MAXIMIZING RETURN ON INVESTMENT IN SPREADERS

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Greetings to you
from Stockholm
from the world leader
in crane spreaders.

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We see four important trends today.

First, TEU volume continues to grow. Terminals must find a way to boost the productivity of their lift cycles in order to accommodate this growth.

High-performance spreaders,

such as Bromma Tandem™ -- which can twin-lift 40’ and 45’ containers, as well as 20’ containers,

are thus one wave of the future.

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TANDEM™ T45 IN YANTIAN, CHINA

Second, it is a time of growing yard congestion at many terminals. As such, work stoppages must be kept to a minimum. Any delays in turning ships will have serious marketing consequences on terminals of the future.

Third, it is a time of rising energy costs.

Spreaders that can boost productivity while lowering weight-related energy expense

Finally, it is a time of growing sophistication in spreader fleet planning.

More and more of the leading global terminal organizations are standing back and basing purchase decisions on the big picture – not initial purchase price, but the anticipated lifetime return on their spreader fleet investment.

This is the focus of my presentation today –

a brief consideration of what it might mean for terminals in southern Asia to approach spreader fleet management … from a <u>strategic perspective</u>.

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TO BEGIN: LET ME REITERATE -- SPREADER INVESTMENT IS A STRATEGIC ACTIVITY

FOUR PRINCIPLES OF SPREADER FLEET ASSESSMENT

- A great **investment** in spreaders is measured by investment criteria -- **return** on investment, **net present value**, and **speed of payback** on capital invested.

- **A low purchase price doesn't necessarily result in a great return on investment.** Value is created or destroyed over a spreader lifecycle.

- **Spreader productivity – the revenue the spreader creates – has an enormous impact on speed of capital payback.**

- The big challenge in assessing spreader return on investment is to **give proper weight to the different factors that impact return on investment.**

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A BRIEF LOOK AT FACTORS THAT IMPACT LIFECYCLE COST …

1. Spreader **weight** & its impact on energy consumption
2. Spreader design & its impact on **energy** consumption
3. Spreader **maintenance and spare parts**
4. Required **capital** allocation for spreader spares in the fleet

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REDUCE SPREADER WEIGHT, AND YOU REDUCE ENERGY COSTS

HOW WEIGHT IMPACTS COSTS

- Bromma R&D calculates that, over a spreader lifetime, even a **one-tonne heavier RTG spreader [7 tonne vs. 6 tonne] will add over $16,000 USD in energy costs** over a 50,000 hour lifetime.

- **How do these savings add up?**

  A 1-tonne weight difference on a 10-spreader RTG fleet saves **$168,814** USD over its lifetime. A 3-tonne weight difference on a 80-spreader RTG fleet. will produce **$3,699,000** USD over its lifetime.

- **Bromma R&D calculates that a 1.5 tonne weight savings on a ship-to-shore spreader produces $2,067 USD in annual energy savings**. Over a 10-year lifetime this is more than $20,000 USD per spreader. For a 10-spreader ship-to-shore fleet, that is more than $200,000 USD in energy savings.

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A Look At The RTG Spreader Weight-to-Energy Back-Up Formula … As The Difference In Weight Between Spreaders Expands, So The Difference In Annual Energy Costs Expands

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RTG Spreader Return On Investment Calculator

US$

3. Energy Cost

	Spreader A	Spreader B
Spreader tare weight, tonne	**8**	**6**
Total weight, tonne	31	29
Diesel consumption l/h	**13.2**	**12.5**
Total hours per year	4004	4004
Diesel cost per liter	$0.7	$0.7
Total Annual Energy Cost	**$37,136**	**$35,126**
Total hoisting time, sec	877	877
Hoist with load, sec	788	788
Hoist without load, sec	89	89
Lowering	1179	1179
Load, average container weight, tonne	23	23

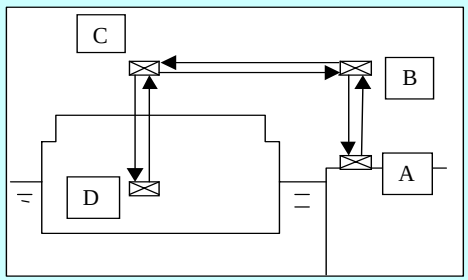
Energy consumption			Motor Power needed	Energy	Motor Power needed	Energy
Hoisting speed with load	26	m/min	165	36.1	154	33.7
Hoisting speed empty	52	m/min	85	2.1	64	1.6
Trolley drive	854	sec	15	3.6	15	3.6
Lowering	0	sec	0	0.0	0	0.0
Positioning and micromotion	690	sec	5	1.0	5	1.0
Other power consumptions during work			10	10.0	10	10.0
Total Energy kWh				**52.7**		**49.8**
Diesel density	0.835	kg/l				
Diesel consumption per kWh	210	g/kWh				

Assumptions per one hour:
3 containers moved for every useful container
Average cycle takes 150 s => 24 moves/hour

A Look At The STS Spreader Weight-to-Energy Back-Up Formula …

STS Spreader Return On Investment Calculator
3. Energy Cost

Crane Data			Spreader A	Spreader B	
Hoist height A	A<=>B	=	20.00	20.00	m
Lowering height	C<=>D	=	20.00	20.00	m
Acceleration time		=	3.5	3.5	sec
Rated Load		=	20.0	20.0	Tons
Lifting System headblock & Spreader		=	19.5	18.0	Tons
Total lifting System		=	39.5	38.0	Tons
Hoist speed at rated load		=	75.0	75.0	m/min
Hoist speed at w/o load		=	150.0	150.0	m/min
Taken power lift:		=	6.9	6.5	kWh
Regenerative power lower:		=	2.5	2.4	kWh
Delta power:		=	4.3	4.1	kWh
Price per kWh		=	$0.064	$0.064	USD
Boxes per hour		=	24	24	containers
Refound per kWh		=	$0.012	$0.012	USD
Hours		=	4,400	4,400	hrs
Total boxes		=	105600	105600	containers
cost per anno		=	$43,142	$41,075	USD
Comparison					
lifting equipment weight	Spreader B - Spreader A	=		1.5	Tons
energy cost	Spreader B - Spreader A	=		$2,067	USD



Additional parameters:

Motor base Speed	Nm	=	1000	rpm		
Motor top speed	Nm	=	2000	rpm		
Overall efficiency (*60	÷	=	0.876			
Overall MOI	It	=	32.4	kg-m	empty	##
Regenerative effiency	÷	=	0.6			

SPREADER WEIGHT IS NOT ONLY A FINANCIAL ISSUE – IT IS AN ENVIRONMENTAL ISSUE.

1. Diesel engines are a major cause of **air pollution** today, particularly nitrogen oxide [NOx], particulate matter [PM], and sulfur oxide [SOx].

2. Heavier **spreader weight requires greater crane diesel fuel consumption** – thereby adding to air pollution.

Conclusion is that “Green” terminals who place a priority on minimizing environmental impact can achieve significant **lifetime pollutant savings** through slightly less heavy spreaders.

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SMALL SPECIFICATION DECISIONS IMPACT ENERGY CONSUMPTION FOR YEARS TO COME

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HOW AN IDLING HYDRAULIC PUMP IMPACTS LIFETIME COSTS

1. Eliminating the **idling action of a hydraulic pump** reduces energy consumption by approximately 3 kWh.

2. Assuming a 50,000 hour spreader lifetime, this means a reduction of **150,000 kWh** over the spreader lifetime.

3. At a cost of 0.09 kWh, this produces **$13,500 USD** in lifetime energy savings per spreader.

4. Savings multiplied on a fleet-wide RTG basis will be **dramatic**.

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SLIGHTLY FASTER MAINTENANCE HAS A DRAMATIC IMPACT ON LIFECYCLE COSTS

HOW DESIGN DECISIONS IMPACT MAINTENANCE COSTS

1. Bromma After-Sales estimates that **all-electric RTG spreaders reduce planned maintenance costs by approximately 10%,** or a global average of $410 USD per year per spreader. Over 10 years this is over $40,000 for a 10-spreader fleet.

2. In ship-to-shore spreaders, Bromma After-Sales estimates rectangular-frame spreaders will generate approximately **16% in savings versus mono-beam spreaders** – or **$2,150 per year**, due to easier ease of access. For a **10-spreader fleet**, this represents savings of over **$200,000** USD over the fleet lifetime.

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A Look At Global
After-Sales Service Cost Projections …

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STS Spreader Return On Investment Calculator
4. Annual Service & Spare Part Cost

Spreader type	STS	Spreader A	Spreader B	
Spare parts		$2,123	$2,123	
First line service		$4,800	$3,900	
Preventive mantainance		$2,200	$1,750	
Corrective maintainance		$4,000	$3,200	
Total cost (trsp to LCC calculator)		**$13,123**	**$10,973**	**16%**
Service labor cost / hour		$50	$50	
weeks per year		44	44	
Days per week		5	5	
Hours per day		20	20	
Moves per hour		24	24	
Hours of operation / year		**4,400**	**4,400**	
Moves /year		105,600	105,600	
Emergency team hour cost		$150	$150	
Downtime hours / year		40	36	***90%***
Emergency team hours spent		**32**	**26**	***81%***
Hours preventive maint per year		**44**	**35**	***80%***
Hours corrective maint per year		**80**	**64**	***80%***
Spare part cost / move		**$0.0201**	**$0.0201**	***100%***

LOWER YOUR CRANE-TO-SPREADER RATIO, AND YOU LOWER YOUR FLEET CAPITAL INVESTMENT

HIGHER SPREADER AVAILABILITY LOWERS YOUR "SPARE SPREADER" RATIO

- The common ship-to-shore crane to spreader ratio at many terminals is **1.6** – 16 spreaders for every 10 STS cranes.
- A spreader with higher reliability can reduce the spare ratio – perhaps reducing fleet size to 1.3 – **13 spreaders for every 10 STS cranes**.
- Reducing the spare ratio can save a terminal an **initial capital outlay of $450,000 USD to $500,000 USD** for a 10-crane fleet.

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TERMINAL GROWTH PLANNING STARTS WITH DOWNTIME REDUCTION

LOWER DOWNTIME BOOSTS MOVES PER HOUR.

HIGHER MOVES PER HOUR BOOSTS PROFIT & SPEEDS SHIP TURNS.

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INCREASING PRODUCTIVITY HAS AN ENORMOUS IMPACT ON PROFITABILITY

A single spreader that can boost productivity by **2/10th of a percent** [26.0 moves per hour vs. 25.5 moves per hour] will produce as much as **$194,000 USD** in extra revenue per year.

This calculation is based on 3,080 extra moves [6,160 hours of service] that generate $63 USD in profit per move.

This added annual profit from higher spreader productivity is **more than the entire capital cost of the spreader**.

Productivity is the single most important factor in determining payback on spreader investment.

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A Look At Annual
Revenue & Profit
Created From The Slightest Gain
In Productivity --

24.0 to 24.1 Moves Per Hour …

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STS Spreader Return On Investment Calculato US$

2. Revenue Production

Revenue	Total Crane Investment	Spreader A	Spreader B		
Investment:	$7,000,000	$130,000	$150,000		
Spreader's share of investment		*1.8%*	*2.1%*		
Spreader Productivity Factor				*0.05%*	Percentage higher productivity for Spreader B used in moves per hour calculation
Estimated moves per hour	24.0	24.00	24.01		
Hours of operation	20				
Days of operation	220				
Downtime hours / year		40	36	*10%*	Percentage less downtime for Spreader B
Moves lost due to downtime	960	960	864		
Estimated moves per annum	104,640	104,640	104,789		
Revenue per move	$213				
Overheads	-$171				
Net Revenue per move	$42				
Total Annual Net Revenue	$4,394,880	$4,394,880	$4,401,130	6,250	
Spreader Share of Revenue		**$87,898**	**$87,898**	2.0%	Percentage used to allocate standard spreader revenue in payback calculation
Productivity gain			$2,218		
Less downtime			$4,032		
Total Annual Spreader Revenue		**$87,898**	**$94,147**		

UNDERSTANDING RETURN ON INVESTMENT REQUIRES A MODEL THAT INCLUDES REALISTIC INDICATORS IN SEVERAL CATEGORIES.

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THE KEY INPUTS IN THE BROMMA ROI CALCULATOR ARE:

OPERATION

Hours per year, moves per hour

INVESTMENT

Initial price, spare spreader ratio, spreader lifetime

PRODUCTIVITY

Profit per move, productivity factor, downtime

LIFECYCLE EXPENSE

Spreader service and maintenance, crane energy expense

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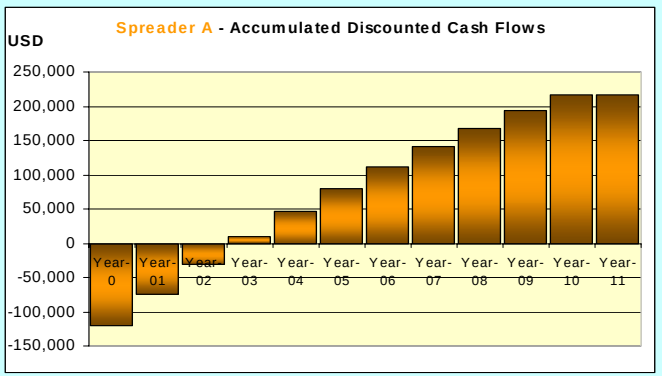
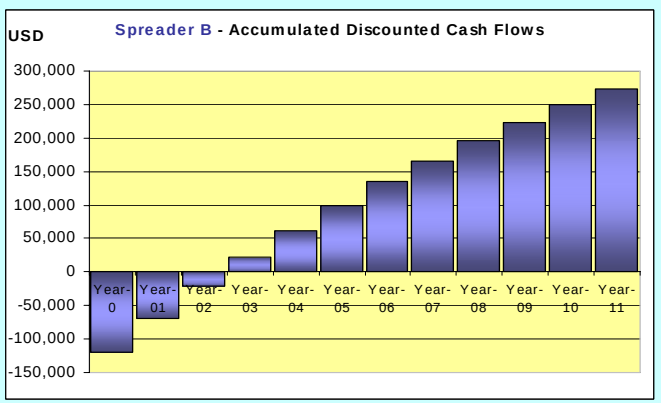
A Look At A Sample
RTG Spreader
Calculator Scenario …

RTG Spreader Return On Investment Calculator US$

INPUT VALUES			Spreader A	Spreader B	Advantage
Operation					
Weeks / year	44	**Spreader Investment**	$80,150	$92,000	-14.8%
Days / week	7				
Hours / day	13	Spreader life time (years):	10	11	1
Moves / hour	24				
		Spare spreader ratio:	50%	30%	
Moves / year	*96,096*	Spare spreader "investment":	$40,075	$27,600	31.1%
Hours / year	*4,004*				
Investment					
Spreadera A	$80,150	Estimated Spreader Revenue	$91,331	$91,331	
Spreader B	$92,000	Productivity gain		$769	
Spare Spr. Ratio		Downtime reduction		$1,536	
Spreadera A	50%	**Total Annual Revenue**	$91,331	$93,635	2.5%
Spreader B	30%				
Spr. Life Time (yrs)					
Spreadera A	10	Service & Spare part cost	$3,982	$3,572	10.3%
Spreader B	11				
		Crane energy cost	$37,136	$35,126	5.4%
Revenue / Move					
	$25	**Total Annual Cost**	$41,117	$38,698	5.9%
	-$9				
	$16	Total Life Time Cost, first 10 year	$531,397	$506,575	4.7%
Prod.factor %	0.05%	(Including cost of investment)			
Down time adv.	10%				
Consumables		**Annualized Life Time Cost**	$53,140	$46,052	13.3%
Diesel / liter	$0.70				
Personnel		Investment % of total life time cost	15%	18%	
USD / hour	$50				





Spreader A

ROI: 40%

NPV: $200,658

Payback time:

3 years and 281 days

Spreader B

ROI: 45%

NPV: $252,406

Payback time:

3 years and 181 days

Payback time reduction:

100 days

Net present value won:

$51,748

IN THE END, PURCHASING POLICY SHOULD BE BASED ON STRATEGIC AMBITIONS.

CONCLUSIONS

- An investment cannot be measured simply by looking at initial purchase price.
- Spreader “cost” can only be calculated over the spreader lifecycle.
- Spreader productivity is the single most important financial factor impacting any spreader investment model. Productivity is what determines speed of capital payback.
- Ultimately, a terminal’s success will be defined by growth parameters -- speed of ship turns, berth utilization, moves per hour, and customer satisfaction. Since the spreader is the key “link” in the productivity chain, this is why the selection of your spreader partner is a defining, strategic activity in the terminal success process.

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THANK YOU.

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