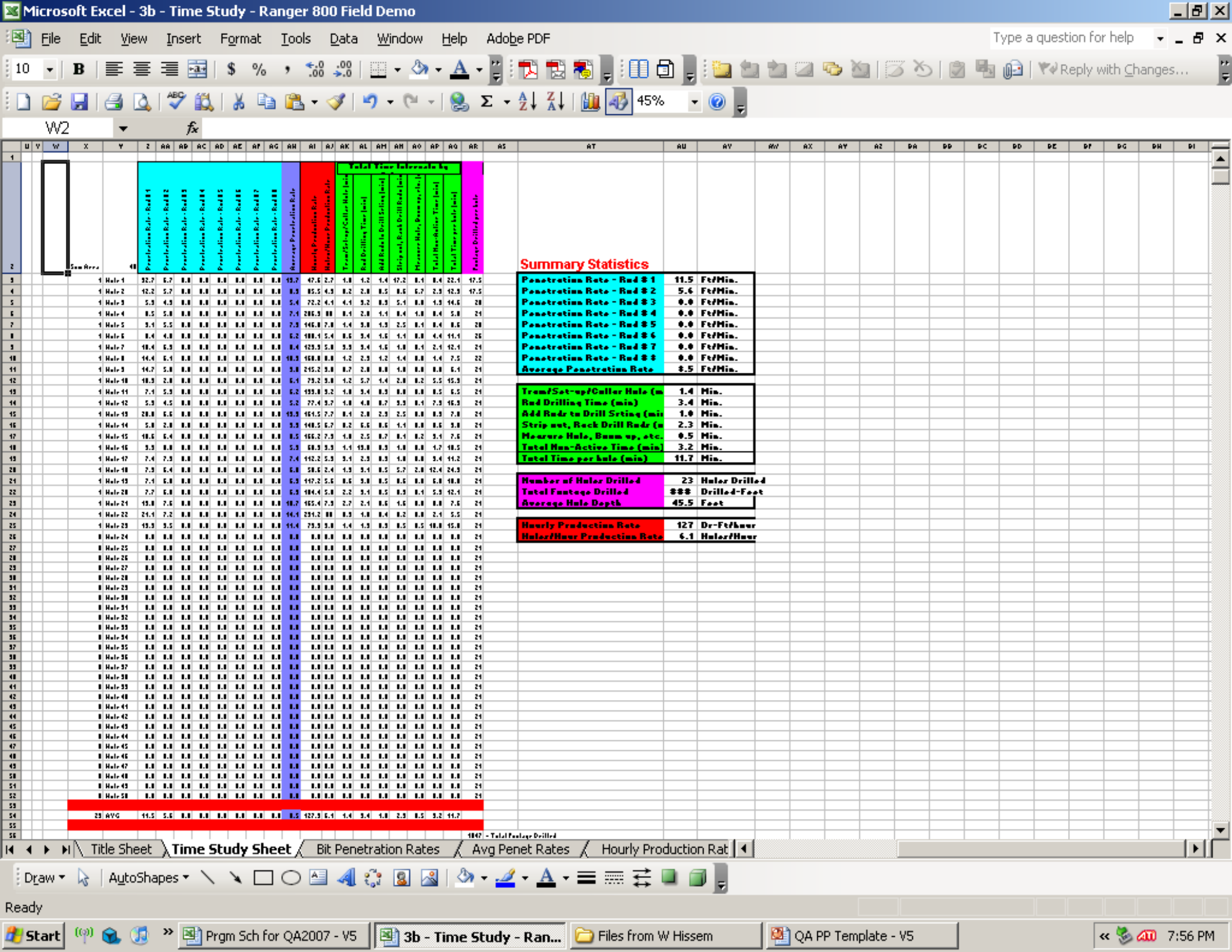
Title Sheet | Time Study Sheet | Bit Penetration Rates | Avg Penet Rates | Hourly Production Rat

Draw AutoShapes

Ready

Start | Prgm Sch for QA2007 - V5 | 3b - Time Study - Ran... | Files from W Hissem | QA PP Template - V5 | 7:47 PM


Microsoft Excel - 3b - Time Study - Ranger 800 Field Demo
File Edit View Insert Format Tools Data Window Help Adobe PDF
Type a question for help
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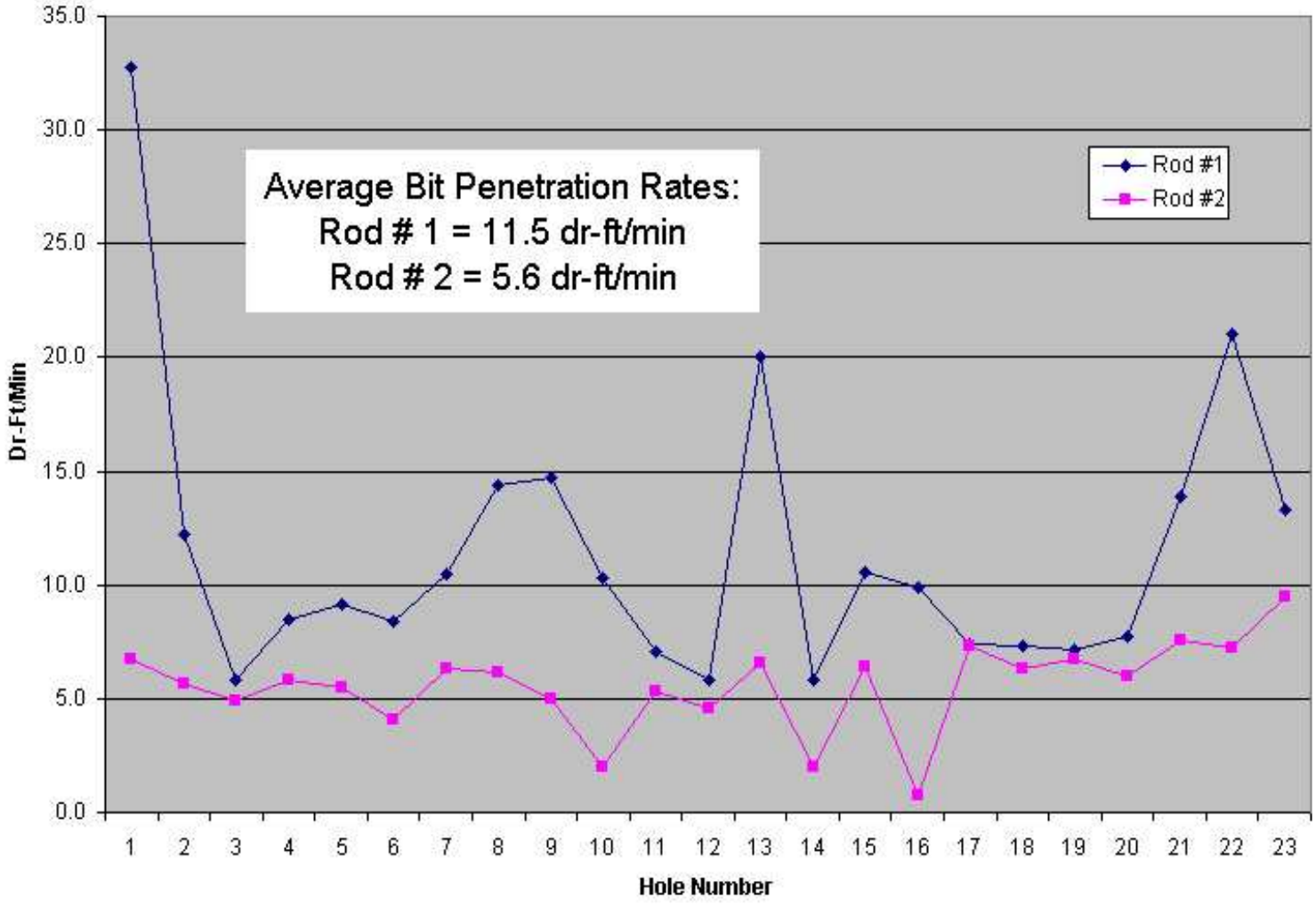
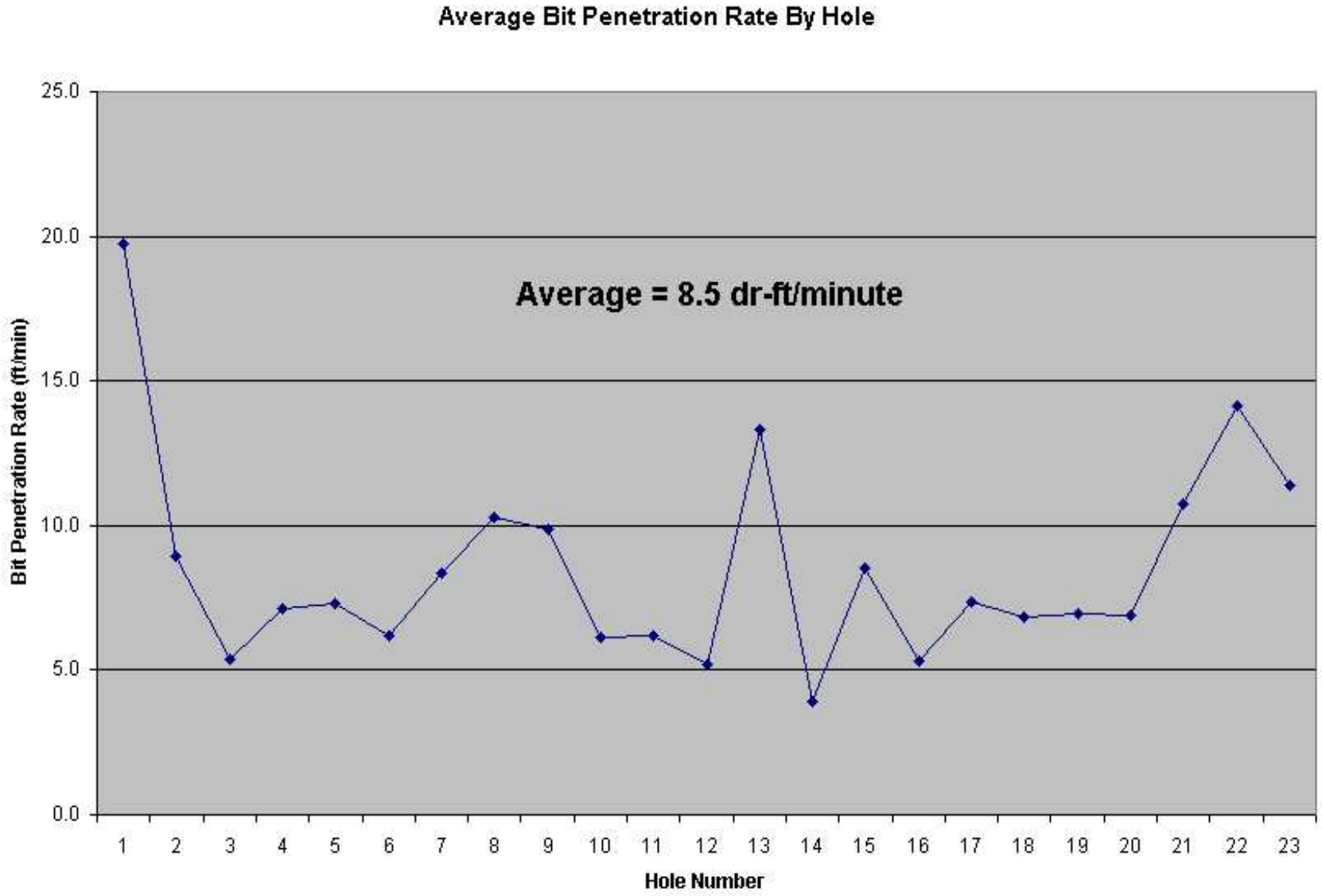
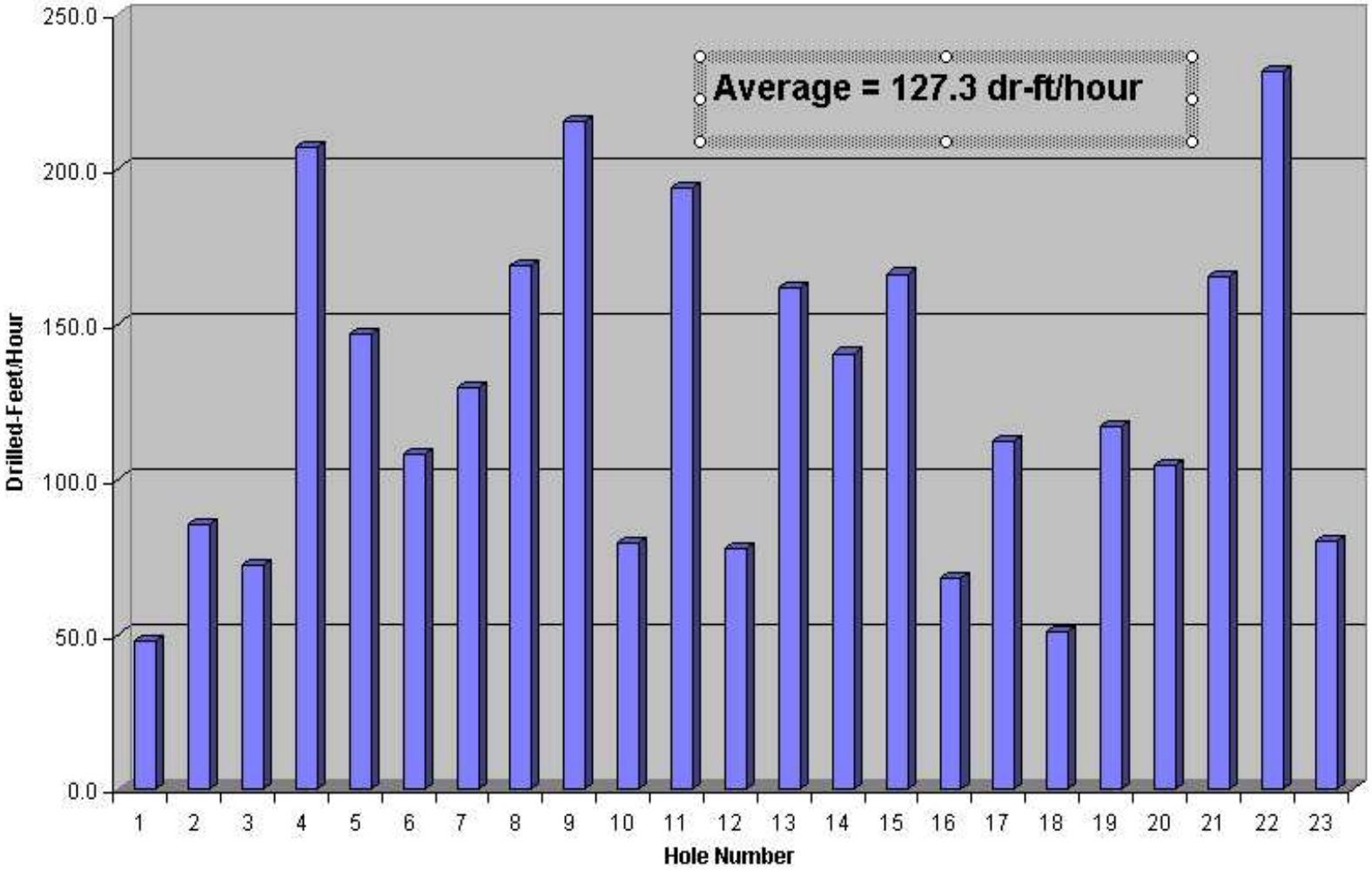
W2
Summary Statistics
Penetration Rate - Rod # 1 11.5 Ft/Min.
Penetration Rate - Rod # 2 5.6 Ft/Min.
Penetration Rate - Rod # 3 0.0 Ft/Min.
Penetration Rate - Rod # 4 0.0 Ft/Min.
Penetration Rate - Rod # 5 0.0 Ft/Min.
Penetration Rate - Rod # 6 0.0 Ft/Min.
Penetration Rate - Rod # 7 0.0 Ft/Min.
Penetration Rate - Rod # 8 0.0 Ft/Min.
Average Penetration Rate 8.5 Ft/Min.
Tram/Set-up/Caller Hole (m 1.4 Min.
Rod Drilling Time (min) 3.4 Min.
Add Rods to Drill String (mi 1.0 Min.
Strip out, Rock Drill Rods (m 2.3 Min.
Measure Hole, Boom up, etc. 0.5 Min.
Total Non-Active Time (min) 3.2 Min.
Total Time per hole (min) 11.7 Min.
Number of Holes Drilled 23 Holes Drilled
Total Footage Drilled 888 Drilled-Feet
Average Hole Depth 45.5 Feet
Hourly Production Rate 127 Dr-Ft/hour
Holes/Hour Production Rate 6.1 Holes/Hour
Title Sheet
Time Study Sheet
Bit Penetration Rates
Avg Penet Rates
Hourly Production Rat
Draw
AutoShapes
Ready
Start
Prgm Sch for QA2007 - V5
3b - Time Study - Ran...
Files from W Hissem
QA PP Template - V5
7:56 PM

Bit Penetration Rate





Hourly Production Cycle Rate By Hole

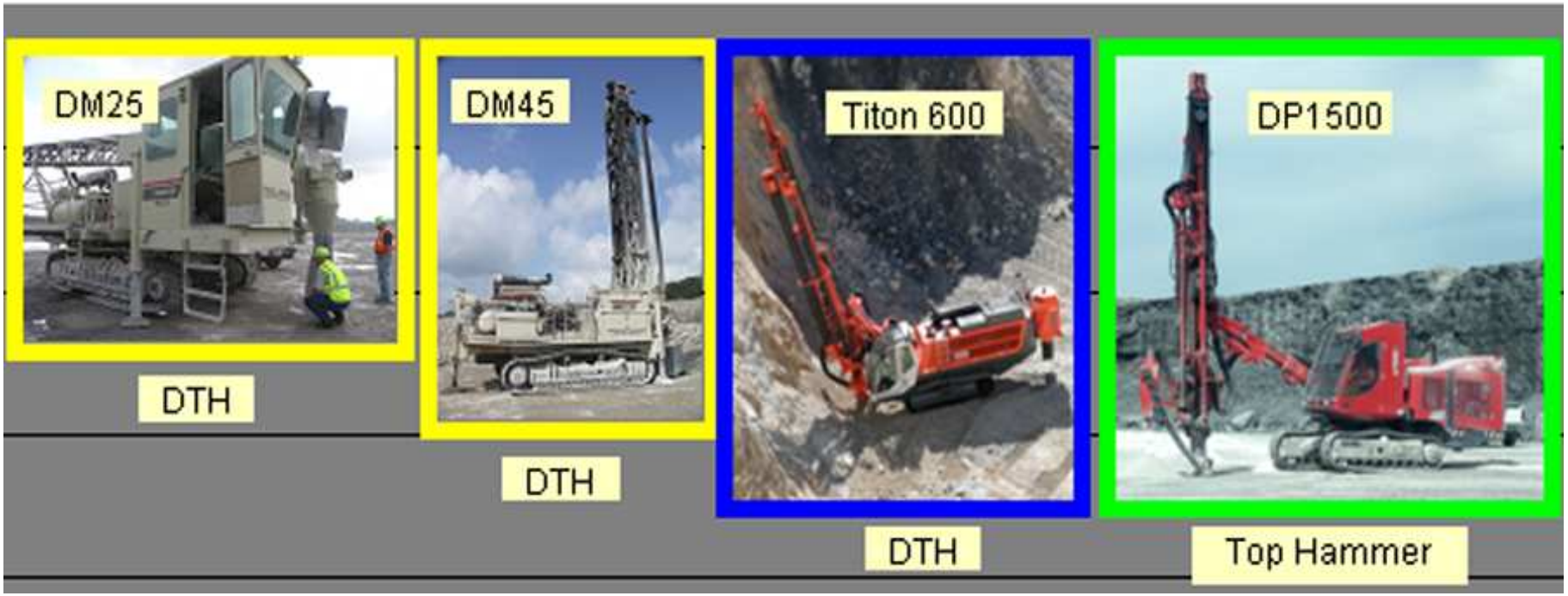


CHA 800 Time Activity Distribution

Drill Cost Analysis

How do you compare different rigs and hole sizes for:

- Economy
- Productivity



Sandvik Drill Cost Analysis

Multiple Sceanrio Input Matrix

Case Number
Drill Rig Type
Drifter Type
Feed Length
Feed/Collar Clearance
Number Of Drillers Per Rig
Rock Characteristics:
Mineralogy Of The Rock Type
Uniaxial Compressive Strength
Specific Gravity Of Rock
Specific Gravity Of Explosivies
Degree Of Fracturization

Sandvik Drill Cost Analysis

Multiple Sceanrio Input Matrix

Drill Rate Index:
Drill Rig Performance:
Addition Time per Rod (SEC)
Racking Time/Rod (SEC)
Collaring Time/Hole(Min)
Move & Set-up Time/Hole(MIN)
Back Hammering (%Perc. Time)
Net Penetration Rate (Dr-ft/Min)
Gross Production Cycle Rate
Operational Parameters:
Bench Height
Sub-Drilling
Stemming

Sandvik Drill Cost Analysis

Multiple Sceanrio Input Matrix

Burden
Spacing
Presplit Holes/Shot
Blast Holes/Shot
Total Holes/Shot
Average Hours Per Shift
Shifts Per Day
Days Per Week
Weeks Per Year
Calc Downtime

Sandvik Drill Cost Analysis
Multiple Sceanrio Input Matrix

Calc Downtime
Schduled Down Time per Shift:
For Fueling & Maintenance
For Breaks and Lunch
Site Tramming Time
Mechanical Availability
General Cost Parameters:
Capitol Cost Of Drill Rig Unit
% Financed
Principal Amount Financed
Finance Period
Annual Interest Rate
Type of Depreciation

Sandvik Drill Cost Analysis

Multiple Sceanrio Input Matrix

Term of Depreciation
Projected Salvage Value
Corporate Tax Rate
Operator Labor Cost
Fuel Consumption Rate
Fuel Cost
Annual Maint. Cost (Pts+Labor)
Drifter Cost
Drifters Required/Year/Rig

Sandvik Drill Cost Analysis

Multiple Sceanrio Input Matrix

Drill String Cost:
Rod/Pipe Type
Drill Rod/Drill Pipe Diameter
Drill Rod/Drill Pipe Length
Drill Rod/Drill Pipe Cost
Drill Rod/Drill Pipe Life
Top Drill Sub Cost
Top Drill Sub Life
Bottom Sub
Bottom Life

Sandvik Drill Cost Analysis

Multiple Sceanrio Input Matrix

Button Bit Diameter
Button Bit Cost
Button Bit Life
ANNUAL PRODUCTION REQUIRE
Tons/Year
Cubic-Yards/Year

1	2	3	4	5	6
4" Pipe	4" Pipe	4.5" Pipe	3.5" Pipe	87mm Tube	87mm Tube
DM 25 SP	DM 45	DI 600	DI 600	DP 1500	DP 1500
DTH Copco	DTH Copco	DTH Sandvik	DTH Sandvik	TH Sandvik	TH Sandvik

Drill Cost Variable/Scenario Matrix

Sandvik Drill Cost Analysis
Multiple Sceanrio Input Matrix

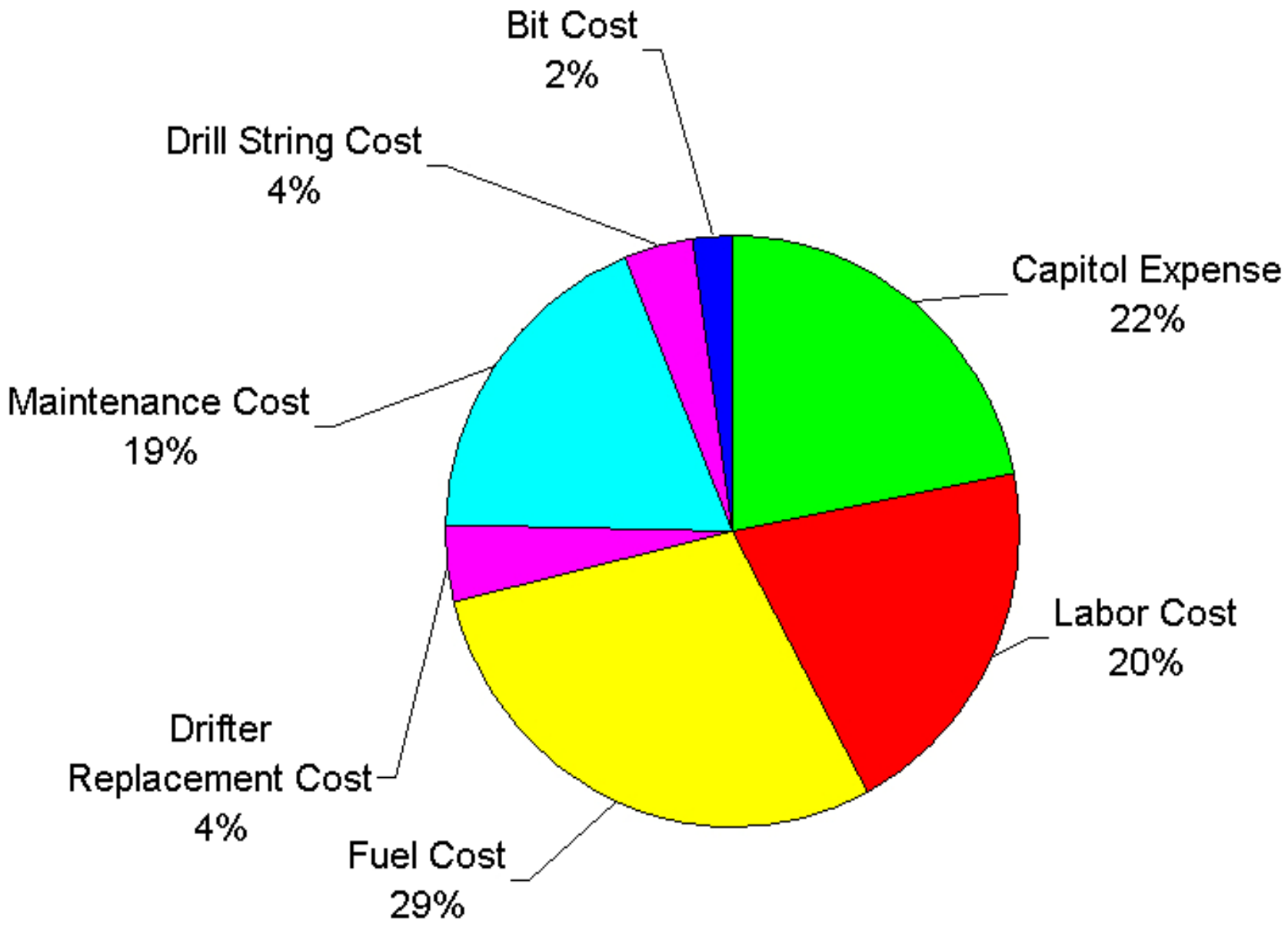
Case Number	1	2	3	4	5	6
	4" Pipe	4" Pipe	4.5" Pipe	3.5" Pipe	87mm Tube	87mm Tube
Drill Rig Type	DM 25 SP	DM 45	DI 600	DI 600	DP 1500	DP 1500
Drifter Type	DTH Copco	DTH Copco	DTH Sandvik	DTH Sandvik	TH Sandvik	TH Sandvik
Feed Length	55	34	20	20	14	14
Feed/Collar Clearance	3	3	2	2	1.5	1.5
Number Of Drillers Per Rig	1	1	1	1	1	1
Rock Characteristics:						
Mineralogy Of The Rock Type	Limestone	Limestone	Limestone	Limestone	Limestone	Limestone
Uniaxial Compressive Strength	20,000	20,000	20,000	20,000	20000	20000
Specific Gravity Of Rock	2.44	2.44	2.44	2.44	2.44	2.44
Specific Gravity Of Explosivies	1.25	1.25	1.25	1.25	1.25	1.25
Degree Of Fracturization	2.5	2.5	2.5	2.5	2.5	2.5
1) None....4) Heavy						
Drill Rate Index:	65	65	65	65	65	65
Drill Rig Performance:						
Addition Time per Rod (SEC)						
Racking Time/Rod (SEC)						
Collaring Time/Hole(Min)						
Move & Set-up Time/Hole(MIN)						
Back Hammering (%Perc. Time)						
Net Penetration Rate (Dr-ft/Min)	3.2	3.23	4	4	4.2	4.5
Gross Production Cycle Rate	(DERIVED)	(DERIVED)	(DERIVED)	(DERIVED)	(DERIVED)	(DERIVED)
Operational Parameters:						
Bench Height	37	37	37	37	37	37
Sub-Drilling	0	0	0	0	0	0
Stemming	5	5	5	5	5	5
Burden	14	14	14	13	14	13
Spacing	16	16	16	15	16	15
Presplit Holes/Shot	0	0	0	0	0	0
Blast Holes/Shot	116	116	116	116	116	116
Total Holes/Shot	116	116	116	116	116	116
Average Hours Per Shift	10	10	10	10	10	10
Shifts Per Day	1	1	1	1	1	1
Days Per Week	5	5	5	5	5	5
Weeks Per Year	39	39	39	39	39	39
Calc Downtime						
Schduled Down Time per Shift:	13.00%	16.00%	13.00%	13.00%	0.13	0.13
For Fueling & Maintenance	1.3	1.6	1.3	1.3	1.3	1.3
For Breaks and Lunch	0	0	0	0	0	0
Site Tramming Time	0	0	0	0	0	0
Mechanical Availability	96.00%	95.00%	95.00%	95.00%	95%	95%
General Cost Parameters:						
Capitol Cost Of Drill Rig Unit						
% Financed						
Principal Amount Financed						
Finance Period						
Annual Interest Rate						
Type of Depreciation						
Term of Depreciation						
Projected Salvage Value						
Corporate Tax Rate						
Operator Labor Cost	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Fuel Consumption Rate	12.1	17.6	17	17	14	14
Fuel Cost	$4.25	$4.25	$4.25	$4.25	$4.25	$4.25
Annual Maint. Cost (Pts+Labor)						
Drifter Cost						
Drifters Required/Year/Rig						
Drill String Cost:						
Rod/Pipe Type	Drill Pipe	Drill Pipe	Drill Pipe	Drill Pipe	Drill Rod	Drill Rod
Drill Rod/Drill Pipe Diameter	4.375	4.375	4.5	4.5	87mm	87mm
Drill Rod/Drill Pipe Length	55	30	20	20	14	14
Drill Rod/Drill Pipe Cost						
Drill Rod/Drill Pipe Life						
Top Drill Sub Cost						
Top Drill Sub Life						
Bottom Sub						
Bottom Life						
Button Bit Diameter						
Button Bit Cost						
Button Bit Life						
ANNUAL PRODUCTION REQUIRED						
Tons/Year	4,200,000	4,200,000	4,200,000	4,200,000	4,200,000	4,200,000
Cubic-Yards/Year	(SET)	(SET)	(SET)	(SET)	(SET)	(SET)

DM 25 SP	5.5 " Hole Diameter		Case ==> 1	
	10 Hours per shift			
@ Req. Production	$/Dr-Ft	$/Cu-Yd	$/Ton	% of Total
Capitol Expense				22%
Labor Cost				20%
Fuel Cost				29%
Drifter Replacement Cost				4%
Maintenance Cost				19%
Drill String Cost				4%
Bit Cost				2%
Total Drilling Cost:				100%

Number of Rigs Required:	1	DM 25 SP

Production:	Max/Rig	Absolute Req.	Req./Rig	% Util. of Rig/Fleet
Gross Drilled-Feet	251,191	246,477	246,477	
Net Cubic Yards	2,082,420	2,043,342	2,043,342	98.12%
Net Tons	4,280,323	4,200,000	4,200,000	

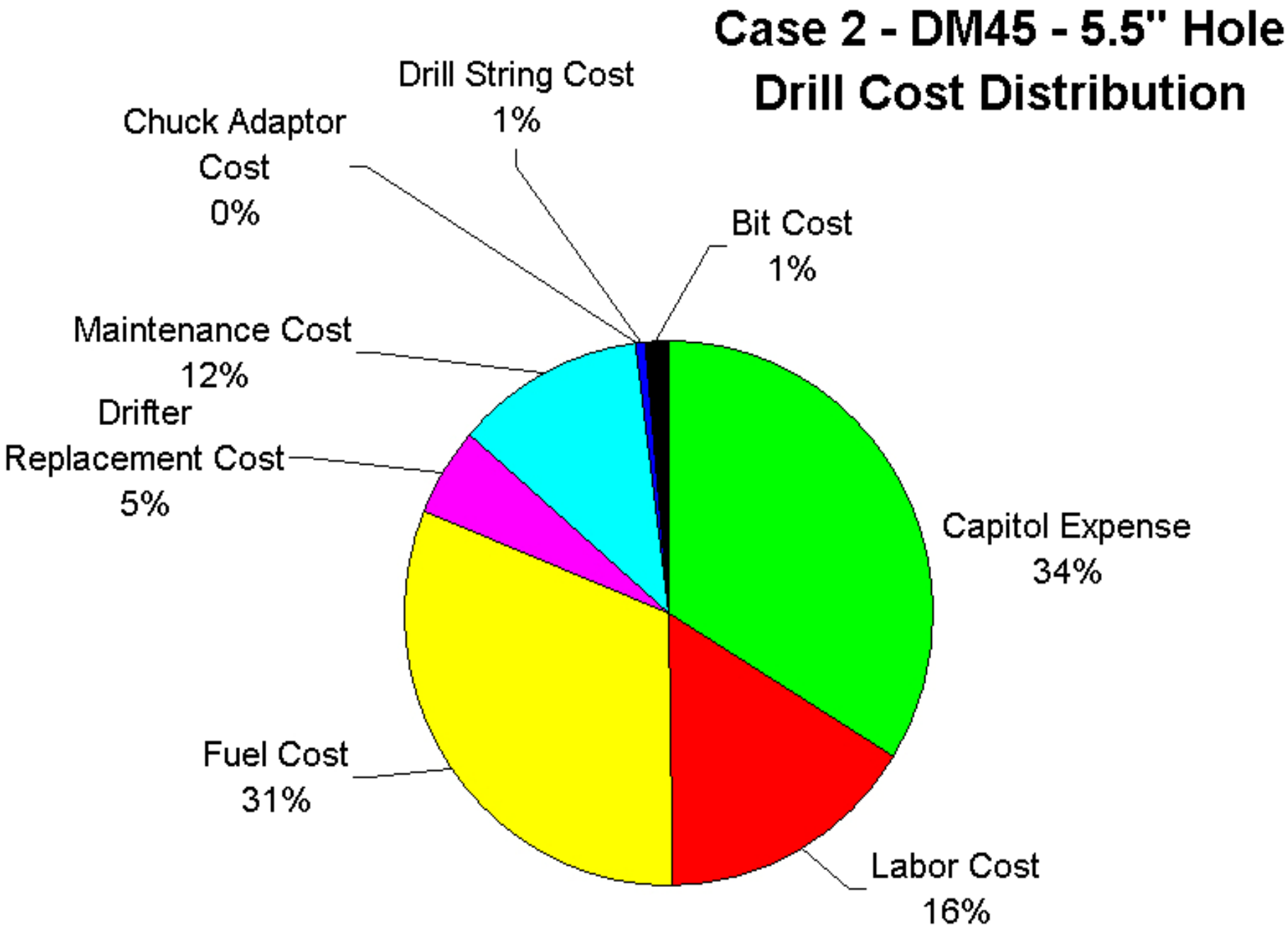
Case 1 - DM 25SP - 5.5" Hole
Drill Cost Distribution



DM 45	5.5 " Hole Diameter		Case ==> 2	
	10 Hours per shift			
@ Req. Production	$/Dr-Ft	$/Cu-Yd	$/Ton	% of Total
Capitol Expense				34%
Labor Cost				16%
Fuel Cost				31%
Drifter Replacement Cost				5%
Maintenance Cost				12%
Drill String Cost				1%
Bit Cost				1%
Total Drilling Cost:				100%

Number of Rigs Required:	2	DM 45

Production:	Max/Rig	Absolute Req.	Req./Rig	% Util. of Rig/Fleet
Gross Drilled-Feet	215,448	246,477	123,239	
Net Cubic Yards	1,786,106	2,043,342	1,021,671	57.20%
Net Tons	3,671,262	4,200,000	2,100,000	

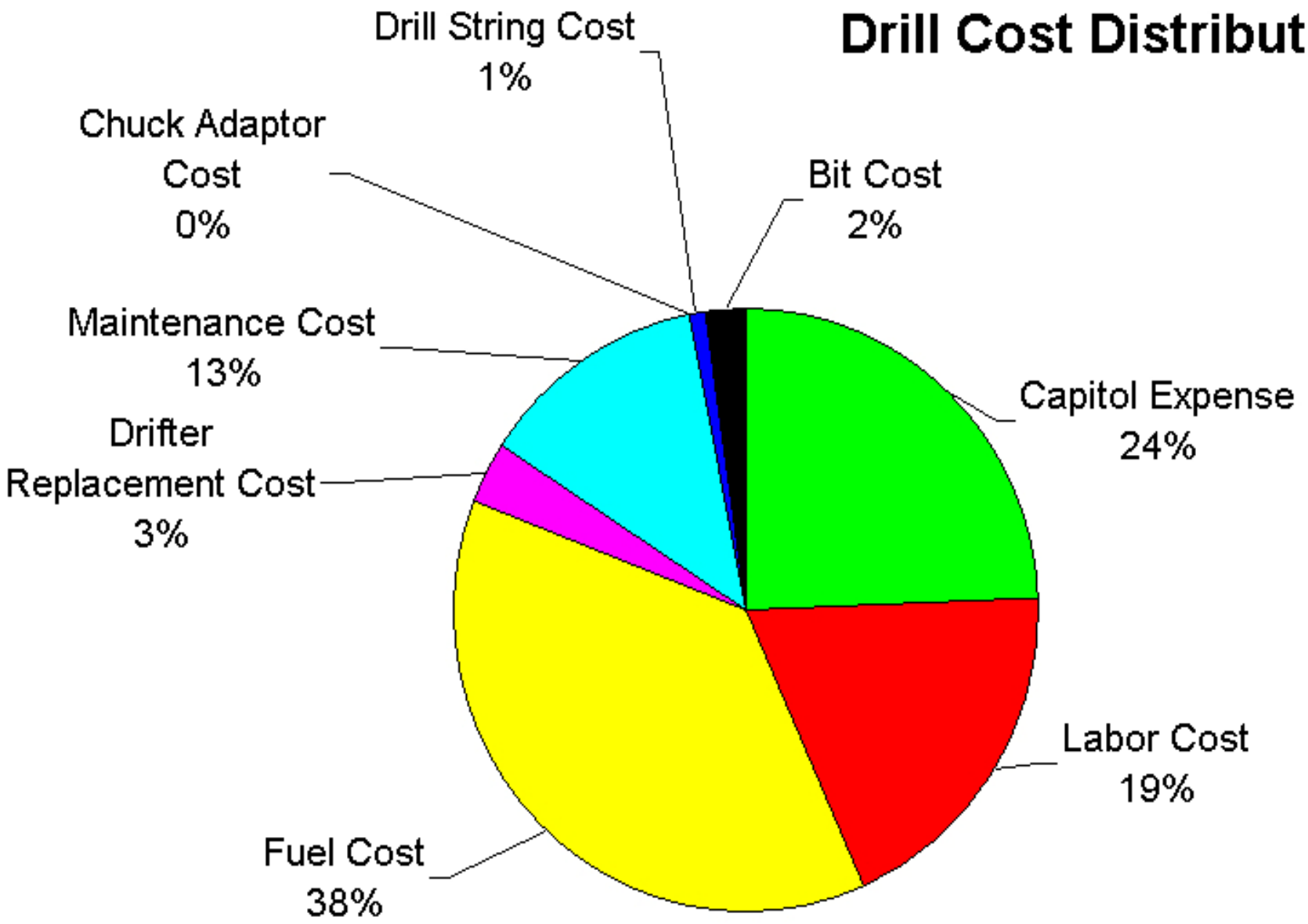

Case 2 - DM45 - 5.5" Hole
Drill Cost Distribution
Drill String Cost
1%
Chuck Adaptor
Cost
0%
Bit Cost
1%
Maintenance Cost
12%
Drifter
Replacement Cost
5%
Capitol Expense
34%
Fuel Cost
31%
Labor Cost
16%

DI 600	5.5 " Hole Diameter		Case ==> 3	
	10 Hours per shift			
@ Req. Production	$/Dr-Ft	$/Cu-Yd	$/Ton	% of Total
Capitol Expense				24%
Labor Cost				19%
Fuel Cost				38%
Drifter Replacement Cost				3%
Maintenance Cost				13%
Drill String Cost				1%
Bit Cost				2%
Total Drilling Cost:				100%

Number of Rigs Required:	1	DI 600

Production:	Max/Rig	Absolute Req.	Req./Rig	% Util. of Rig/Fleet
Gross Drilled-Feet	269,320	246,477	246,477	
Net Cubic Yards	2,232,714	2,043,342	2,043,342	91.52%
Net Tons	4,589,246	4,200,000	4,200,000	

Case 3 - DI600 - 5.5" Hole
Drill Cost Distribution

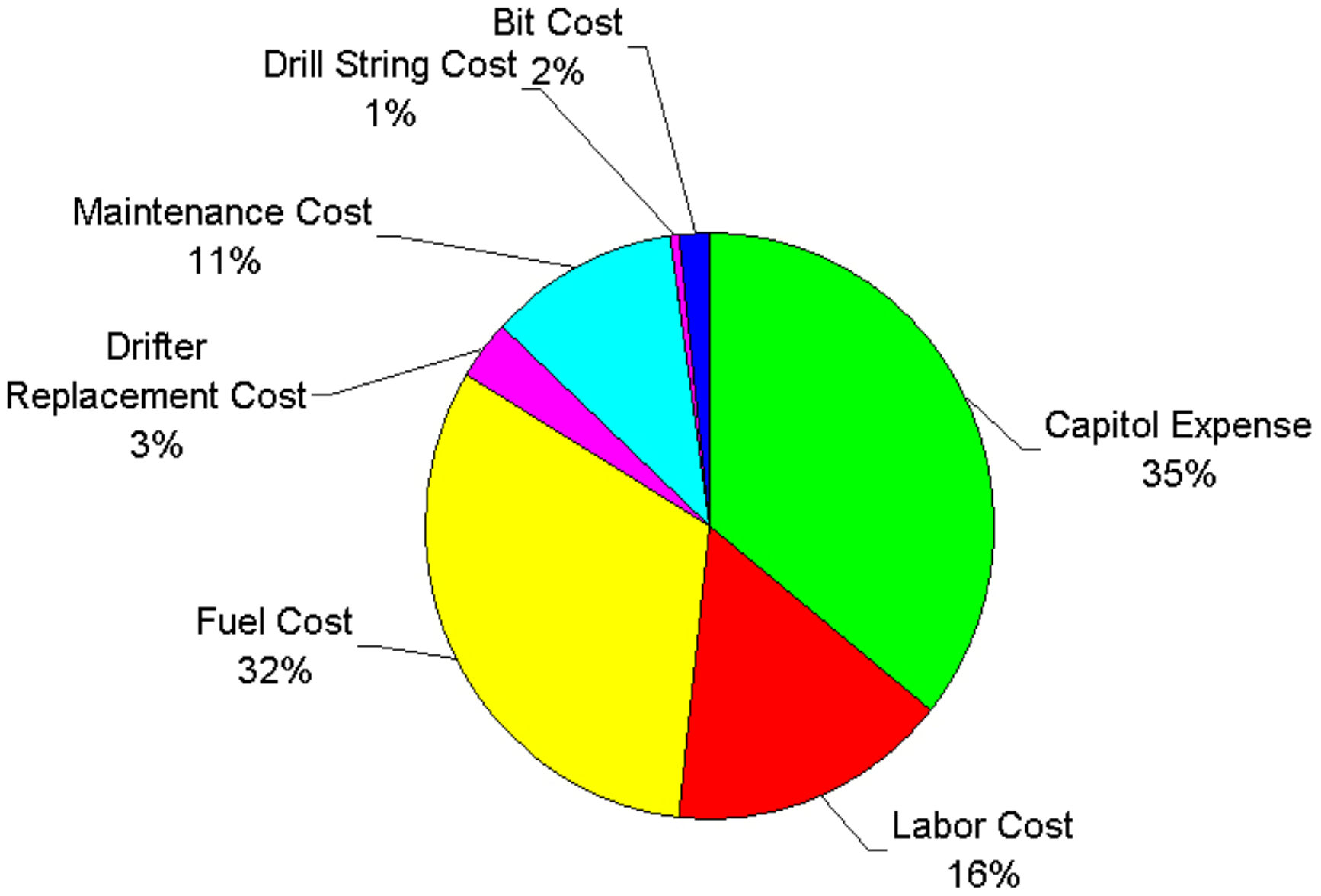


DI 600	5 " Hole Diameter		Case ==> 4	
	10 Hours per shift			
@ Req. Production	$/Dr-Ft	$/Cu-Yd	$/Ton	% of Total
Capitol Expense				36%
Labor Cost				16%
Fuel Cost				32%
Drifter Replacement Cost				3%
Maintenance Cost				11%
Drill String Cost				1%
Bit Cost				2%
Total Drilling Cost:				100%

Number of Rigs Required:	2	DI 600

Production:	Max/Rig	Absolute Req.	Req./Rig	% Util. of Rig/Fleet
Gross Drilled-Feet	269,320	283,122	141,561	
Net Cubic Yards	1,943,730	2,043,342	1,021,671	52.56%
Net Tons	3,995,252	4,200,000	2,100,000	

Case 4 - DI 600 - 5.0" Hole
Drill Cost Distribution

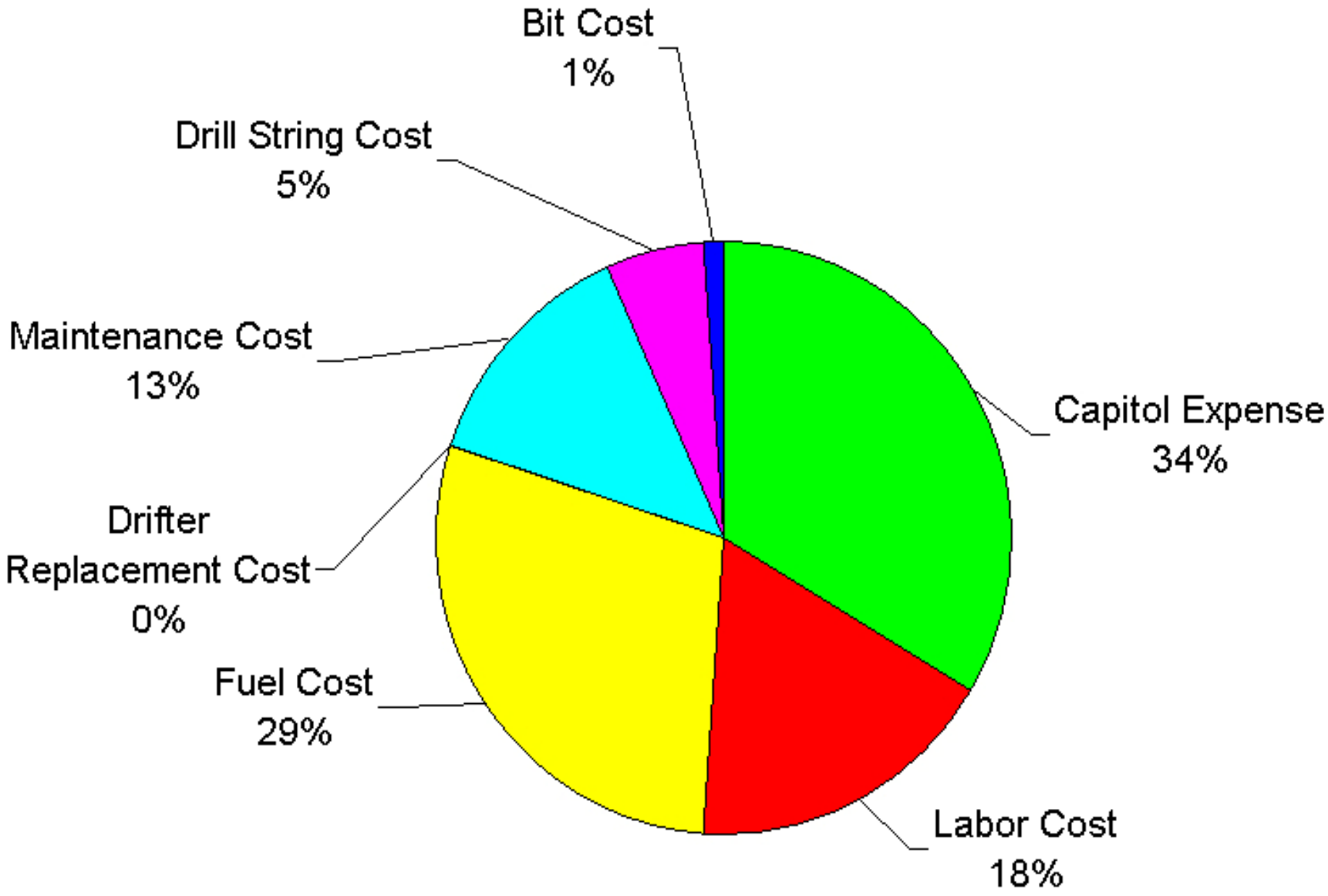


DP 1500	5.5 " Hole Diameter		Case ==> 5	
	10 Hours per shift			
@ Req. Production	$/Dr-Ft	$/Cu-Yd	$/Ton	% of Total
Capitol Expense				34%
Labor Cost				18%
Fuel Cost				29%
Drifter Replacement Cost				0%
Maintenance Cost				13%
Drill String Cost				5%
Bit Cost				1%
Total Drilling Cost:				100%

Number of Rigs Required:	2	DP 1500

Production:	Max/Rig	Absolute Req.	Req./Rig	% Util. of Rig/Fleet
Gross Drilled-Feet	245,303	246,477	123,239	
Net Cubic Yards	2,033,607	2,043,342	1,021,671	50.24%
Net Tons	4,179,989	4,200,000	2,100,000	

Case 5 - DP1500 - 5.5" Hole
Drill Cost Distribution

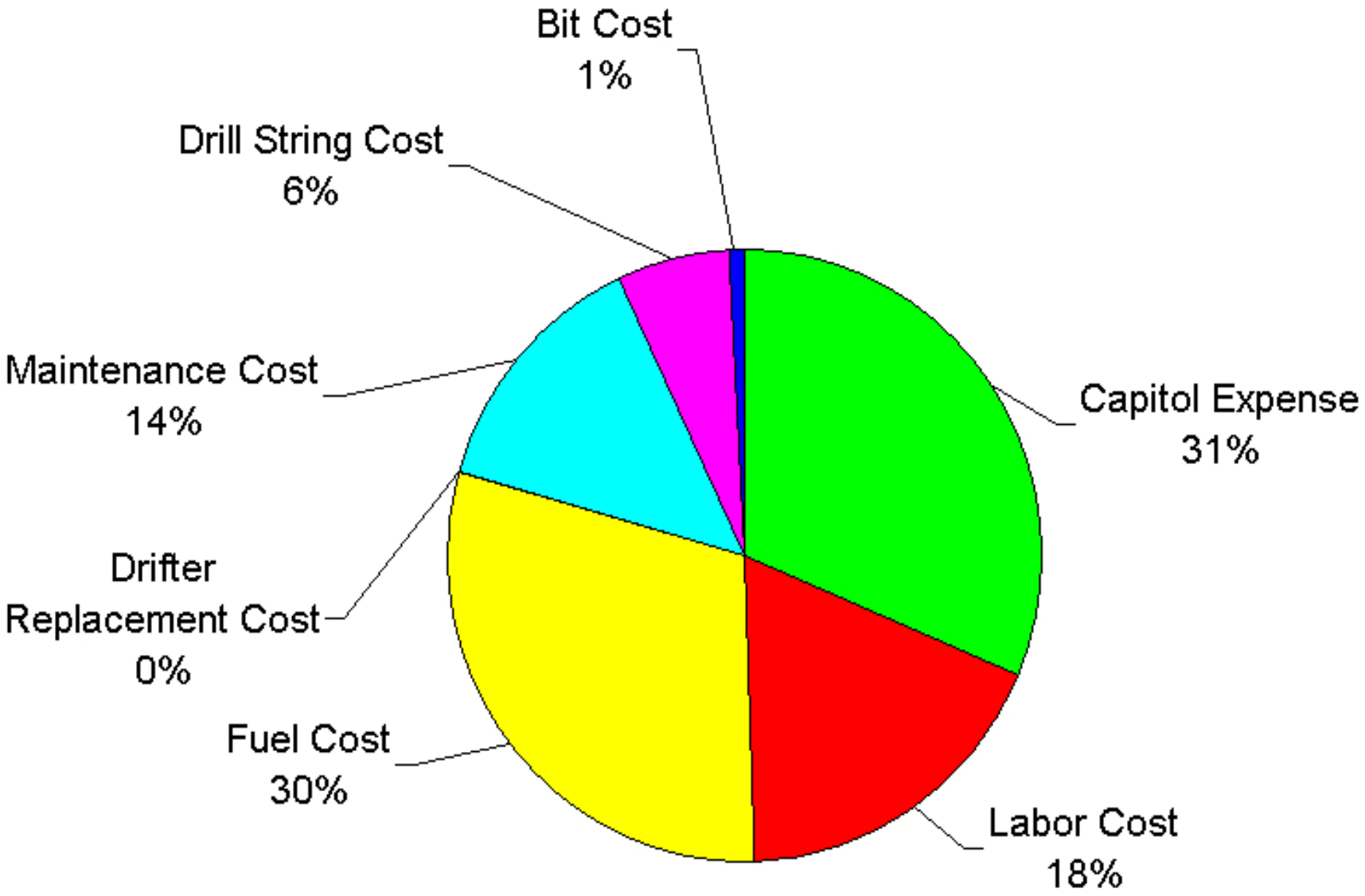


DP 1500	5 " Hole Diameter		Case ==> 6	
	10 Hours per shift			
@ Req. Production	$/Dr-Ft	$/Cu-Yd	$/Ton	% of Total
Capitol Expense				31%
Labor Cost				18%
Fuel Cost				30%
Drifter Replacement Cost				0%
Maintenance Cost				14%
Drill String Cost				6%
Bit Cost				1%
Total Drilling Cost:				100%

Number of Rigs Required:	2	DP 1500

Production:	Max/Rig	Absolute Req.	Req./Rig	% Util. of Rig/Fleet
Gross Drilled-Feet	255,809	283,122	141,561	
Net Cubic Yards	1,846,219	2,043,342	1,021,671	55.34%
Net Tons	3,794,822	4,200,000	2,100,000	

Case 6 - DP1500 - 5.0" Hole
Drill Cost Distribution



Two-Variable Table Matrix

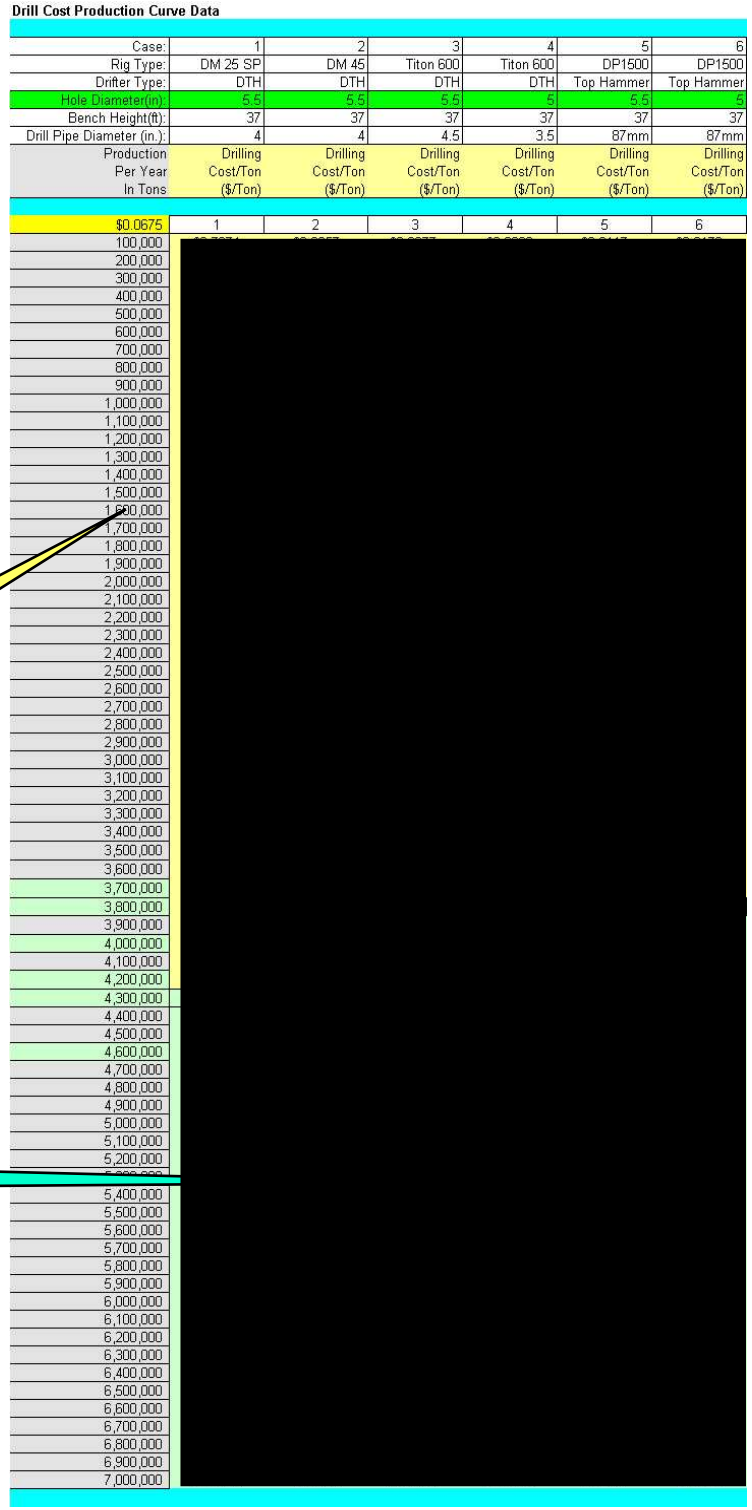
Drill Cost Production Curve Data						
Case:	1	2	3	4	5	6
Rig Type:	DM 25 SP	DM 45	Titon 600	Titon 600	DP1500	DP1500
Drifter Type:	DTH	DTH	DTH	DTH	Top Hammer	Top Hammer
Hole Diameter(in):	5.5	5.5	5.5	5	5.5	5
Bench Height(ft):	37	37	37	37	37	37
Drill Pipe Diameter (in.):	4	4	4.5	3.5	87mm	87mm
Production Per Year In Tons	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)
$0.0675	1	2	3	4	5	6
100,000						
200,000						
300,000						
400,000						
500,000						
600,000						
700,000						
800,000						
900,000						
1,000,000						
1,100,000						
1,200,000						
1,300,000						
1,400,000						

Two-Variable Table Matrix

Full Range

1 Rig Zone

2 Rig Zone



Drill Cost Production Curve Data

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$0.0675	1	2	3	4	5	6
100,000						
200,000						
300,000						
400,000						
500,000						
600,000						
700,000						
800,000						
900,000						
1,000,000						
1,100,000						
1,200,000						
1,300,000						
1,400,000						
1,500,000						
1,600,000						
1,700,000						
1,800,000						
1,900,000						
2,000,000						
2,100,000						
2,200,000						
2,300,000						
2,400,000						
2,500,000						
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4,600,000						
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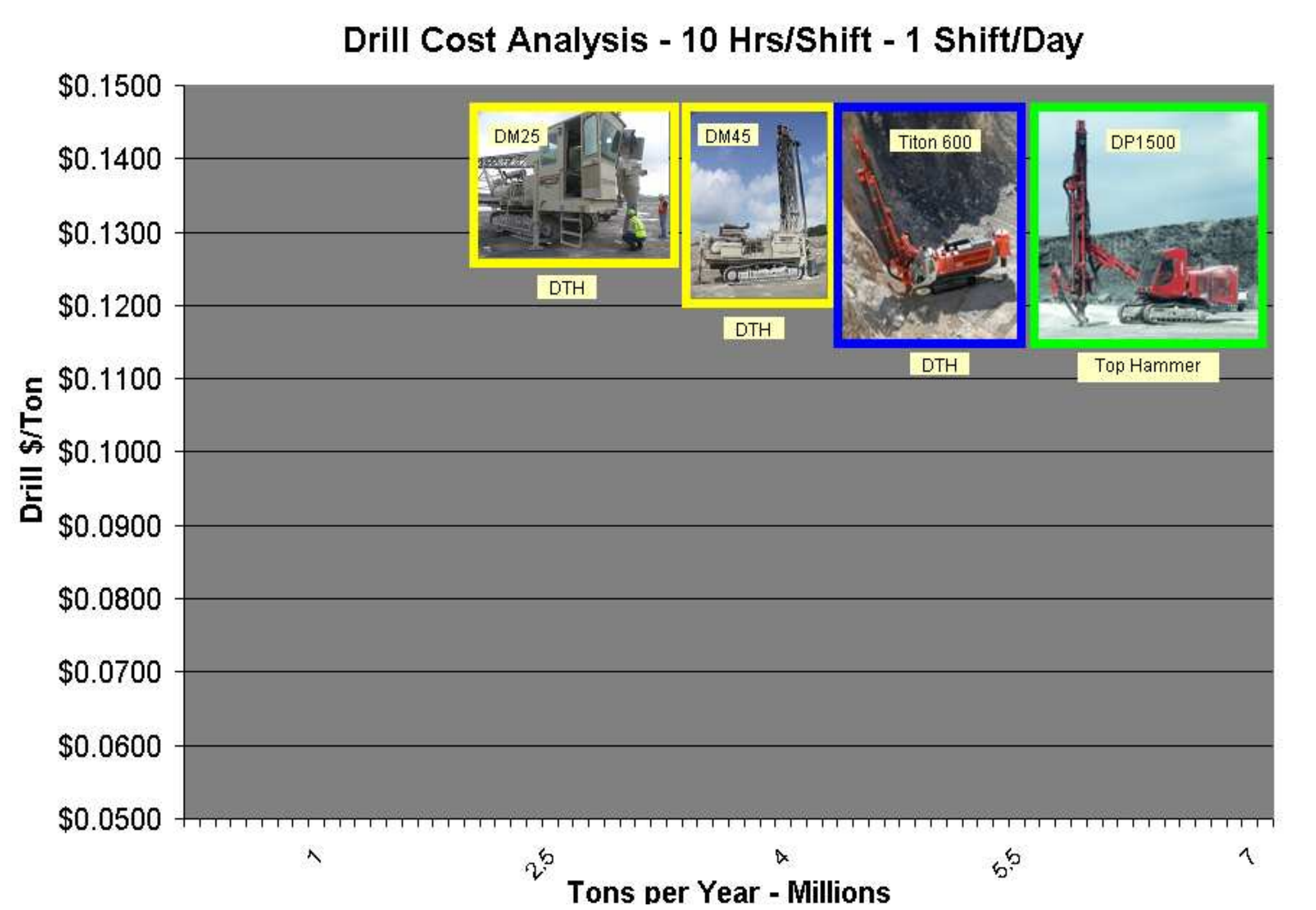
4,800,000						
4,900,000						
5,000,000						
5,100,000						
5,200,000						
5,300,000						
5,400,000						
5,500,000						
5,600,000						
5,700,000						
5,800,000						
5,900,000						
6,000,000						
6,100,000						
6,200,000						
6,300,000						
6,400,000						
6,500,000						
6,600,000						
6,700,000						
6,800,000						
6,900,000						
7,000,000						

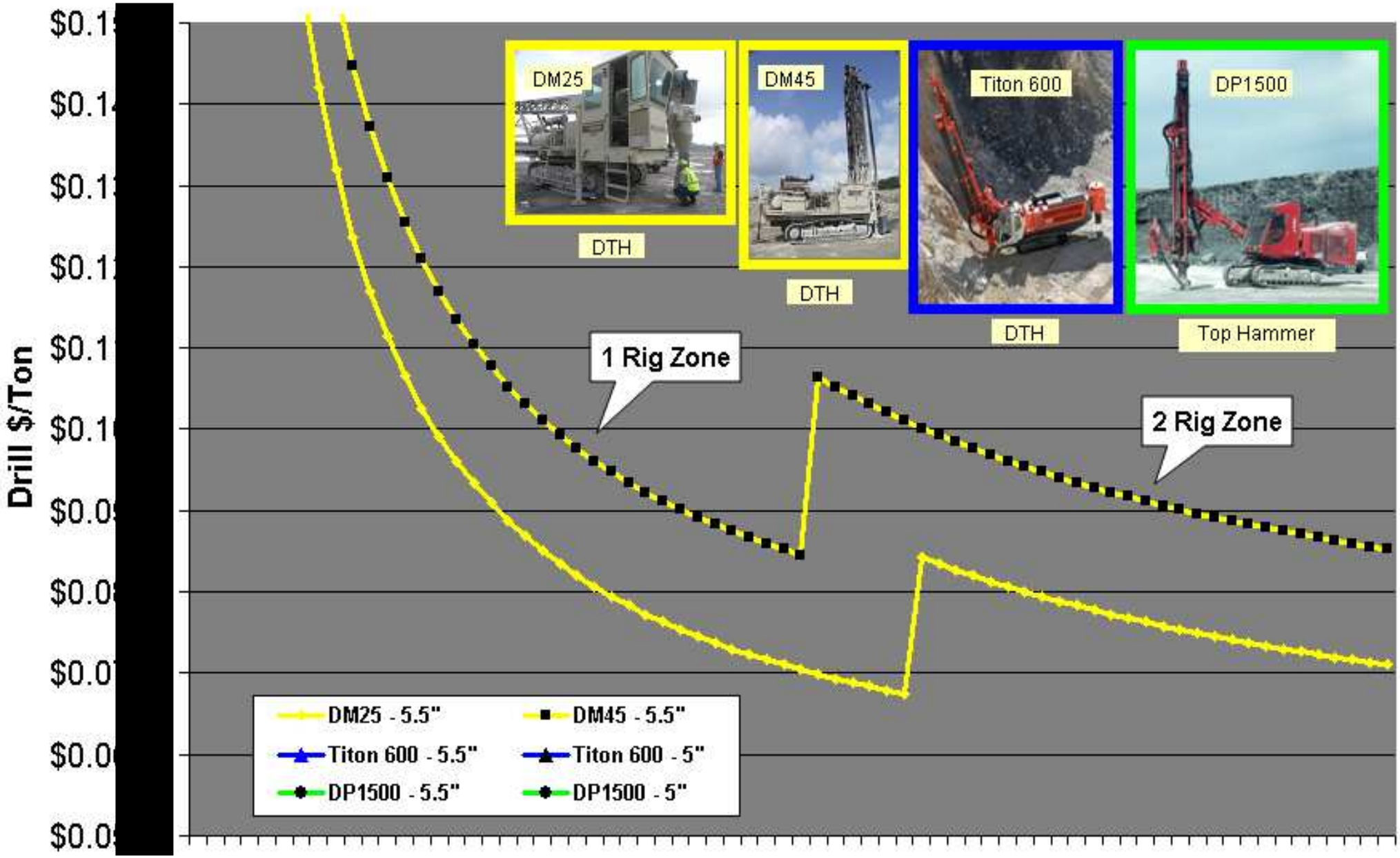
Tonnage Range for Rig Count Roll Over

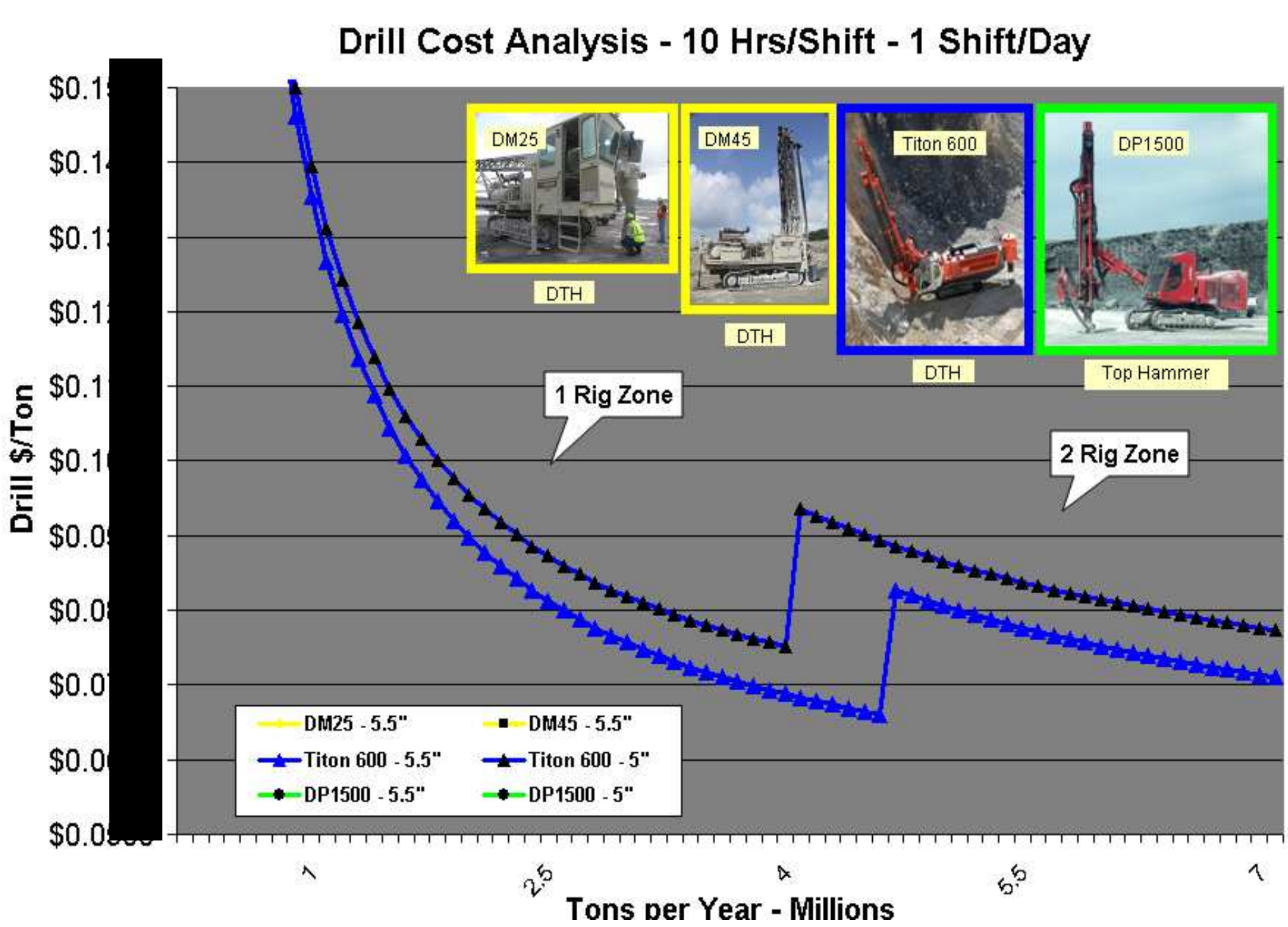
Drill Cost Production Curve Data						
Case:	1	2	3	4	5	6
Rig Type:	DM 25 SP	DM 45	Titon 600	Titon 600	DP1500	DP1500
Drifter Type:	DTH	DTH	DTH	DTH	Top Hammer	Top Hammer
Hole Diameter(in):	5.5	5.5	5.5	5	5.5	5
Bench Height(ft):	37	37	37	37	37	37
Drill Pipe Diameter (in.):	4	4	4.5	3.5	87mm	87mm
Production Per Year In Tons	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)	Drilling Cost/Ton ($/Ton)
$0.0675	1	2	3	4	5	6
3,700,000						
3,800,000						
3,900,000						
4,000,000						
4,100,000						
4,200,000						
4,300,000						
4,400,000						
4,500,000						
4,600,000						

Drill Cost Analysis - 10 Hrs/Shift - 1 Shift/Day



Drill Cost Analysis - 10 Hrs/Shift - 1 Shift/Day




Drill Cost Analysis - 10 Hrs/Shift - 1 Shift/Day
Drill $/Ton
$0.1
$0.1
$0.1
$0.1
$0.1
$0.1
$0.0
$0.0
$0.0
$0.0
DM25
DTH
DM45
DTH
Titon 600
DTH
DP1500
Top Hammer
1 Rig Zone
2 Rig Zone
DM25 - 5.5"
DM45 - 5.5"
Titon 600 - 5.5"
Titon 600 - 5"
DP1500 - 5.5"
DP1500 - 5"
1
2.5
4
5.5
7
Tons per Year - Millions

Drill Cost Analysis - 10 Hrs/Shift - 1 Shift/Day

DTH

DTH

DTH

Top Hammer

1 Rig Zone

2 Rig Zone

DM25 - 5.5"
DM45 - 5.5"
Titon 600 - 5.5"
Titon 600 - 5"
DP1500 - 5.5"
DP1500 - 5"

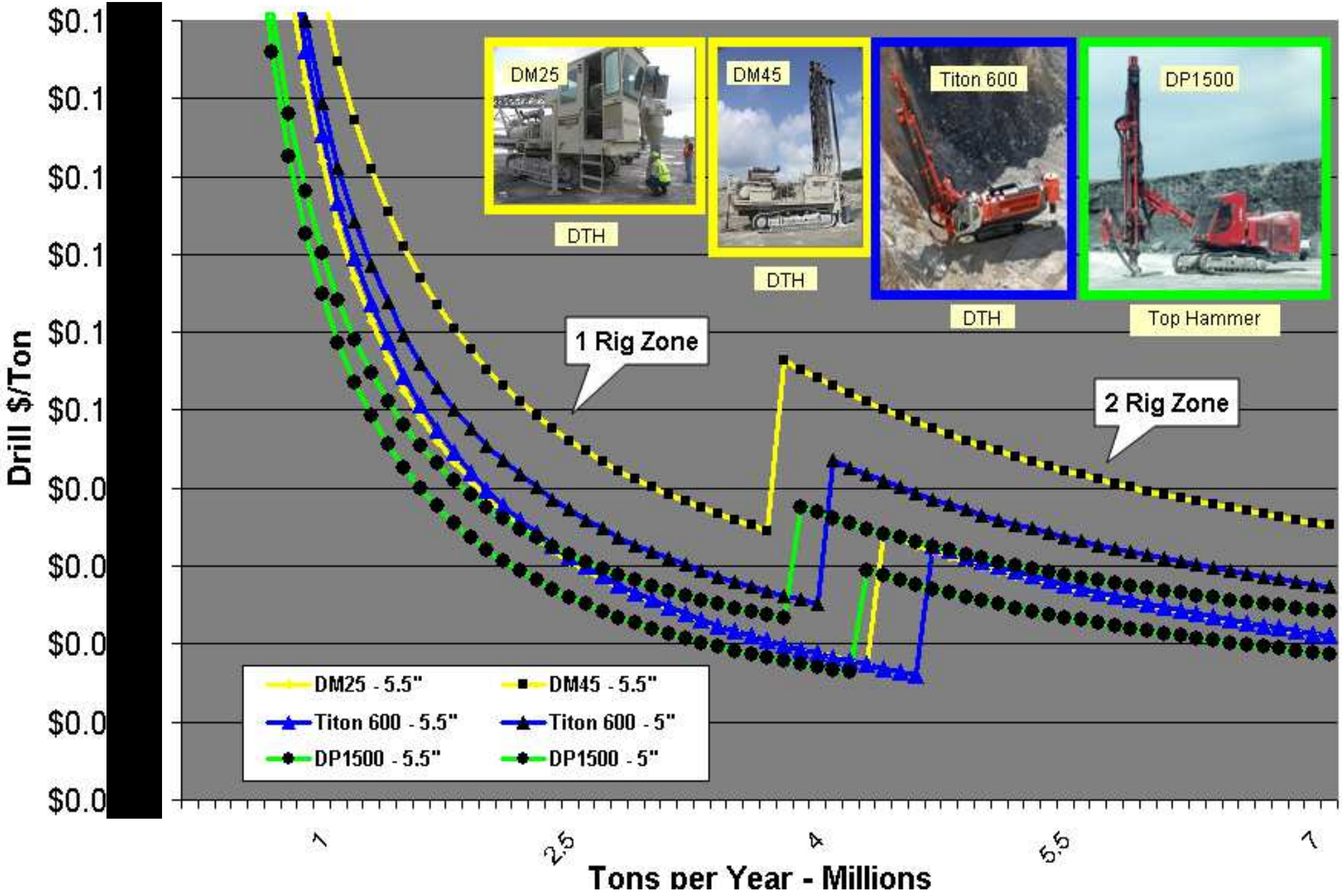
$0.1
$0.1
$0.1
$0.1
$0.1
$0.0
$0.0
$0.0
$0.0
$0.0

Drill $/Ton

1
2,5
4
5,5
7

Tons per Year - Millions

Drill Cost Analysis - 10 Hrs/Shift - 1 Shift/Day



Drilling

$ per Ton

Poor

Excellent

Degree of Fragmentation

Blasting

$ per Ton

Poor

Excellent

Degree of Fragmentation

Secondary Breakage

$ per Ton

Poor

Excellent

Degree of Fragmentation

Loading

$ per Ton

Poor

Excellent

Degree of Fragmentation

Hauling

$ per Ton

Poor

Excellent

Degree of Fragmentation

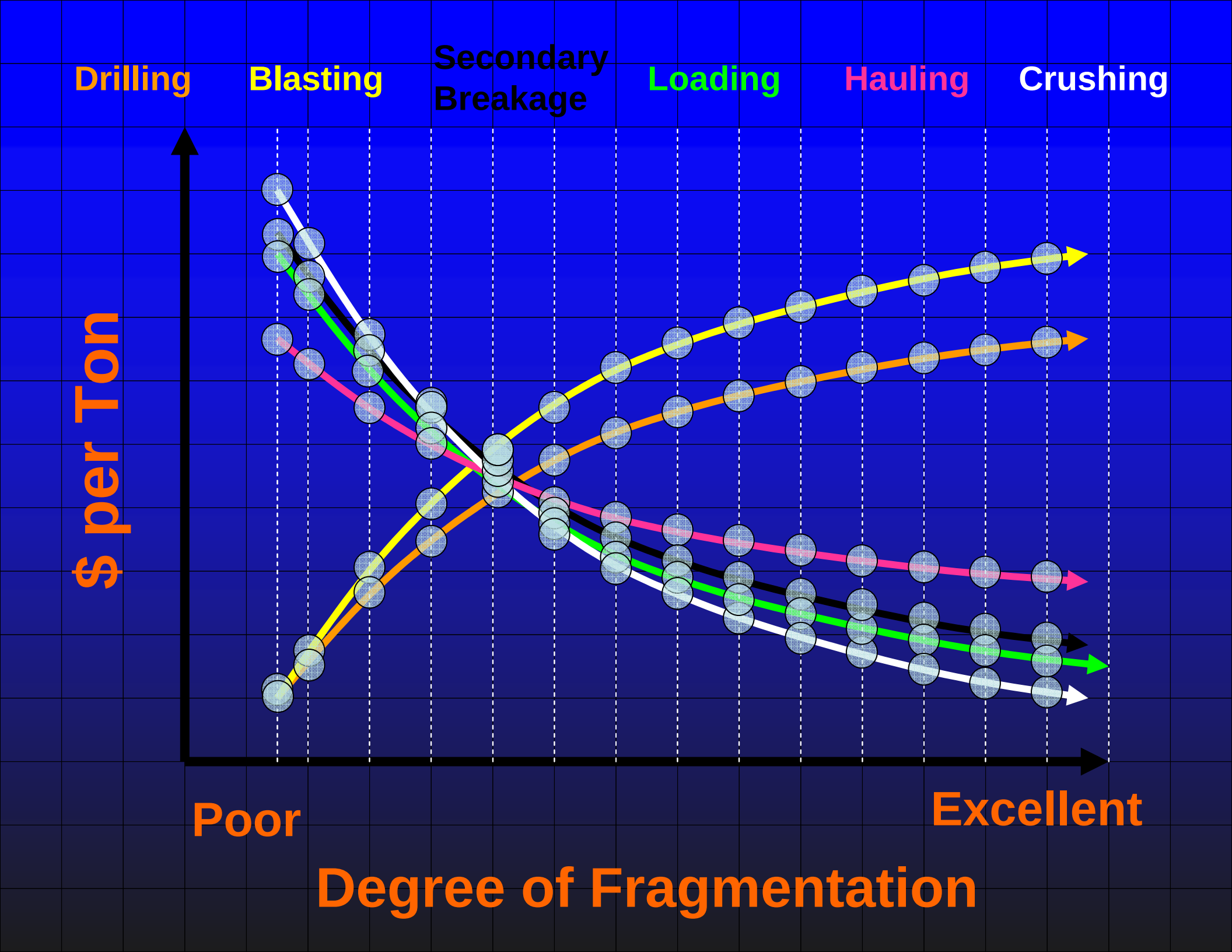
Crushing

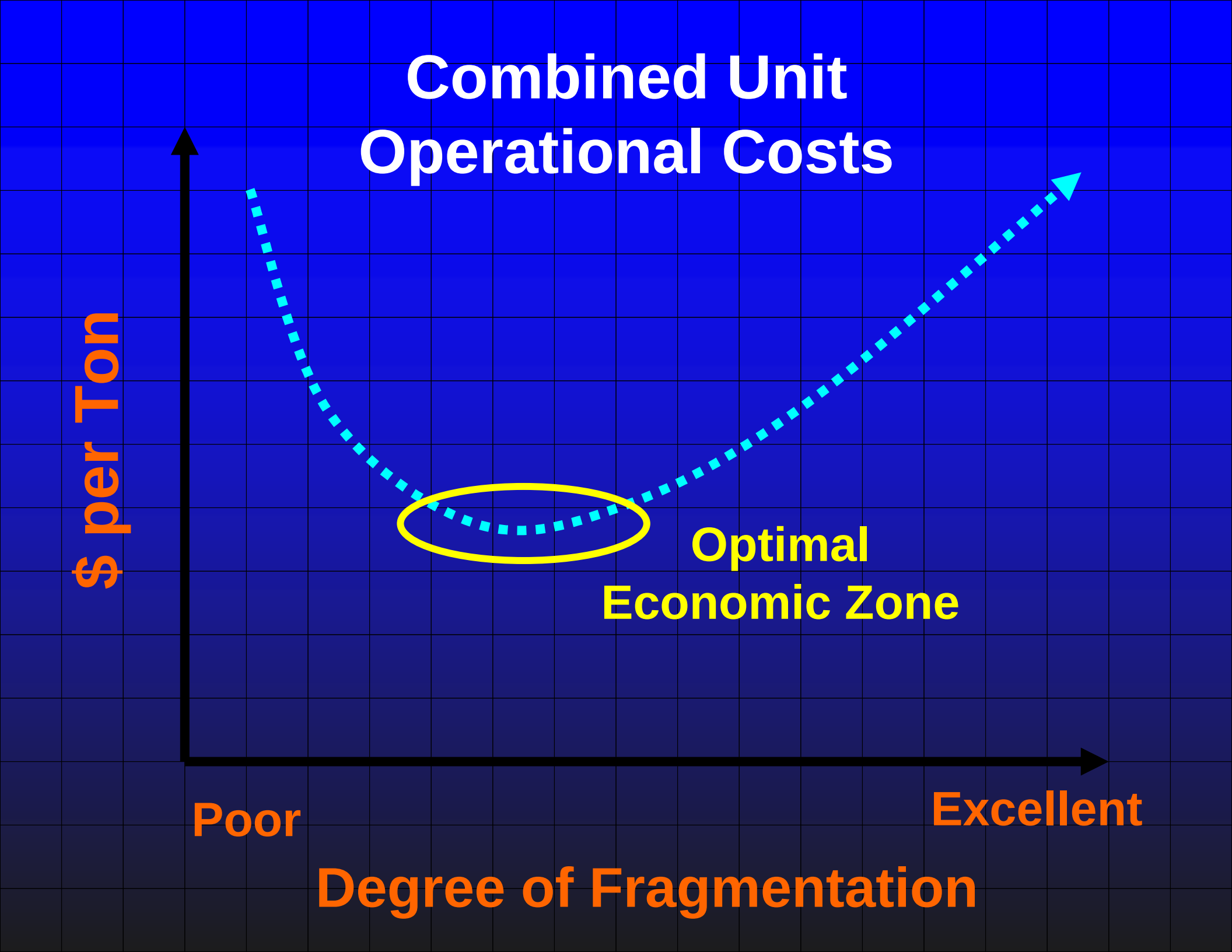
$ per Ton

Poor

Excellent

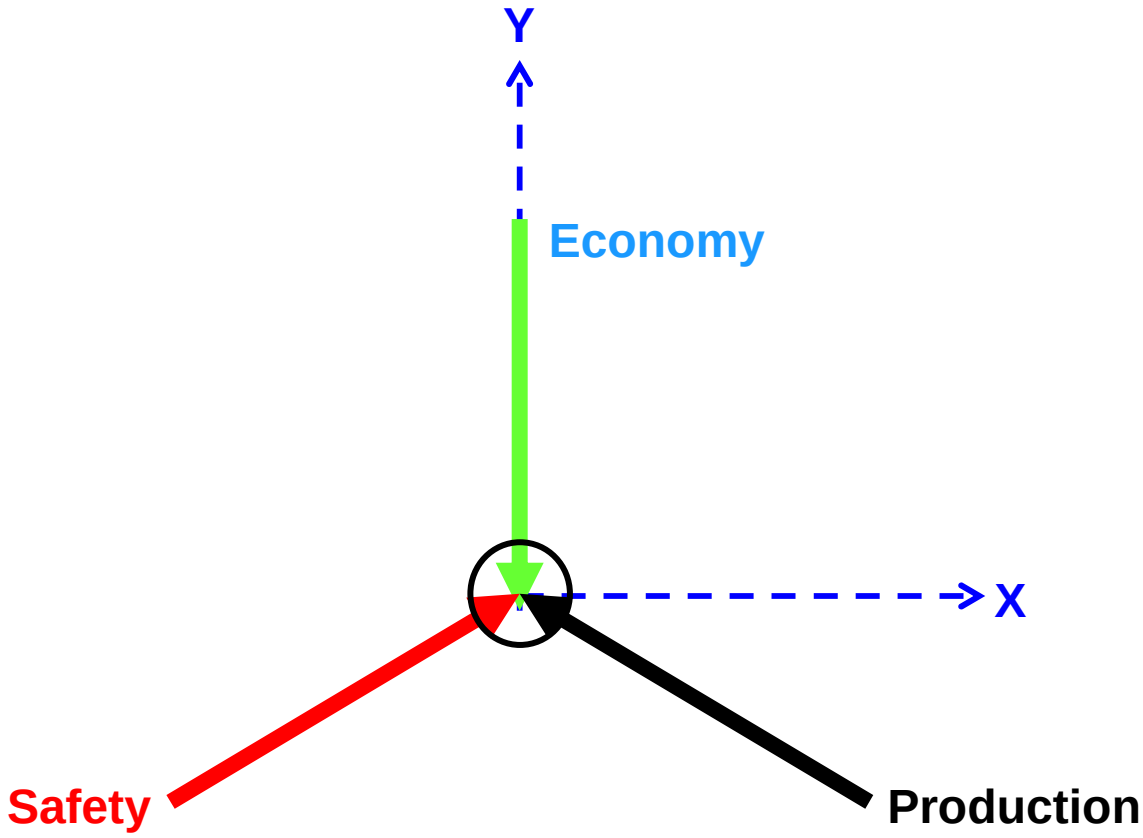
Degree of Fragmentation


Drilling
Blasting
Secondary Breakage
Loading
Hauling
Crushing
$ per Ton
Poor
Excellent
Degree of Fragmentation


Combined Unit
Operational Costs
$ per Ton
Optimal
Economic Zone
Poor
Excellent
Degree of Fragmentation

Drilling & Blasting Issues

- Safety
- Productivity
- Economy



Convergence should be the objective.

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