

Part II of Daewoo Rebirth Program[1988-1993]

**‘The secret of success behind
the most efficient shipbuilder in the world’**

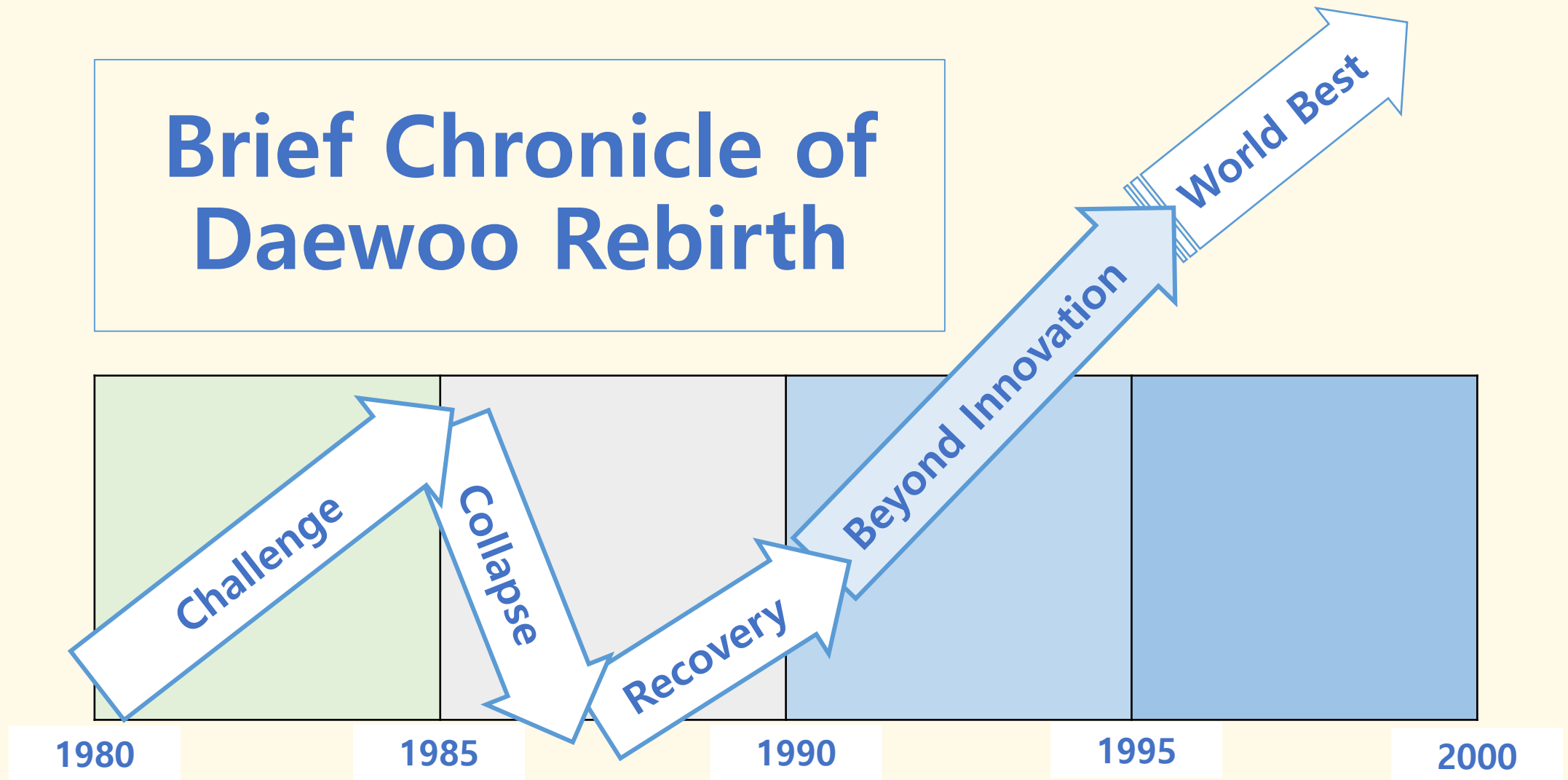
Beyond Innovation

2018

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Proper Mediation Inc.

Brief Chronicle of Daewoo Rebirth



Key words: [Recovery] Authentic Leadership, Renewed Trust, Back-to-Basic, Learn-how-to-learn,
[Beyond Innovation] Paradigm change, Speed & Productivity, Hit Product

Miraculous Recovery in 2 years

[1987] → Collapsed, seriously critical, in Coma

[1988] **Authentic & Visionary Leadership**

(Chairman came down and live with the shipyard.)

- Recover Consciousness: **Authentic & Careful Nursing**
Build Trust: Open Mind, Open Eyes → Save our shipyard!
- Restructure Business: **Cut the Fat, Create New Business**

[1989] **Vision 90s**: Holistic treatment for Real change

- Back-to-Basic → Behavior Change
- Learn how to learn: Real Learning culture
for 'Better Tomorrow'

[1990] 'Almost completely recovered in 2 years.'

→ Employees are **Full of vitality!**

→ **Well prepared to transform shipyard.**

* **Shipbuilding Market depressed[1986-1991]**

6 Basics

- ① Be punctual!
- ② Keep clean!
- ③ Keep Safety rule!
- ④ Don't hang around
- ⑤ Greet with smile
- ⑥ Use refined words

『Beyond Innovation』

1. Paradigm Change
2. Meteoric Improvement



1. Paradigm Change

- **New Shipbuilding Concept**
- **Business Process Renovation**

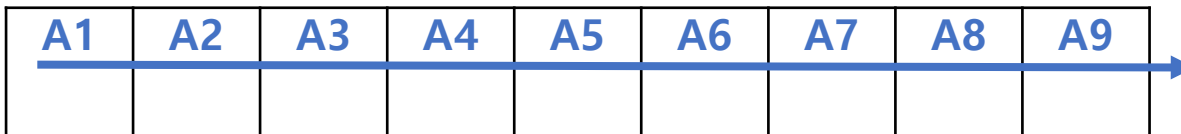
New Shipbuilding Concept
from Job shop Production
→to Flow Line Production
for High Speed & Productivity

1-1. SYNCHRO*-Production System

- Simple & Compact Flow Lane
- Continuous Improvement embedded

'SYNCHRO'-Production system is,

4Hr T/T, 2 Days C/T



8Hr TAKT Time, 9 Days Cycle Time

Flowline production moving at
a constant speed (TAKT Time).

Substantial Benefits: CI embedded

- ① Easy to find Bottleneck, Problems & Solutions for Immediate Action
- ② Easy to plan and monitor in Visible way
- ③ Easy to eliminate idling resources, Waste, Delay....

[Cardinal rule] Keep TAKT Time
Teamwork, Baton-passing is everything

Group Technology[GT] is employed.

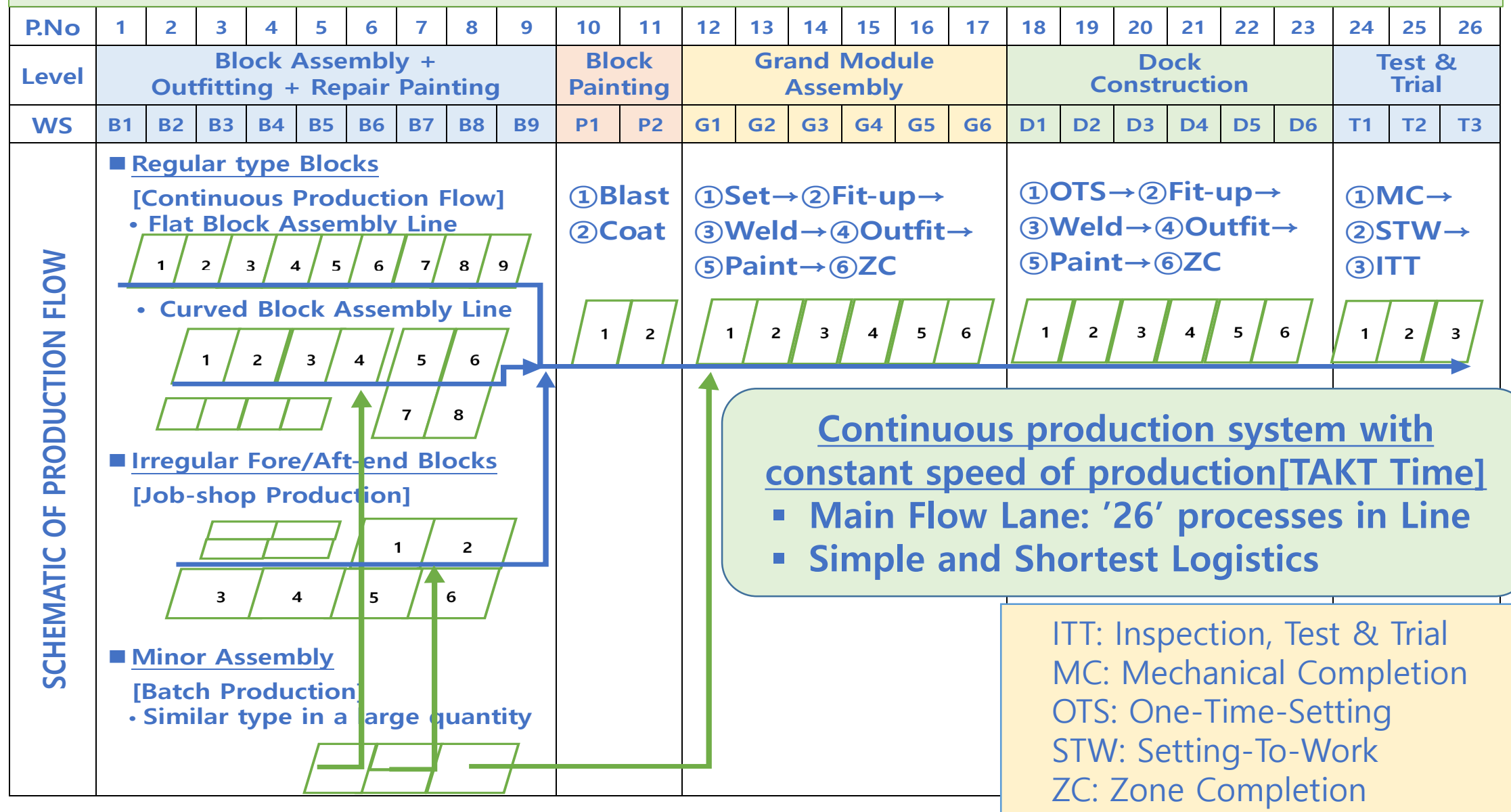
GT is a method for applying **mass production techniques** to a variety of products in widely varying quantities.

GT is '..a family manufacturing philosophy; the parts having similarities(Geometry/manufacturing process) are grouped together in order to bring the benefits of mass production.'

GT is a general principle....

- ① Many problems are similar and
- ② by grouping SIMILAR problems, a '**Single**' **Solution** can be found to a set of problems,
- ③ thus SAVING TIME and EFFORT to produce interim product **with perfection in time.**

SYNCHRO*-Production Flow Lane



Business Process Renovation
from Low integrated process
→to Tightly integrated process as One
to reduce Total Cost at Minimum

1-2. Design-led Target-driving System

- Design-leading Total Optimization
- Target-driving Business Process

Design-led Total optimization

- ① **NEEDS-based Design**
to meet **Specific** needs of **Specific** Customer
- ② **Material Cost-conscious Design**
Vendor information[Technical, commercial & Price] provided to Design
Major Vendors directly aligned before/immediately after Contract
- ③ **Production-convenient Design**
Input Production method, Work Practice & Standard in Details
- ④ **Production-friendly Drawing**
for Workers at worksite to easily understand what/how they have to do.
→ **Reduce Total Cost. High Speed Production with Productivity**

- Design lead from start to end: client's Needs-finding to satisfaction.
- Design works together with Advance Material Purchasing & Production.
- Powerful Initial Design Team should be set up.

Target-driving Business Process in 3 steps

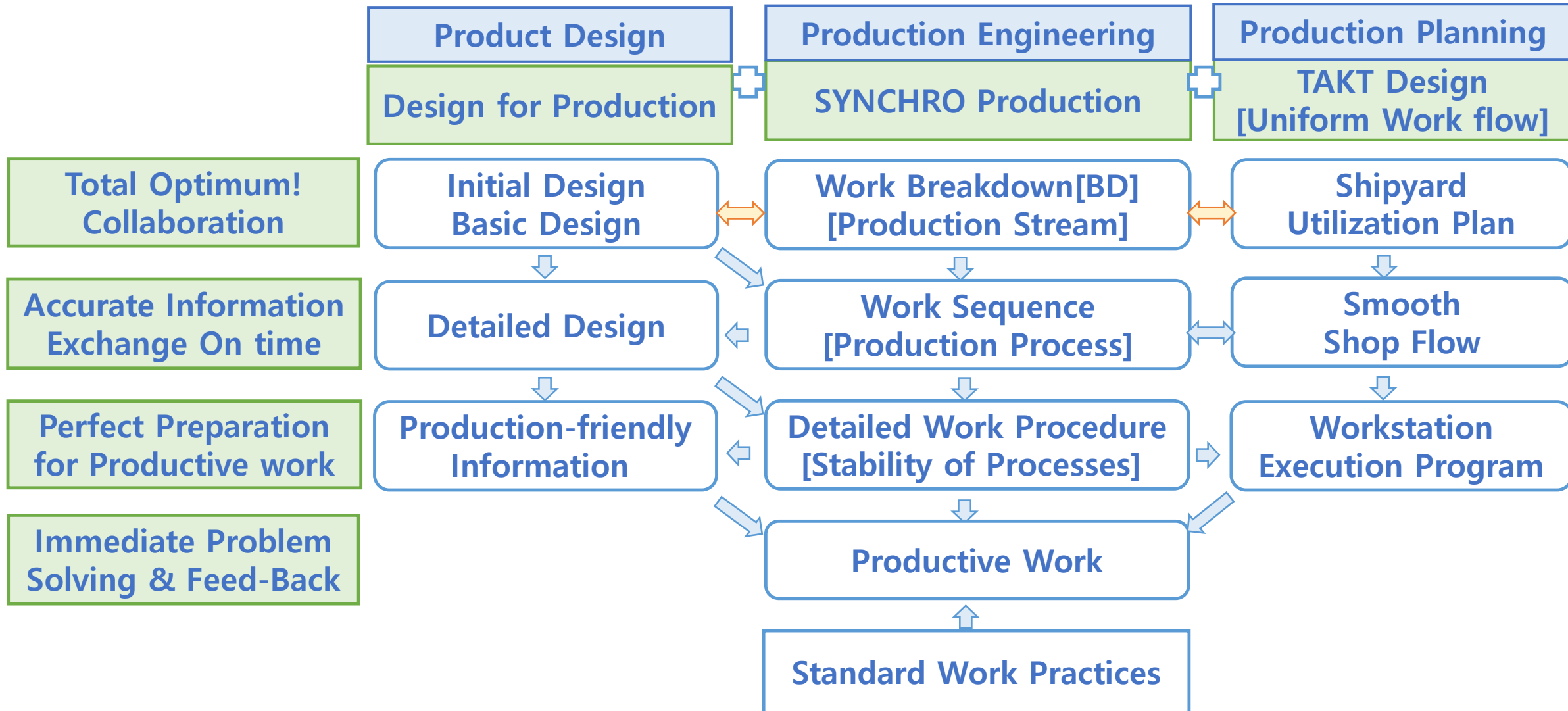
Planning and Design is the label assigned to the **purposeful activity of creating and restructuring a situation-specific solution**

Step I	Target setting at Initial Stage [QCD]	▪ Cost-effective Design at the initial design stage ▪ Advance Vendor Aligning with Initial design ▪ Production-Convenient Design for Efficient Production
Step II	Careful Planning to reach Target	▪ Detailed Design according to Production requirement to meet Target[Productivity, Production speed, Quality] ▪ Production process good for smooth flowing of production
Step III	Clear Instruction to achieve Target	▪ Shop drawing to be Production-friendly according to Standard work practice & Detailed work procedure ▪ Detailed Work procedure to be updated by each Workstation

Organic co-work required

Highly Interactive, Closely Interconnected & Laterally Communicated between **Small working groups** → Solution somewhere in this well woven network

Framework of Design-led Target-driving System

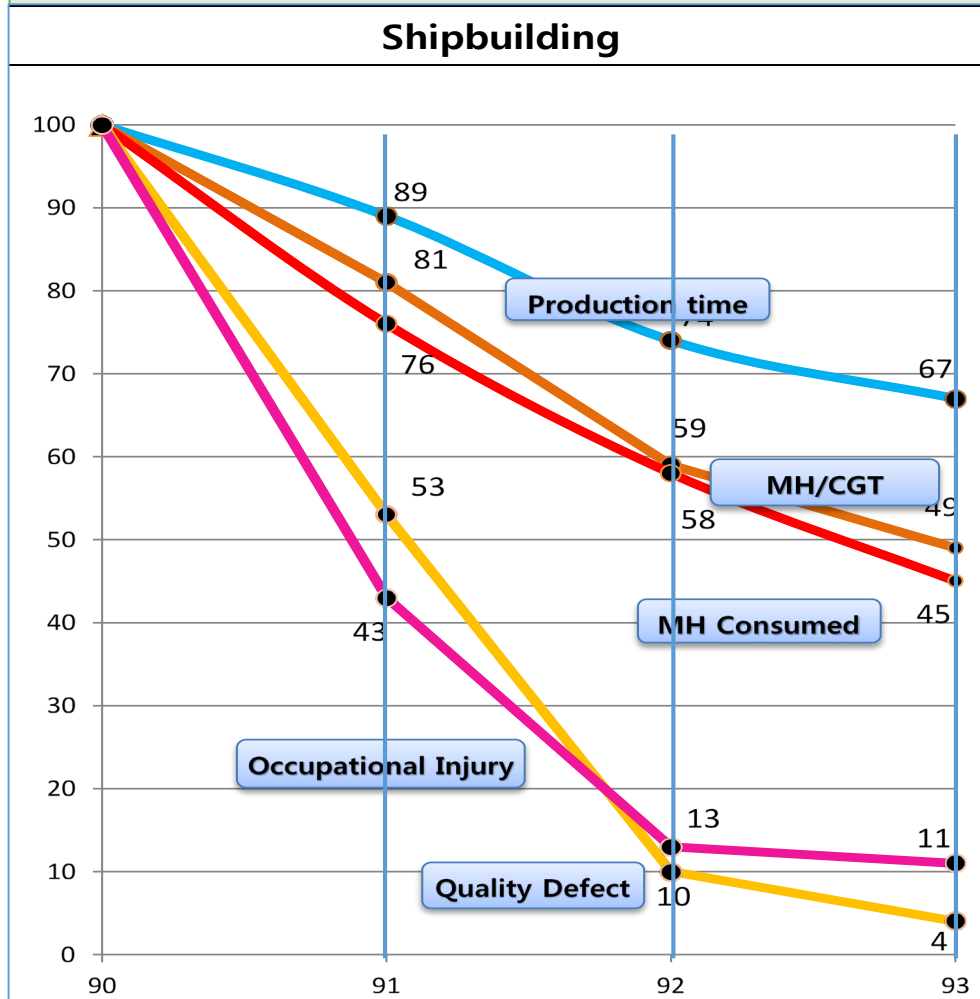


2. Meteoric Improvement

- Speed & Productivity
- 'HIT' Product



2-1. Speed 50% up, Productivity doubling



CGT: Compensated Gross Tonnage

Indicator of Performance Change

- ① Occupational Injury →
- ② Quality(Defect) →
- ③ MH Consumption[below half] →
- ④ Overall Productivity[Double] →
- ⑤ Production Speed →
- ⑥ Revenue Increase → Cost Reduction
- ⑦ **Profit [Oct. '90: Turned into Black]**

Achievement

- ① **Occupational Injury: Reduced to 11%**
- ② **Defect reduced to 4%**
- ③ **MH Consumption reduced to 45%**
- ④ **Total Production Period : Reduced to 67%**

Daewoo's meteoric improvement in Speed & Productivity

Summary of 5 year Endeavour [1988-1993]

▪ All employees participation

- Top management at front
- Middle-line working hard with
- Front-line workers together

▪ Real-learning for the Best

- Benchmarking of the World-Best Behavior, Mind, Thinking, People, & Technology
- Learn-how-to-learn Culture

▪ Building-up Aggregate Strength

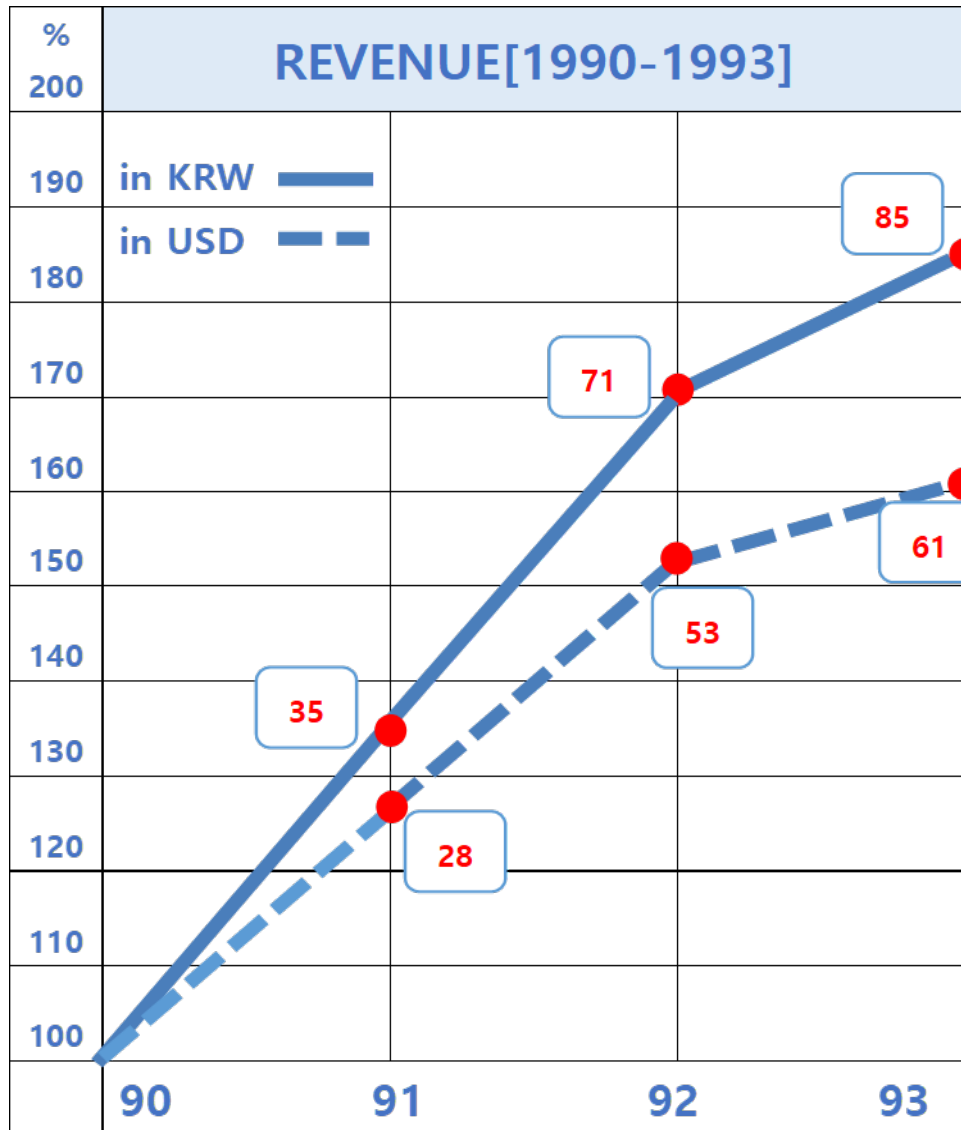
- Organization, Operation System

▪ Holistic Change

- People, Method, System, Culture

Two driving goals, speed & productivity, which had eluded even the most inventive shipbuilding companies.

<Case Study of Harvard Business School, Oct. 1994>



Revenue Increase

[1990] **1.0bil**→[2000] **2.6bil. USD**

[2010] Revenue: 12.0bil. USD

[2005] Revenue: 5.0bil. USD

[2000] Revenue: **2.6bil. USD**

[1994] Revenue, 2.0bil. USD

[1993] **World Champion of Market Share**
The World-best Builder of VLCC

[1992] **10% production share of the World**
Revenue: 1.53bil. USD, Profit: 280mil. USD

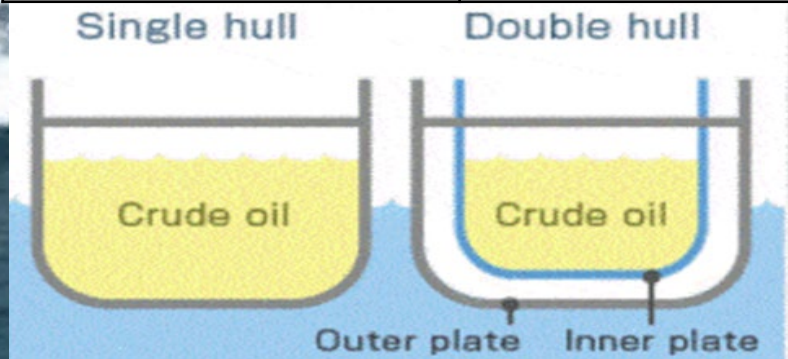
[1991] **Business turned into black**
Revenue: 1.28bil. USD, Profit: 144mil. USD

[1990] Revenue: **1.0bil. USD**, No Profit

2-2. Hit Product: VLCC



VLCC Principal Dimensions	
Length overall	333 m
Extreme breadth	60 m
Molded depth	30.5 m
Keel to Masthead	63.5 m
Net Tonnage	108,113 Ton



1) Innovative Design Change with Production

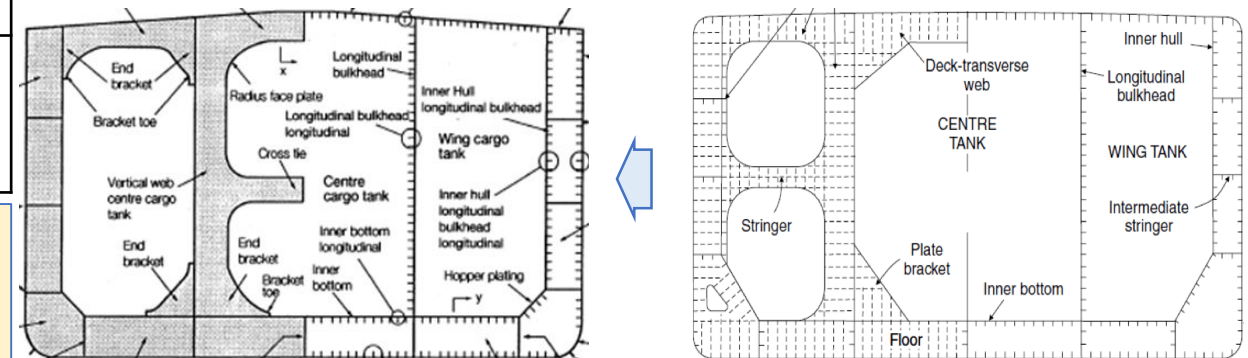
① Economic Design

No. of Blocks	50%
Erection Unit	59%
Scaffolding	41%
No. of Steel pieces	79.6%
Pipe Works (Ton)	84.9%
Cable length	77.0%

****BIG Gains in Cost Reduction & Productivity Increase**

② Modification of Cross-tie

- ◀ Traditional design: Crosstie in Side Tank
- ▶ Daewoo design: Crosstie in Center Tank [Effect]
- ① Smooth flow of Block Assembly Line
- ② Min. Scaffolding on Assembly Line
- ③ Safer Work Condition.....



③ Production-friendly Drawings : 'Worker-friendly'

④ Material Definition by Work package[Pallet] : Supply Pallet of right quantity, at right spot, & on time

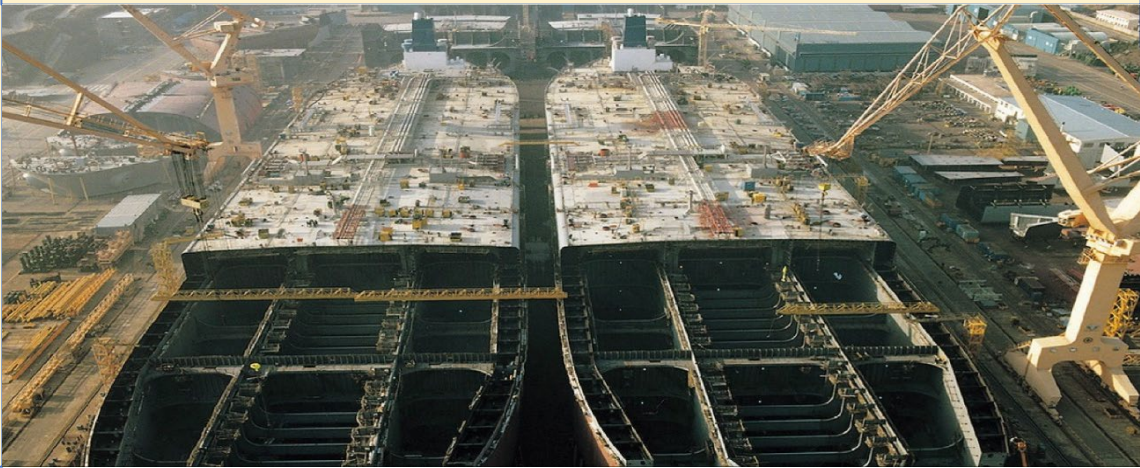
2) New Shipbuilding Method

[Indoor Production]

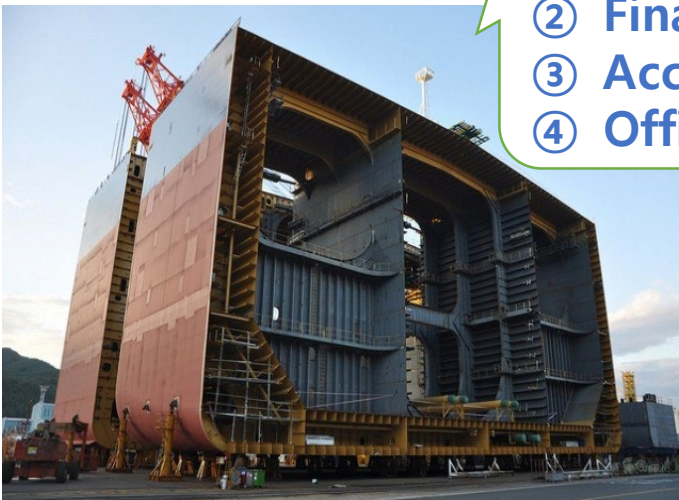
- **Maximize Block Size:**
Max. Utilization of Production Facilities
- **Change of Assembly method:**
Matrix assembly to Line welding
- * **92% of Joint length welded in shop**
: Productivity: 0.85MH/JL, 3.63MH/JL(Dock)
- **Perfect Interim Product in Process:**
Complete Hull(+ Line heating + Painting repair), Outfitting & Painting

[Outdoor Production]

- Engine Rm: **Full-width Upright** Module
- Cargo Hold: **Ring-type** Module
- **Perfect IHOP Completion by Zone**



- ① Cargo pipes in position
- ② Final coating finished
- ③ Accuracy controlled
- ④ Official Inspection done



Progress[%] of Outfitting at Erection

	'90	'91	'92	'93
Engine Room	60	66	82	90
Cargo Hold	52	69	85	92

Progress[%] at Launching

	'90	'91	'92	'93
%	84.6	95.1	96.8	HAT/SAT at Quay

Daewoo achieved world-best Speed & Productivity



[Speed] Total Production Period

	Shop	Dock	Quay	Total
'88	4.5M	5M	4M	13.5M
'93	3M	4M	2M	9.0M
	-33%	-20%	-50%	-33%

[Productivity] Manhour Consumption

'88	1.2mil Manhours
'93	540,000 MH
	-55%

9 months, 540,000MH

Sick dog got reborn as Bright Star. Great Hit!

[1988] 1st S/H VLCC
'Dying Dog'[Big Loss]

[1990-1992] NSC
Optimal Design
3 year Intensive Efforts

[1993] 1st D/H VLCC
'Bright Star' saved
company.....

[2008] 102nd VLCC built
20% out of 506
Healthy Cash Cow

Till now, Best selling Ship

'PRODUCTIVITY' [MH Consumed]

1,200,000 Man-Hour

Cut
MH
55%

540,000 Man-Hour



'88

Meteoric
Improvement

'93

Production
Speed, 50% ↑

9M

-4.5M!

13.5M



'PRODUCTION SPEED' [=SHIPYARD UTILIZATION]

181 VLCC built as of May 2018[Present fleet: 702]

'Best Selling' Products

VLCC(Double Hull, Very Large Crude oil Carrier)

- **20% Market Share [181 built as of May, 2018]**

Benchmarking & Optimal Design for Production

[1990-1992] New Technology input(NSC + Design-lead optimization)
[1992-2000] Bright Star, World Best[Shortest Delivery]
[2000-Present] Healthy Cash Cow

LNG Carrier + LNG-Powered Ship

- **35% Market Share as of Mar. 2018.[159/474]**

Research & Design-lead Development

[1989-Present] Research & Design Development
[2000 - 2010] Bright Star, World Best[Highest Quality]
[2010-Present] Healthy Cash Cow



Harvard Business School

9-695-001

October 1, 1994

[Case study by Harvard Business School, 1994](#)

By 1994, DSHM had become one of the most efficient shipbuilding companies in the world. Probably more important, DSHM had recently benchmarked itself, and found its Okpo shipyard to be the fastest improving. Over the seven years between 1987 and 1994, Daewoo had built what many companies were still striving for: a plant that had learned how to learn—and was becoming better at it every day.

This case was prepared by Professor David Upton and Doctoral Student Bowon Kim as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation. Names and data have been disguised.

Beyond Innovation

[1990] VISION **90s**:

- Employees are **Full of vitality!**
- **Well prepared to transform shipyard.**

[1990] Revenue: 1.0bil. USD, No Profit

- **New Shipbuilding Concept, Design Change**

[1991] Revenue: 1.3bil. USD, Profit: 144mil. USD

- **1st year Business turned into the BLACK***

[1992] Revenue: 1.53bil. USD, Profit: 280mil. USD

- **10%* production share of the World**

[1993] **The World-best Builder of VLCC**

- **World Champion of Market Share**
- **Built 1st Submarine**

[1994] Revenue, 2.0bil. USD. 11,000 persons

Luck helps us.
Market recovered
from 1992.

Yearly Order in Mil. GT
[80s] 15.3 [91-95] 21.3
[96-00] 32.1 [2000] 45.0

『Critical Condition』 on 1988
The Place to start a MIRACLE



『Comfort Zone』
The Pathway to COLLAPSE

DSME BUILDING RECORD: 1,287 Projects delivered as of May, 2018

	Type of Project	No. of Project		Type of Project	No. of Project
Commercial Ship: 1,107					
1	Oil Tankers	387	4	Containerships	299
1.1	ULCC/VLCC	(181)*	4.1	Above 10,000TEU	(113)
1.2	Suezmax Tanker	(77)	4.2	5,000-10,000TEU	(71)
1.3	Aframax Tanker	(35)	4.3	Below 5,000TEU	(115)
1.4	Others	(94)	5	Bulk Carriers	193
2	LNG Carriers	123**	6	Ro/Ro, Car Carriers	64
3	LPG Carriers	37	7	Heavy Lift	4
Naval & Special Ship: 83					
1	Naval Ships	57	3	Ferries	10
2	Special Vessels	10	4	OSV	6
Offshore & Plant: 97					
1	FPSO	6	6	Semi-Rig	25
2	LNG FPSO	1	7	Drilling Barge	1
3	FPU	3	8	Drillship	22
4	TLP	4	9	Jack-Up	3
5	Fixed Platforms	30	10	Modular Plants	2

* Present fleet: 702 VLCC as of Apr. 2018

** LNGC+LND-Powered Ship: 159 of 474 in total, 35% Market Share as of Mar. 2018

Reference

Standard Program for Littoral Combat Ship



Frigate Principal Dimensions

Length overall	122 m
Max. Breadth	14.2 m
Draft	4.15 m
Complement	120 persons
Tonnage	3,100 Ton

[DSME, Special ship design]
Brief history on how they developed Design Ability

Design Technology	Learning Platform	Infrastructure
<u>Buy, Copy & Paste</u> [1980-1987] Learning from Mistake	① Fast Attack Craft ② Corvette for Korea Navy ③ OPV for Korea Coast Guard ④ Frigate for Korea Navy ⑤ Aux. Rescue/Salvage vessel , KCG	<u>Excellent Design Tools</u> ① Design Standard ② Design Library ③ Drafting Practice <u>Input Data for Production</u> ① Production Process ② Production Practice <u>Vendor Information</u> ① Technical Spec. ② Standard Drawings
<u>In-house Design</u> [1988-1994] Improving Design Ability	⑥ Diving support vessel for KCG ⑦ Destroyer I [135m, 3,800 Ton] ⑧ Submarine Rescue Vessel	
<u>Research & Development</u> [1995-] Design-lead Total Optimum	⑨ OPV for KCG ⑩ Frigate [Export to Bangladesh] ⑪ Destroyer II [150m, 5,500Ton] ⑫ Destroyer III [166m, 10,000Ton] ⑬ Frigate Batch II ⑭ Frigate [Export to Thailand]	Long time & labor[10 years, 10 projects] required to get in-house design ability with proper infrastructure.

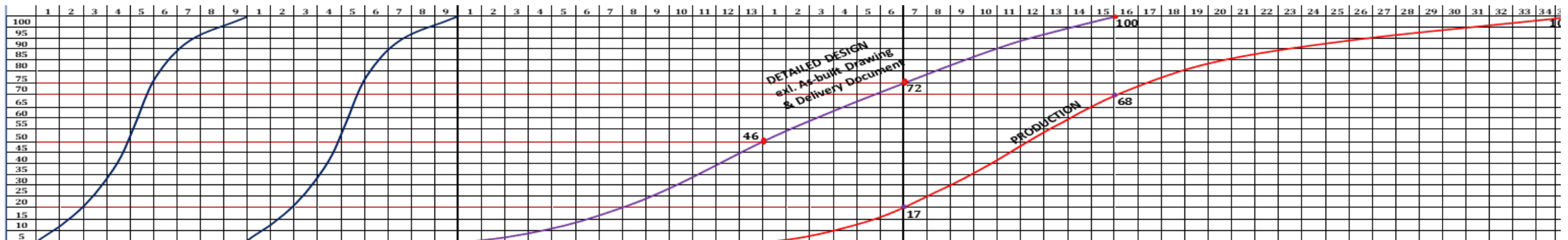
Standard Program for Building LCS

[based on Design-led Target-driving Optimization]

- 1) Standard Scheme of Total Project Realization [in case of Prototype project]
- 2) Standard Master Program of Initial & Basic Design
- 3) Standard Master Program of Detailed design & Production

1) Standard Scheme of Total Project Realization [Prototype]

Contract for Design		Contract for Shipbuilding			
Initial design	Basic design	Detailed design	Production		
9M	9M	13M	6M[Shop]	9M[Platform]	19M[Quay]
18Months		13Months	34Months ← High Speed		
18,000MD		35,000MD	140,000MD ← Best Productivity		



2) Standard Master Program of Initial & Basic Design

DISCIPLINE	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Design Stage	Contract for Design										Contract for Shipbuilding								
	Initial Design(9 months)																		
Key Activities with Client	Design Review(1st)										Design Review(2nd) & Interim Report								
	Budget Estimation & Review																		
	Equipment Listing-up				Review Tech. Specification and Approval by Client				Vendor selection				LOA with Vendor						
Basic Design	Review Ship Characteristics		Lines & Appendage Design(1st)			Report: General Arrangement & Stability													
	General Arrangement & Report(Concept)			General Arrangement(Initial)			Study and Report on Basic Performance				General Arrangement								
	Ship Charc. Trade-Off			Weight(1D)		Manning Study		Weight Estimation(3D)		Interim Report with Drawings			Weight Estimation(1st)						
	Basic Performance Criteria(Resistance /Ship Motion/Weight/Arrangement)			Speed Estimation(1st)		Lines(2nd)		Speed Estimation(2nd)		Sea Keeping/ Maneuvering		Risk Management/Human Engineering /Hazard/Safety Analysis							
Hull	Hull Structure Trade-off			Prel. Block Division		Appendage (Bilge Keel, Skeg)			Lines Fairing			Block Division							
	Structural Design Criteria			Structure Analysis & Key Plan(Prel.)															
	Hull Material Selection			Foundation Scantling															
Propulsion	Prop. Trade-off Study			Shafting Plan			Interim Report with Drawings			Report on P									
	Propulsion/Shafting Design Criteria			Machinery Space Arrangement(including JP-5, Exhaust Pipe)															
Electrical	Electrical Design Criteria				One Line Diagram														
	Power Generating, Power Supply System Trade-off, Electrical Load Analysis				Report on Electrical System														
	System Block Diagram				Control System Layout				Final Key										
	Study on Propulsion & Auxiliary Control System			Report on Control System				Interim Report with Drawings			Repo P								
Nav. & Comm.	System Design Criteria			Layout & System Diagram				Final Key Plan											
	Key Plan Drawing			Layout & System Diagram															
	Topside Configuration			Navigation/Communication System Study															
Auxiliary	Auxiliary System Design Criteria			JP-5, Exhaust Pipe Arrangement				Chilled Water Plant & Pump Room Arrangement											
	Auxiliary System Trade-off & System Study				Auxiliary System Diagrams & Arrangement				R										
Outfitting	Study on HVAC/NBC			HVAC/NBC System Diagram & Fan Room Arrangement															
	Study on Mooring & Storage System				Unrep/Helo System			Interim Report with Drawings		Re									
	Study on Access, Steering Gear & Anchoring System				System Design on Deck Machinery & Steering Gear System(Prel.)				Report on J										
	Study on Habitability, Office, Medical & Stowage					Arrangement of Accommodation, Store & Medical Space(Prel.)			Report on Habitability										
Weapon	Combat/Weapon Criteria				Interim Report with Drawings				Final Key Plan										
2-1) Summary of Program Activity																			
Main Area												ID		BD		Total			
Key activity												7		4		11			
Basic												17		10		27			
Hull												8		4		12			
Propulsion												5		3		8			
Electrical												9		7		16			
Nav. & Com.												5		4		9			
Aux.												5		3		8			
Outfitting												9		7		16			
Weapon												6		5		11			
Total												71		47		118			
Design Period												9M		9M		18M			
This is the Firm Basis of Engineering Management for Design-lead Optimization																			

This is the Firm Basis of Engineering Management for Design-lead Optimization

2-2) Complete set of Design Document				
System	System Description	Initial	Basic	Total
000	Basic	53	61	114
100	Hull	28	52	80
200	Propulsion	18	20	38
300	Electrical	34	70	104
400	Nav/Comm	41	66	107
500	Aux.	35	43	78
500/600	Aux/HVAC	66	69	135
400/700	Nav/Com/Weapon	22	26	48
Total		297	407	704

Including,

- Building Specification
- Comprehensive Material List
- Standard Master Program for Detailed design & Production

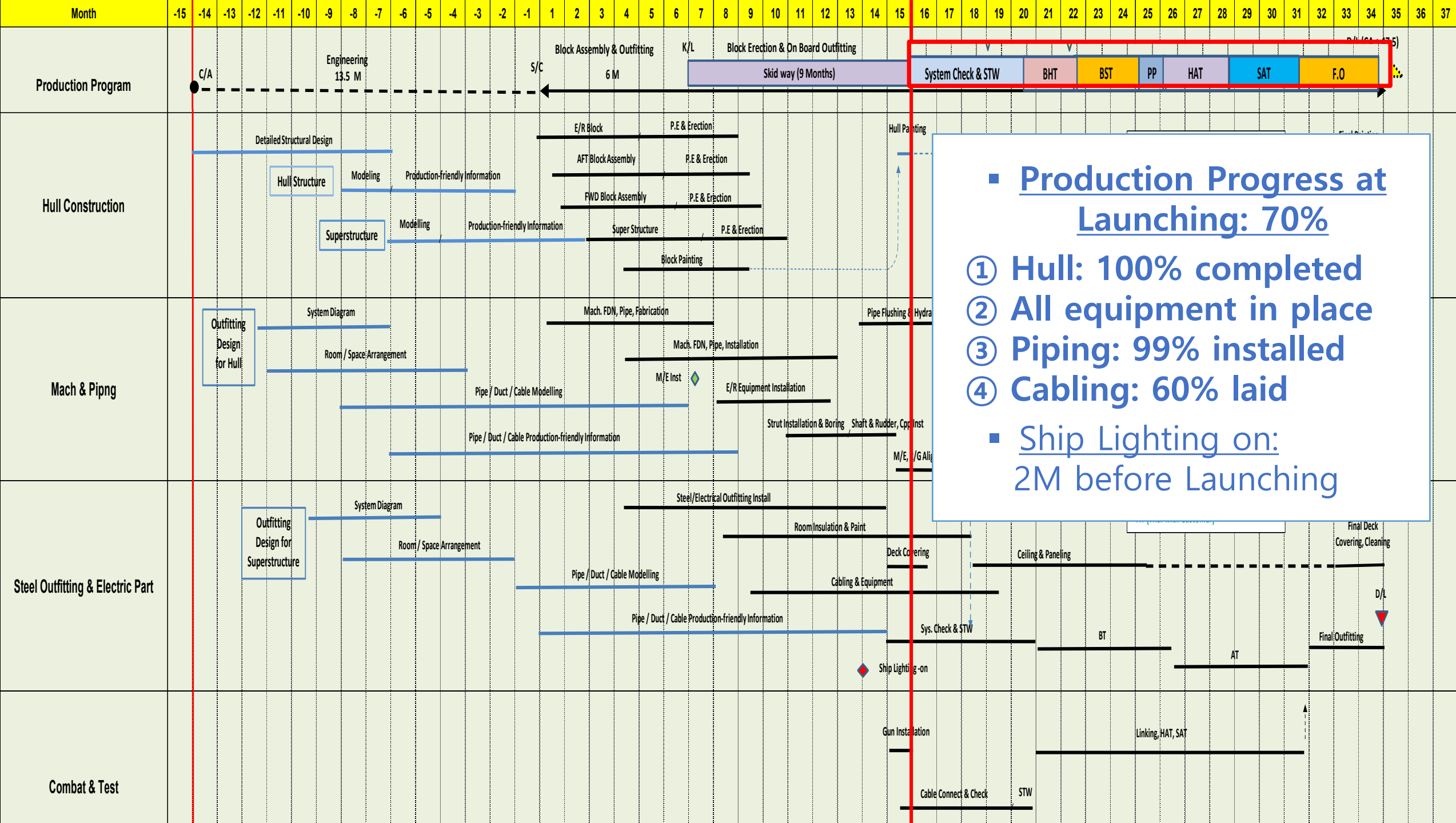
2-3) Initial & Basic Design driven by Target

Step I	Target setting [QCD] at Initial Stage	▪ Cost-effective Design at the initial design stage ▪ Advance Vendor Aligning with Initial design ▪ Production-Convenient Design for Efficient Production
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Typical examples of Target-setting at Initial stage

- 1st Review on 3rd month.....
① Ship's Basic Performance ② Vendor Specification ③ Production Method
- Refining Process for Optimization..... [7th month] ① Budget Estimation
② Vendor selection, [10th Month] ③ Block Division(Final)
- Setting Achievable Stretching Target on QCD.....
[16th Month] Final Budget Estimation

In 18 months for ID & BD, all basics are thoroughly reviewed, analyzed, refined and optimized.
Target is set on clear basis; How-to-do, what-to-do



Malaysia Maritime Industry

The Potentials!

We have BIG Potential- **Solid Platform & Good People.**

1) Domestic Demands: Springboard for home Industries to take a big leap to the Global Market

→ **OPV**[RMN, APM], **OSV**[Petronas], **OFV**[LKIM]

- **Prime water to get ground water**
- **Solid Learning Platform** to make leading shipyards competitive in the World

2) Good People in Shipyard & University

- Younger people in Shipyard have Hidden Potential & 'CAN-DO' Spirit within them.
- Confident Frontier in University

We expect that OPV Market is Rising.

Outlook of Market

[Projection of Market in Billion USD(year)]

- ① Offshore Patrol Vessel: **Optimistic Growth**
16.2(2014) → 20.7(2017) → **31.4(2022)**
- ② Offshore Support Vessel: **Poised for Growth**
20.0(2018) → **25.0(2023)**
- ③ Offshore Fishing Vessel: **Great Latent Demand**

Let's make
A Big picture.

Long-term Strategy

1) Review **Long-term Shipbuilding Program**[2019-2030]

Based on 'Planned and desirable' Domestic Demands for
① OPV, and possibly ② OSV ③ OFV

2) Set **Realistic Strategic Plan**

to make leading shipyards competitive in the World
building ① OPV, first of all, and then ② OSV, ③ OFV

Vision

Become 'World Best OPV Provider'

Mission

Export OPV

- Earn Foreign Exchange [= 'Real' Business]
- Take Corporate Social Responsibility for Wealth-making for the country. No Budget-spending Business.

Key to Success

[K1] Centralized Strong Driving Institution

[K2] Shared Vision, Long-term Strategy

[K3] Authentic & Visionary Leadership

[K4] Implant 'World-best' Technology

[K5] Complete Change of Behavior & Habits

Make the Future Today!