



Report on the Interim General Manager Project from October 2014 to January 2018

In Asia with high speed out of the price spiral: I know how it works!

1. Who was the client, and what was the sector?

The client came from the electric industry sector. He produces electric motors and controllers for applications such as material handling, aerial platform, windmills, hybrid electrical bus, high-power e-powertrain, agriculture and onboard-refrigeration. The client employs approximately 1,400 people in its five worldwide locations.

The client, a global leader in low-voltage inverters, was the first to produce 400,000 inverters per year. He has 55% market share worldwide. Furthermore, for electric motors he has a 42% market share worldwide with 280,000 motors per year. He also produces high-frequency chargers.

2. What was the situation in the beginning?

As the interim general manager, I reported to the vice president and to the board of directors of the group. The client bought entire unprofitable business from an American company, located in China. I realized following situation in the beginning:

- 1- Over capacity situation (lack of orders)
- 2- Undesirable customer satisfaction
- 3- Large proportion of raw material and WIP investment
- 4- Poor MCE (Manufacturing Cycle Effectiveness)
- 5- Batch production mode (insert coil process)
- 6- Too many quality issues
- 7- 5S insufficiency
- 8- Excessive overtime
- 9- Very low daily output quota
- 10- Management is not on Gemba
- 11- High management attention (too much meeting and firefighting)
- 12- Low working morale

3. What was the order?

Restructuring and business development of the client's plant. This unprofitable business needed to be turned around within short time, relocated from former factory to a new one, build up the relationships with current clients, local government, stakeholders, suppliers and employees. Most of the employees had been sold by the former company and couldn't be used or had to be either trained and developed or released, whereas unprofitable business columns needed to be investigated and new business plan to be developed.

Not only the employees but also the old, imprecise machines needed to be repaired, maintained or replaced by new state-of-the-art ones. Skills in manufacturing, engineering and purchasing must be developed in order to meet targets with respect to quality, time and cost.

4. What did you need to change?

First of all, to increase net profit, which means Sales- Cost. If sales are fixed, in order to increase net profit, the only way is saving cost. I believed that the resource standing idle was a major waste.



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But for a long time, resource utilization and efficiency has been the prime operational measurement in production.

I raised the question, “Why should the customer choose us?” It must be if we have customer-perceived value. Generally, customer-perceived value includes quality, price, technology, OTD and rapid delivery capability.

So, can we obtain order or even increase them? We must meet one or more significant sustainable customers demand beyond competitors and it is difficult to achieve within a short period of time.

This is called DCE (Decisive Competitive Edge). For details, see <https://www.toc-goldratt.com/en/topic/decisive-competitive-edge-dce>

So, I needed to change the KPIs for sales and for production, and motivate staff to work for these goals.

5. How did you step in this task? How did you measure the change management in manufacturing?

We defined value for customers: A very short lead time with 100% OTD. Therefore, we measured the lead-time trend and data.

We defined the value stream in order to understand and assess the logic and process for creating value for external and internal customers. Therefore, we installed CONWIP, which means constant work in process and is part of the pull-oriented production-control system. For details, see <https://en.wikipedia.org/wiki/CONWIP> . We measured Work in Progress trend and data, and we created a Value Stream Management/Mapping VSM board.

To have a smoothly flow,

- I requested a regular Muda shooting result and improvement report
- We measured Productivity with Throughput by Operators
- We installed one-piece-flow OPF, where possible.
- We trained our operators to become Multi-skill operators
- **We changed from Push to a Pull system:** First, we defined a pacemaker process to eliminate the Bottleneck. With the Pace-maker process, we calculated monthly the Overall Equipment Effectiveness OEE.

For continuous improvements, we installed a process of ongoing improvement (POOGI) which is a five-step focusing process. For details, see <https://www.tocinstitute.org/five-focusing-steps.html>. Our constraints were trained operators, the installation of quality checks, preventive maintenance, Monitor OEE and improvement over time.

We measured the following KPIs in manufacturing, for example:

- We measured the Internal Business Process Performance by Manufacturing Cycle Efficiency MCE. For details, see http://www.accountingexplanation.com/manufacturing_cycle_efficiency_mce.htm
- TPS kaizen project report
- First Pass Yield FPY trend and data



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- For each investment, we calculated the ROI (Return on Investment)
- Furthermore, we measured our inventory turnover
- Cycle time of each operation

And a lot of others for the departments in charge of quality, EHS, engineering, maintenance, the supply chain, finance, HR and IT.

All staff were trained in Lean tools, Lean culture. At HR, we installed a talent development program.

Right from the beginning, we always try to achieve win-win between short-term and long-term benefit; Achieve win-win between customer and us; and achieve win-win between employer and employees

6. What were the challenges? Which new methods and processes did you place in?

For example, one of our challenges was the **FORECAST from customers**, which wasn't accurate. If forecast too high, we had a cash backlog, and the large investment in a slow mover would have resulted in dead stock.

If the forecast was too low, we lost sales or the chance to capture the market.

Our Solution here was: DBM (Dynamic buffer management) + R&R (Rapid replenishment).

DBM works in a similar way to forecasts, meaning it looks back to the past to deduce the near future. However, DBM looks only to the very recent past and considers only the actual state of the on-hand stock. For details, see the Internet article:

<https://elischragenheim.com/2017/01/17/dynamic-buffer-management-dbm-the-breakthrough-idea-and-several-problems-to-solve/>

Dictionaries define Replenishment as "refilling by supplying what has been depleted." Rapid replenishment, as an attempt to micro-match supply and demand, particularly if your Supply Chain velocity is too slow. See Chapter 4.1 in

<https://dspace.mit.edu/bitstream/handle/1721.1/40109/184986299-MIT.pdf?sequence=2>

For example, transportation smoother everyday volume due to more frequent deliveries, creating routines which are easier to plan. For example, instead of five trucks going out twice a week to replenish non-promotional inventory, you can deliver one truck to each customer warehouse every day. Shorter delivery time makes the performance of the transportation group more dependent on upstream resources, such as inventory availability.

Main problems at warehouse which would prevent a full-scale rollout of rapid replenishment include "a limited number of forklifts," "a limited number of forklift drivers," "a lack of staging space for collecting orders prior to ship" and "inventory availability, "focusing on case-fill metrics as opposed to asset-utilization metrics.

The next challenge was the **decision-making process**. The management of any organization (particularly those characterized by complexity and uncertainty) has to make, every day, important decisions (e.g., whether to accept a new project with very challenging due-dates and/or requirements; whether to hire additional people or make a substantial investment, etc.) that can and will most often impact the organization as a whole and specifically its financial performance and even viability.



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For decision-making, we changed from traditional Cost Accounting, which focus on cost reduction, to throughput accounting, which primarily focuses on generating more throughput. Conceptually, throughput accounting seeks to increase the speed or rate at which throughput (see definition of T below) is generated by products and services with respect to an organization's constraint, whether the constraint is internal or external to the organization. Throughput accounting is the only management accounting methodology that considers constraints as factors limiting the performance of organizations.

Decisions were based on performance measurements that use Throughput ($T = \text{Sales} - \text{Totally Variable Cost}$), Operating Expense (OE) and Investment (I), which lead to better decisions at all levels of the company.

Details see

https://en.wikipedia.org/wiki/Throughput_accounting, https://dralanbarnard.com/pdf/Theory_of_Constraints_Throughput_Accounting.PDF,

A third challenge is how to use Rapid delivery capability to expand market. It means, Value need to be created by removing a significant limitation for the customer, in a way that wasn't possible before, and to the extent that no significant competitor can deliver.

Here, we expand our constraint from one shift model to 24/7 with a three-shift model within few weeks and could expand our delivery capability over 300%, which allows our customers to place more orders and got it in time with zero defects. We got high customer satisfaction rating and even more orders.

7. Except these you mentioned, what other items you put on your roadmap at that time?

- 1) To shorten the lead time
- 2) Defined the pacemaker process and changed to the pull system
- 3) Continuous improve buffer status with buffer management
- 4) POOGI (as focused on five steps)
- 5) Value-stream analysis and mapping
- 6) Define standard work with work description of each manufacturing step
- 7) Changing attitude to Lean mindset, go to GEMBA every day
- 8) Focusing on 5S in shop floor and office

8. Ultimately, which improvements in performance did you achieve? What did you not achieve? Were the employees and your client satisfied?

The assignment was extended several times due to the excellent value being gained.

As well as negotiating new global supply deals, I prepared a future work plan for the client's procurement team so as to ensure further progress could be made and that the arrangements negotiated were sustainable. The cost of hiring me was entirely self-liquidating.



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The headcount reduction with respect to the manufacturing and finance departments, while ramping up the supply chain, quality and maintenance departments were completed on time, and I went on to find further synergies and cost savings.

In generally, my activities were following:

- Build-up of efficient organizational structure and high-performance organization
- Business expansion of sales, marketing and aftersales.
- Cost reduction activities by supply chain improvements,
- installation of Lean office and Lean production, Toyota Production System TPS, Kanban, VSA/VSM and Andon
- Installing a Manufacturing Execution System MES.

I participated in international conferences in US, Sweden, Germany and Italy to share my knowledge, success and to get new group instructions.

The following departments reported directly to me: engineering, manufacturing, maintenance, TPS, supply chain, IT, finance, HR, quality and SQE.

Due to my long work experience in China in purchasing, tool shop, project management, Lean and quality management, with my team, client could confirm. I have **achieved following outstanding results** (extract):

Quality Management

- External generator customer failure occurrence frequency (six months rolling) reduced from 4,261 to 0.
- External controller customer failure occurrence frequency reduced from 1,657 to 0.
- Internal failure occurrence frequency reduced from 117,845 to 16,413 (-86%)
- Customer field returns reduced from 56 generators to 0.
- Scrap rate reduced from 704,000 RMB/month to 13,000 RMB/month (-97%)
- Company passed all 9001/18001/14001 audits at the first step.

Manufacturing and Maintenance

- Production line productivity increase from 9.36 to 12.86 pieces/operator/day (+38%)
- Flowability at generator line increased from 12.2 to 6.1 days per part.
- Problem-solving workshops increased from 0 to 6 per year.
- Utilization ratio of machines increase from 84% to 92.5%.

Sales and Finance

- Sales volume increased from 97 million RMB to 130.5 million RMB (+30%)
- Operating profit increased from 56,000 to 2.6 million RMB/month
- Total labor costs reduced from 210 to 168 TUSD/month

Human Resource

- Headcount reduced from 143 to 117 (-18%)
- Absenteeism reduced from 8.02 to 0.48% (-93%)
- Staff turnover rate reduced from 6 to 3.6% (-40%)
- Number of realized improvements by implemented suggestion system increased from 0 to 283.



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9. In quality management, how did you get External generator customer failure rate (6 month rolling) reduced from 4261 to 0?

We established a lot of steps, for example:

- **5S Red card labelling.** Every morning at plant tour of the shop floor, a marked area with red labelled products is checked by management and decided what to do. For details, see: <https://enna.com/learning-center/using-the-steps-for-5s-red-tagging/>
- **Regular daily kaizen report.** We use an Asaichi meeting in the morning after plant tour. Reports are filled in by department and presented to management team. It is mentioned problem, root cause, solution, responsibility and due date. The kaizen approach consists of five fundamental elements: teamwork, personal discipline, improved morale, quality circles, suggestions for improvement. Toyota has been using the kaizen approach to improve processes, tools, and skills to optimize productivity, safety (reduce risks), quality, deadlines, costs, working conditions, value collective intelligence and decompartmentalize skills, reduce waste (to improve inventory management). For details, see <https://www.appvizer.com/magazine/collaboration/kaizen-approach>
- **Structured A3 Report** is a tool for root-cause analysis. We place all reports on Asaichi meeting boards for review. An A3 reports—and more importantly the underlying thinking—play more than a purely practical role; they also embody a more critical core strength of a Lean company. A3s serve as mechanisms for managers to mentor others in root-cause analysis and scientific thinking, while also aligning the interests of individuals and departments throughout the organization by encouraging productive dialogue and helping people learn from one another. The DIN A3 format is divided into seven steps. (1) establish the business context and importance of a specific problem or issue; (2) describe the current conditions of the problem; (3) identify the desired outcome; (4) analyze the situation to establish causality; (5) propose countermeasures; (6) prescribe an action plan for getting it done; and (7) map out the follow-up process. For details, see: <https://sloanreview.mit.edu/article/toyotas-secret-the-a3-report/>
- We **evaluated TOP kaizen employees** and award them. They can present their show cases, before and after implementation, at townhall meetings.
- One of our main internal problems was embodied by lead-wire damage defects. So, we established a list of weak points with background, key process defect cause, potential quality risks and kaizen injection, actions and follow-up with the owner, and due date). For details, see https://www.researchgate.net/figure/Weak-points-of-the-lean-production_fig5_284158989
- **Statistical Process Control SPC charts.** We used SPC charts to determine if an improvement is actually improving a process and also use them in order to statistically predict whether a process was capable of meeting a target. With control charts we see the results of a stable, controlled process because the variation is



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predictable. For details, see [https://qi.eft.nhs.uk/wp-](https://qi.eft.nhs.uk/wp-content/uploads/2020/03/how-to-use-statistical-process-control-spc-charts.pdf)

[content/uploads/2020/03/how-to-use-statistical-process-control-spc-charts.pdf](https://qi.eft.nhs.uk/wp-content/uploads/2020/03/how-to-use-statistical-process-control-spc-charts.pdf)

- **Validating two measurement systems for problem-solving.** Depends on customer requirements, what they want to get according to their approval system.
 - o **Gage RR (Six Sigma concept):** A gage R&R has two operators measure 10 parts two times. Through this we obtain a percentage of how much your measurement process (repeatability + reproducibility) contributes to your total variation (10% is good). For details, see <https://www.six-sigma-material.com/Gage-RR.html>
 - o **ISOPLOT (Shainin concept):** An Isoplot is used to compare the relative size of the process and measurement system families of variation. In its simplest form, 30 units are selected, and each unit is measured twice [6]. This method is used to analyze that the resulting variation in the process is either due to the process or the measurement system.
However, the standard process is more complicated: An operator measures 10 parts in order, then proceeds to randomly and blindly remeasure the same parts. Then, those 20 data points are plotted on a graph. The first measurement of each part goes on the X axis, the second trial goes on the Y axis. Thus, you obtain a scatter plot with a best-fit line going through the middle. As you can probably guess, the higher r^2 value, the better the measurement system. However, shainin doesn't consider the r^2 value. A hotdog shape is constructed whereby the data is generally around that best-fit line. The diameter of the hotdog is determined by the point farthest from the best-fit line and is drawn symmetrically about the line. So, if you have an invalid measurement system, you'll end up with more of a sausage than a hotdog...maybe even a hamburger. The criteria for passing: The distance of the hotdog divided by the diameter of the hotdog must be greater than 6 (as an estimate).
so what are the differences? The Isoplot doesn't consider reproducibility (possibly not a huge issue depending on what the measurement system will be used for). From what I've deciphered, the biggest discrepancy between the two is that in an Isoplot, your measurement system is only as good as the biggest difference between two of the parts you measured (i.e., if the operator measures nine of the parts and gets exactly the same reading, then on the tenth, totally blows it, you fail with the Isoplot), whereas a gage R&R may be more forgiving and consider all of the trial runs. For details, see https://www.researchgate.net/publication/301561265_Simplifying_Six_Sigma_Methodology_Using_Shainin_DOE
- **First in, first out (FIFO)** results in lower waste (a company that truly follows the FIFO method will always move the oldest inventory first), which means greater profitability. For details, see <https://www.investopedia.com/terms/f/fifo.asp>

10. How did you reduce the external controller customer's failure occurrences from 1,657 to 0?

Solutions:

- **Supplier development:** We went to our PCBA supplier, discussed failure rates with him. Together investigated root cause, found solutions and eliminated field arc failures. We went to our plastic housing supplier, discussed tensions and breaks in warm and hot plastic material, changed the granulate composition and design to eliminated problems at field. For details, see <https://www.industrystar.com/blog/2018/03/8-advantages-supplier-development/>



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- **Replacing suppliers.** Finally, we changed Supplier who delivered resistances as failure rate couldn't be reduced or eliminated. Nowadays, suppliers need to focus on customers' needs to stay in business, if they aren't monopolists. There are five reasons to change manufacturing suppliers: **1. Better Price, 2. Reliability in Quality and Deliveries, 3. Geographical Proximity, 4. Know-How, 5. Better Collaboration.** Details see / <https://www.spotlightmetal.com/what-are-automotive-suppliers-basics-ranking-and-examples-a-802457/> <http://knowledge.panxpan.com/articles/five-reasons-to-change-manufacturing-suppliers>
- **ESD floor/clothes/shoes control and recording.** It is very important for staff to be disciplined in passing ESD test stations to eliminate any static discharge within EPA (ESD protected area). You can put failure rates into operators' KPI or install surveillance cameras. Most important is to create a guideline first, which needs following items:
 - Only handle unpackaged ESD sensitive items [ESDS] in the ESD protected area [EPA] when grounded
 - Only allow trained or escorted people in the EPA
 - Ground all conductors including people in the EPA
 - Use continuous monitors or test wrist straps at least daily
 - If ESD footwear is used, test at least daily
 - Visually confirm that grounding cords are connected
 - Keep wristband snug, foot grounder grounding tab in shoe, and ESD smocks covering all clothing on torso

11. How did you reduce the customer field returns from 56 generators to 0?

Our Solutions are following:

- First, you need to make sure that new **CAD design** and each modification is made for manufacturability, assembly and cost-based design. You need to check tolerances so that they're neither too tight nor loose. Both extreme cases can create noises in the customer's application.
- **Poka-yoke/Error proofing:** Poka-yoke refers to the act of error-proofing a process through excellent design. Error-proofing in this case is a quality assurance technique that ensures quality is in-built and results in better products. After we had several cases of wrong or missing screws and upside-down washers at the assembly station, we use Poka-yoke to use the right screws and proper assembly of washers. For Details see https://en.wikipedia.org/wiki/Poka-yoke,_or <https://leanfactories.com/poka-yoke-examples-error-proofing-in-manufacturing-daily-life/>
- **Five-piece counting at the assembly station:** To prevent operator to forget one piece at the assembly station, there is a trick. The warehouse handler is involved and will, during his milk-run tour of the shop floor, check the counts of parts in the corresponding boxes. Out of these boxes, operator uses only five parts of each and



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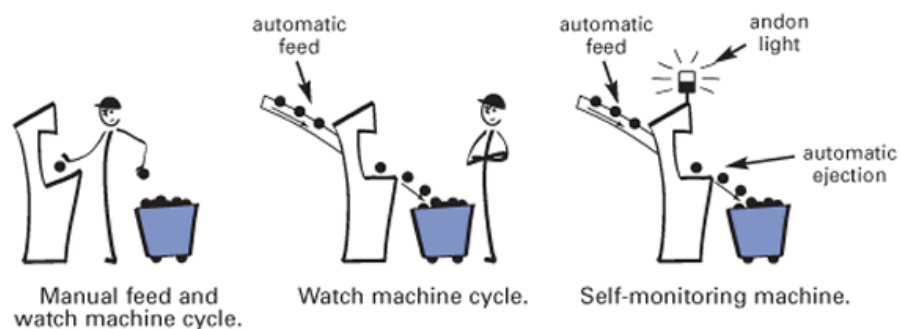
put it in front of him. Following the assembly of five parts, he or she continues with five more pieces.

12. In quality management, how did you reduce the internal failure occurrence frequency from 117,845 to 16,413 (-86%)?

Here again, we used several ideas in our daily continuous improvement process:

- Regular in-house training of operators and engineers by our TPS manager, who was hired by me.
- Permanent check and improvement of fixtures, which were made by the Total Productive Maintenance department, which I established. Generally, they worked and repaired on weekends and idle times of production. They had a new workshop with lathe, drilling and milling machines to avoid external work, which caused project delay and cost increase in the past.
- For milling stacks on a big CNC machine, the setup man and operator regularly checked programming to ensure that the dimensions were identical to the drawings.
- For automatic dimensional checking of parts at CMM machines coming from suppliers as well as motors assembled in-house, operators in the testing room used programs to ensure that the dimensions are identical to those of the drawings.
- Regular checking and updating of work instructions for operation and repairing, which are taught through regular in-house training and examined at three-month intervals. Operators who fail tests on WI, weren't allowed to work in this workstation.
- Regular unplanned daily controlling of what is going on the shop floor created high awareness of operators and managers for cleanliness, 5S, quality and focus on work.
- Especially shopfloor staff had no sense for productivity and played at mobile phone during working time. We set some regulations of mobile phones and installed surveillance cameras to control regulations.
- To reduce failure rates by manual operations, JIDOKA was installed at some workstations.

Jidoka sometimes is called *autonomation*, meaning automation with human intelligence. This is because it gives equipment the ability to distinguish good parts from bad autonomously, without being monitored by an operator. This eliminates the need for operators to continuously watch machines and leads in turn to large productivity gains because one operator can handle several machines, often termed *multiprocess handling*.



Details see <https://www.lean.org/lexicon/jidoka>



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- **Root-cause analysis:** Root Cause Analysis is great for decision-making. It saves time and costs in the process of solving problems. Quality management team took the lead to organize workshops with other departments to solve problems in time. The 5 Best Tools for Root Cause Analysis: The 5 Whys, The Challenger Interview, Role Playing, Flowcharts, The Fishbone Diagram. Fishbone factors contributing to defect are measurements, material, personnel, environment, methods, machines. For details, see: <https://upskillnation.com/root-cause-analysis>
- **DOE (Design of Experiments):** Correctly designed experiments advance knowledge in the natural and social sciences and engineering. Other applications include marketing and policy making. In its simplest form, an experiment aims at predicting the outcome by introducing a change of the preconditions, which is represented by one or more independent variables, also referred to as "input variables" or "predictor variables." The change in one or more independent variables is generally hypothesized to result in a change in one or more dependent variables, also referred to as "output variables" or "response variables." The experimental design may also identify control variables that must be held constant to prevent external factors from affecting the results. For details, see https://en.wikipedia.org/wiki/Design_of_experiments

13. How did you reduce the scrap frequency from 704,000 RMB/month to 13,000 RMB/month (-97%)?

To pay more attention to scrap reduction, we found following solutions:

- **From batch operation to one-piece-flow operation:** In batch manufacturing, skilled employees carefully craft the product at each step of production. Employees are skilled in the use of their workstations, and the mastery of their skills results in quality products. Each piece of the batch requires proper completion, and there is a demand for inspection and quality management before the following stage of manufacturing can begin. However, **one-piece flow** means that parts are moved through operations from step-to-step with no work in process in between; either **one piece** at a time or a small **batch** at a time. Once work on a product begins it never stops moving until it's a finished product. Because of the labor rate is low, the cost of production decreases. One-piece flow production is extremely quick and efficient. Each piece on the manufacturing process moves along with no wait time. Quick production means customers will receive the finished goods in a timely manner, and you can fulfill more orders in your workday. Who made mistakes is very transparent, and everybody like to avoid. More Pro and Cons, see <https://cetecerp.com/blog/one-piece-flow.html>
- All **production cell teams are responsible for quality check:** The team choose one person to be responsible for it. Documentation and signature is needed at each exit check and every entry check. Surveillance cameras and a bonus system are installed to control the process.
- **Maintenance:** A new hired maintenance team with a new installed workshop is responsible for repairing in-house to avoid outside repair scrap, high repair costs



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and time delay. For example, fixtures, welding machines, cleaning machines and glue-injection machines.

- **Total Productive Maintenance (TPM)**: Preventive maintenance delegated to operators and production cell team to maintain and improve fixtures, welding machines, cleaning machines, glue-injection machines.
- **Engineering** got new bonus relevant tasks:
 - Permanent updating work instructions. Operators need to follow WI, perform regular preventive WI checks, and prepare for training and tests of Wis;
 - Reduce surge failures by root-cause analysis;
 - Reduce lead-wire damage by root-cause analysis;
 - Investigate resistance balance failure at test station 3 by root-cause analysis;
 - Investigate black-cap damage by root-cause analysis;
 - Investigate Arc 6 (Gen6) failure by root-cause analysis;
 - Reduce the raw-material scrapping of slot paper; and
 - Reduce the raw-material scrapping of copper wire and others.

14. How did you manage to pass all 9001/18001/14001 audits at the first attempt?

The following steps were taken:

- We selected a qualified, motivated coordinator. She had project-management skills and performed follow-up on each action with time management.
- I, as a GM, was involved in each quality-management topic and decision-making meetings.

15. At the manufacturing department, how did you increase the line's productivity from 9.36 to 12.86 pieces/operator/day (+38%)?

We found following solutions:

- **Water spider**: The term “**water spider**” (or mizusumashi) is a phrase used in Lean **manufacturing**. It refers to a person in a warehouse or **production** environment who is tasked with keeping workstations fully stocked with materials, thus ensuring the continuous flow of productivity. For details, see <https://kanbantool.com/kanban-guide/water-spider>
- **Go Gemba and see Muda (waste)**: During the plant tour, the quality engineer took photos of problems, described and defined owner and action until the results were confirmed. There were seven forms of waste to eliminate: overproduction, waiting, transport, overprocessing, inventory, motion and defects. For details, see <https://www.mudamasters.com/en/lean-production-theory/toyota-3m-model-muda-mura-muri>



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- **Limit overproduction:** Avoid overproduction by making things only as quickly as the customer wants. Just-in-time inventory lets you hold the minimum stock required to keep your business running. You can order what you want for your immediate needs and limit overproduction by only producing what is needed, when it is needed. For details, see <https://blog.cpsgrp.com/nehp/8-wastes-of-lean-construction-overproduction>
- **Establish a Kanban pull system:** A pull system reduces waste in the production process. This kind of system offers many advantages, such as optimizing resources, increasing flow efficiency, and more. We used Kanban cards and supermarket stations. For details, see <https://kanbanize.com/lean-management/pull/kanban-pull-system>
- **Weekly WIP inventory trend analysis:** If you have high WIP, it slows down your cash flow. If you don't have cash, you can't invest. High WIP also generally means longer lead times and more opportunities for mistakes in the production process. Lean production is all about eliminating waste; about producing what is needed and when it is needed. For details, see <https://productoo.com/solution/reduce-wip-inventory-reduction/#:~:text=If%20you%20have%20high%20WIP,and%20when%20it%20is%20needed.>
- **Cash distribution:** We had a lot of cash, but we needed to distribute and to reduce idle cash. We invested in semi-automated machines, R&D and a new production line to make new products for the future market. So, our accounting entry for distributions is a debit to account called Distributions and credit cash. For details, see <https://smallbusiness.chron.com/effect-cash-distribution-balance-sheet-24416.html>
- **Kaizen projects:** We established kaizen projects (critical, noncritical, routine work) as a method of management Improvement in small production companies. In a nutshell, kaizen is a never-ending process of improvement and change for the better. For details, see https://www.researchgate.net/publication/276511504_Kaizen_as_a_Method_of_Management_Improvement_in_Small_Production_Companies
- **Regular standard work update** to get following advantages: Reduced variability, enforcing standardized work increases efficiency, thus making more time for creative work, increased safety and continuous improvement. First, we collected data on current operations, then noticed variations and issues, found the most efficient way to run operations, documented everything and adapted our training programs. Finally, we implemented constant improvement with respect to the standard. For details, see: <https://tulip.co/blog/lean-manufacturing/what-is-standardized-work-and-how-to-apply-it/>
- **Single-Minute Exchange of Die (SMED):** All employees involved in the changeover process had been trained and had buy-in for the change. The process had been a bottleneck in the overall operation, meaning changes would have immediate impact. Our bottleneck operation was the slow painting process, which required improvement. We took videos to investigate details and find improvements. Elements that are currently internal, could be made external. In this final step, the internal elements were simplified to take less time. For details, see:



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- **One-piece flow (OPF):** Everything is constantly progressing and only one item is in any given queue at a time. our work was completed faster and that saved money both due to the time and space you free up. First, using one-piece flow can make your final results higher quality than if you tackle them in bulk. For details, see <https://www.process.st/one-piece-flow/>
- **TOC (Theory of Constraints):** TOC is a management paradigm that views any manageable system as being limited in the achievement of its goals by a very small number of [constraints](#). There is always at least one constraint, and TOC uses [a focusing process](#) to identify the constraint and restructure the rest of the organization around it. TOC adopts the common idiom "a chain is only as strong as its weakest link." This means that processes, organizations, etc., are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome. The five focusing steps are taken to ensure ongoing improvement efforts are centered on the organization's constraint(s). In the TOC literature, this is referred to as the [process of ongoing improvement](#) (POOGI).
 - **Operations**

In the context of manufacturing operations and [operations management](#), the solution seeks to pull materials through the system, e.g., Kanban, as opposed to push them into the system.
 - **Supply chain and logistics**

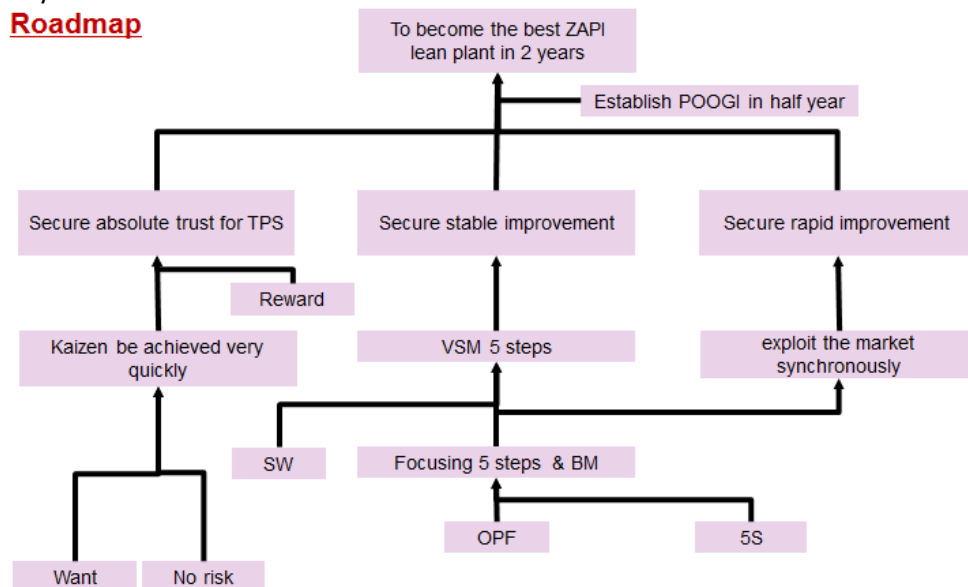
Generally, the solution for supply chains was to create flow of inventory so as to ensure greater availability and to eliminate surpluses in warehouse entry and exit, but you need some buffers (see project management).
 - **Project management**

[Critical Chain Project Management](#) (CCPM) was used in this area. It's based on the idea that every project looks like an A-plant, in which all activities converge to a final deliverable. As such, in order to protect the project there must be internal buffers to protect synchronization points and a final project buffer to preserve the overall project.
 - Details see <https://www.tocinstitute.org/examples-of-constraints.html>, https://en.wikipedia.org/wiki/Theory_of_constraints, https://en.wikipedia.org/wiki/Theory_of_constraints#The_five_focusing_steps
- **Multiskilled operators:** We introduced this opportunity to workers and gave them outlook in additional bonus and salary after training and examination. For details, see:
- **Team-building events such as** external training, mountain hiking, tug-in-war competitions, table-tennis-, badminton-, and soccer-tournaments, helped to bind people together, helped each other and took care of each other. This motivated and increased working efficiency drastically.



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- **Process stability:** Process stability could easily be determined using [control charts](#). Processes that are "out of control" need to be stabilized before they can be improved. **Special causes require immediate cause-effect analysis to eliminate the special cause of variation.**
 - **Process capability:** The [histogram](#) is the correct tool with which to analyze [process capability](#). The QI Macros histogram will calculate the process capability measures (Cp, Cpk, Pp and Ppk) based on your data and on the specification limits. For details, see <https://www.qimacros.com/lean-six-sigma-articles/stability-analysis-vs-capability-analysis/#:~:text=Process%20stability%20can%20be%20easily,are%20calculated%20from%20the%20data.>
 - **Visual management:** This is a way to visually communicate expectations, performance, standards or warnings in a way that requires little or no prior training to interpret. We used scoreboards, qualification and bonus boards. Even 5S boards can be used for visualization if tools and gauges are missing. <https://www.100pceffective.com/blog/what-is-visual-management/#:~:text=Visual%20management%20is%20a%20way,all%20sorts%20of%20everyday%20scenarios.>
 - We created TPS and FP **to-do lists** for follow-up, then we trained our staff to focus on the Eisenhower diagram. To work on important and urgent tasks, we had to stay focused and use time management. For details, see https://nlctb.org/tips/increase-your-productivity-at-work/?gclid=CjwKCAiAjeSABhAPEiwAqfxURUmogJWLHIZJ5_HXt1h5Dm05Ti1_twZUJktxrp6kX-wYAfobF2pA7hoC6MoQAvD_BwE
- Summary and roadmap of all steps needed to become the best Lean plant in the group within two years:





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16. How did you manage to increase flowability at the generator line from 12.2 to 6.1 days per part?

Our Solutions were:

- **Flowability control** (including WIP trend): Improved flow (or equivalent lead time) is a primary objective of operations. Once the root causes of the constraints were identified, the solution required some changes in the production process. It required a total re-design of the equipment, methods and layout of the work area. Employees needed to be retrained in order to understand the improvements. It also required a process to be monitored on a regular basis so as to track and trend its performance over time. For details, see <https://leanmanufacturingcoach.com/lean-model/>, <https://leanmanufacturingcoach.com/step-4-improve-process-flow/>
- **Improve throughput time**: We eliminated throughput bottlenecks with increased manufacturing safety. Then reduced the part-rejection rate by improved employee training and using factory automation, where possible. We also put prototype build on a separate production line, not to interfere with serial production. For details, see <https://www.marlinwire.com/blog/improve-manufacturing-throughput>
- **Reduction of manufacturing WIP**: First, we forecasted and calculated WIP Levels where upon we shared capacity, adding machines and improved workforce, JIT (Just-in-Time) production, time savings and the allocation of the right operators. Benefits **from WIP reduction were** obtained through the use of extra machines or process improvements that reduced defects and produced more at a given time, among other things. The company policy, which encouraged departments to work well together for the benefit of the enterprise as a whole, also had a positive impact on WIP. For details, see <https://www.qualitymag.com/blogs/14-quality-blog/post/92258-five-techniques-for-reducing-manufacturing-wip-lean-six-sigma-project-opportunity>
 - **Just-in-Time Production (JIT)**: We were able to manufacture the products that the clients wanted at the desired quantities, just when they needed them. JIT depended on the utilization of control cues in inventory to indicate the need to produce products from raw materials. The outcome was a very large reduction in WIP and other issues such as overproduction and inaccurate inventory. For details, see https://en.wikipedia.org/wiki/Just-in-time_manufacturing
 - **Time savings and allocating the right operator, including:**
 - **Manufacturing lead-time reduction**: How can you reduce manufacturing lead time? We ordered smaller amounts more frequently. Larger orders took longer to fulfill and ship. Then made a clear lead-time contract with customers, which we kept what was promised by automation of our inventory management and let our suppliers know about sales data. We had a weekly follow-up about TPS status, flowability status and WIP trends. For details, see <https://www.tradegecko.com/blog/supply-chain-management/why-reducing-manufacturing-lead-times-is-vital-for-your-business>
 - **Value-stream analysis and mapping**: This VSA/VSM illustrated the necessary process steps that existed from order entry to final product delivery and was useful for gaining a wide-reaching view of the company's activities. It allowed us to remove nonessential activities that



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created waste while maintaining the manufacturing process. For details, see <https://asq.org/quality-resources/lean/value-stream-mapping>

- **Takt management:** Takt time is the rate at which we had to complete a product to meet customer demand. Takt time was our sell rate and was categorized as the heartbeat of our work process. It allowed us to optimize our capacity in the most appropriate way to meet demand without keeping too much inventory in reserve. For details, see <https://kanbanize.com/continuous-flow/takt-time>

Summary: For a long time, resource utilization and efficiency had been the prime operational measurements in production. We changed our target to flowability, because of increasing productivity (calculated by Throughput (T) divided by operation expenses OE), increasing inventory turnover (calculated by Throughput (T)/Inventory), increasing cash flow (as throughput value T minus Operation expenses OE minus inventory increases), increasing sales output (finished goods) by Input TVC (total variable costs) + Throughput value (T), shorter ROI by (Throughput value (T) minus OE) /Investment

We aligned our organization to our goal by distinguishing between three operational measurements:

- **Throughput:** The rate at which the system generates money through sales as the net of variable costs. This corresponds to the value added by the system.
- **Inventory:** All the money that system has invested in purchasing things which it intends to sell. This was later expanded to include all investment such as plant, property, equipment, etc.
- **Operating expense:** "All the money the system spends in order to turn inventory into throughput." These fixed costs, such as rent and salaries, are incurred regardless of whether throughput increases or decreases.

Details see <https://www.tocinstitute.org/toc-applications.html>, <https://www.vistem.eu/>,

17. What kinds of Six Lean culture problem-solving workshops did you install and lead on a yearly basis?

1. **A3 charts and A3 thinking:** This is used to document the necessary information needed for progress reporting and decision-making. For details, see <https://www.moresteam.com/lean/a3-report.cfm>
2. **Defect investigating by mathematical statistics:** For example, for numerical evaluation of the endurance limit of very hard material states the knowledge of defect distribution of the material is necessary. However, the standard methods aren't suitable to find the actual inclusion distribution. For details, see <https://www.wiley.com/en-us/Examples+and+Problems+in+Mathematical+Statistics-p-9781118605837>, <https://www.sciencedirect.com/science/article/abs/pii/S0142112312000412>; https://www.researchgate.net/publication/227844002_Statistical_Analysis_of_Defects_for_Fatigue_Strength_Prediction_and_Quality_Control_of_Materials
3. **Workshops for weekly training:** 5S, poka-yoke, Lean production, SPC, basics of Six Sigma



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4. Kaizen projects
5. Transparency of success and problems



6. **Obeya (war room):** An obeya room is a major component of Lean manufacturing and Lean-thinking strategies. We used it for workshops, project meetings, etc. We follow TPS rules: Be specific, Be organized, Be visual to have quick and efficient results. All involved people were in this room for fast communication and quick decision-making. For details, see <https://www.5snews.com/obeya-the-lean-war-room/>

18. How did you manage to increase utilization ratio of machines from 84% to 92.5%?

We took the following actions:

- **OEE monthly control:** Overall equipment effectiveness provides a measure for production output during a given period of time. OEE identifies the percentage of planned production time that is truly productive. We set painting oven as the pacemaker process. Call it BN (Bottle Neck), wherein OEE is calculated as equal BN utilization * BN efficiency* FQY (Final Quality Yield). Simplified OEE = (Good count x Ideal cycle time) /Planned Production Time, or Performance x Availability x Quality = OEE. Each factor has two associated losses making six in total. The six losses are as follows:
 - Performance = (1) running at reduced speed - (2) minor stops
 - Availability = (3) breakdowns - (4) product changeover
 - Quality = (5) startup rejects - (6) running rejects
 The objective finally is to identify then prioritize and eliminate the causes of the losses. This is done by self-managing teams that solve problem. Employing consultants to create this culture is common practice. For details, see [https://www.leanproduction.com/oe.html#:~:text=OEE%20\(Overall%20Equipment%20Effectiveness\)%20is,as%20possible%2C%20with%20no%20downtime.](https://www.leanproduction.com/oe.html#:~:text=OEE%20(Overall%20Equipment%20Effectiveness)%20is,as%20possible%2C%20with%20no%20downtime.)
- We place **SPC (Statistical Process Control) charts** on all machines. The control chart is a graph used to study how a process changes over time. We used it by finding and correcting problems as they occurred, by predicting the expected range of outcomes from a process and by determining whether a process is stable (in statistical control). For details, see <https://asq.org/quality-resources/control-chart>



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- Installation of a **preventive maintenance plan** of each machine. Preventive maintenance is work that is performed regularly (on a scheduled basis) in order to minimize the chance that a certain piece of equipment will fail and cause costly unscheduled downtime. The manuals, which were provided by machine manufacturers, often contain schedules for necessary maintenance, the usage of critical spare parts, and basic maintenance instructions. For details, see [https://limblecmms.com/blog/the-ridiculously-simple-preventive-maintenance-plan/#:~:text=Preventive%20maintenance%20\(or%20preventative%20maintenance,and%20cause%20costly%20unscheduled%20downtime.](https://limblecmms.com/blog/the-ridiculously-simple-preventive-maintenance-plan/#:~:text=Preventive%20maintenance%20(or%20preventative%20maintenance,and%20cause%20costly%20unscheduled%20downtime.)
- **Spare-parts management:** Practical spare-part inventory management remained the foundation for dependable plant operation. As a plant manager or supply chain manager, we were required to know the process of determining which spare parts were needed to make our system productive. To be efficient in the management of spare parts, we calculated risks for every equipment. For details, see: <https://limblecmms.com/blog/7-things-to-consider-for-efficient-spare-parts-management/>
- **Overtime management** for operators tasked with the repair of defective fixtures and equipment in the new tool shop. In order to fulfill this task in-house on weekends with lower costs and much quicker response than is possible with outside suppliers, we bought some basic machines for turning, milling and drilling.
- **ANDON created rapid response.** The Andon principle refers to a method used by frontline workers to quickly communicate with leaders about process-related problems for which the problem-resolution process should be escalated. The Andon signal can be done in various ways using alarms, cords, colored cones, monitors, lights, music or a combination thereof. Our Andon visualization of red, yellow and green was to have in each workplace a way (either manual or automatic) for the operator to signal the presence of any abnormal condition and receive prompt assistance in order to fix the issue. For details, see <https://www.alfraconsulting.eu/what-is-andon/#:~:text=Andon%20is%20a%20Japanese%20word,escalation%20process%20for%20rapid%20solving.>
- **Surveillance camera system:** Following the occurrence of a defect, we used cameras to find root cause. Cameras were visible for workers, and prevented any intentional defect.
- **Total productive maintenance (TPM):** An important objective of TPM is to increase the productivity of a factory and its equipment with a modest investment in maintenance. The main objective of TPM is to increase the OEE (Overall Equipment Effectiveness) of plant equipment. TPM addresses the causes for accelerated deterioration while creating the correct environment between operators and equipment so as to encourage ownership. Total quality management (TQM) and total productive maintenance (TPM) are the key operational activities of the quality management system. In order for TPM to be effective, full support by the entire workforce is required. This should result in accomplishing the goal of TPM: Enhance the volume of the production, employee morale and job satisfaction.

The eight pillars of TPM were generally focused on proactive and preventive techniques for improving equipment reliability:

1. Autonomous maintenance
2. Focused improvement



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3. Planned maintenance
4. Quality management
5. Early equipment management
6. Education and training
7. Safe, healthy environment
8. Administrative and office TPM

With the help of these pillars, we were able to increase productivity. However, we needed management support. For details, see

https://en.wikipedia.org/wiki/Total_productive_maintenance

19. We've discussed quality management, manufacturing and maintenance. Now, let's talk about finance and sales figures. How did you raise the sales volume from 97 million RMB to 130.5 million RMB, which was an increase of approximately 30%?

We used various solutions:

- We found a few **additional distributors** who already had good connections to potential customers. We gave them a good profit margin to buy and sell our controllers and inverters. Consequently, they changed from selling products from our competitors to ours.
- **Price reduction:** Furthermore, in the U.S. market we reduced our prices a little to challenge customers to change from competitor generators to ours. This was possible due to internal cost reduction activities with good results, which I explained before.
- **Increased orders:** Due to a better supplier rating by our top customer, we got more orders. Our customer's Malaysian SQE investigated our plant, but we played with open cards, stating that it was our intention to improve and asking for approval. A month later, her boss visited too. We discussed the restructuring of our company with better quality, OTD and pricing. He gave us his approval. We then restructured our production line during holidays and installed a three-shift model so as to fulfill the OTD with higher volumes.
- **New, competitive products:** Meanwhile, our R&D improved motor and generator design to achieve lower prices, which was accepted by customers as well with additional orders.
- **Localization of manufacturing in China** for Chinese customers: Sourcing in the purchasing department was high priority to get rid of overseas suppliers. We hired an engaged sourcing engineer who was able to find and to qualify local suppliers which much better prices as before, with lower delivery risks as before. Even pre-payment to suppliers wasn't necessary anymore. So, we increased the OTD to 100%, which customers like, and thus obtained more orders.



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20. More orders and turnover don't mean more profit. How did you manage to increase operating profit from 56,000 to 2.6 million RMB/month?

- As you already know, we improved continuously a lot in quality management, manufacturing, maintenance and supply chain. Our **expenses dropped** a lot.
- After six to 12 months, all customers recognized drastically improvements in their KPIs, such as zero defects at their site, 0 defects out of box at their warehouse check. Last but not least, better communication between SQE and our engineers and myself at same level about technical improvements, which in total **increased our turnover**. More turnover with lower costs expanded our profit enormously.

21. How did you manage to reduce total labor costs reduced from 210 to 168 TUSD/month?

- Luckily, we didn't have a strong work council. So, we installed some employee representatives and introduced our improvements and gave them a good future in our company. Step by step, **we reduced number of operators** by evaluating performance, behavior, attitude, unexcused absence, illness rates, etc., and made it very transparent to everybody. In the same time, we changed from cell production to one-piece-flow production, where we didn't need so many people to operate. Skilled operators, who could manage several tasks, replaced other operators, who could manage only their single operation.
- **Reduction of management**. As I discovered a very slow of information from me to operator level and even refusal of orders by middle management, I made the organizational structure very Lean and took out one to two level of management. So, production director and some of his supervisors were dismissed. I hired an outside person as production and TPS manager who could direct the cell leaders. The finance director and IT manager quit, but the HR director had to be dismissed because she had a strike by the operators.

22. Let's talk about human resources. After the dismissal of your HR manager, how did you manage to reduce the headcount from 143 to 117, which is approximately 18%?

- The new HR manager, whom I had hired at the recommendation of a friend, was supportive of the company's vision and mission, generally with regard to overtime in her team **due to the challenging tasks at hand**. So, a reduction in the headcount was among those tasks. Because we'd increased our productivity and automation, we didn't need as many operators.
- As government shifted their mindset from supporting companies to supporting employees, it becomes increasingly **difficult to release staff**, no intensive preparation some months before were necessary in order to win arbitration cases and lawsuits in China.

23. Absenteeism was reduced from 8.02% to 0.48% (-93%). How did you achieve it?

- There is a simple trick in China: Reduction of headcount and increase of overtime at the same time. According to Chinese labor law, overtime is paid with 50% extra money during the week, double on the weekends and triple for holidays. To calculate hiring or overtime work is among the HR tasks as well.



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24. The staff turnover rate was reduced from 6 to 3.6% (-40%). Why were staff people willing to stay despite such pressure?

- Actually, HR and I created **fun during work** for the employees, and they liked it. Even we need to took some small money in our hands. For example:
- **Open doors for family** members for the first time in three years.
- We applied for a designation as the **best company in our city**, competing with Siemens, Volkswagen and other big players, so that we'd become a well-known company in town. Meanwhile, we didn't need to look for new staff. They applied to our company automatically, even we weren't among the best 100 companies.
- Another social improvement was a private **insurance for families** with children to cover curing illnesses that weren't otherwise covered by government insurance.
- **Team-building events**, such as badminton and soccer tournaments against other large companies. Even as a small company we didn't achieve the ranking we'd hoped for, but we were proud to be a participant.
- **Outings**. Once a year, the entire company traveled to a touristic place within China, such as for hiking in the mountains or boating on a lake.
- **Outdoor training** on weekends, such as management and workshop team-building with a dedicated training program by a private or governmental institute.
- Once a year, each employee received a coupon for an expensive **health check**.
- **Monthly short townhall meetings** to show everybody our achievements in each department and make our success and challenges transparent, which people liked
- My **coaching management style** for the direct reporting managers led to a supportive mindset with good, quick implementation results. Every day after lunch there is an **open-door time** of 30 minutes for everybody to meet me and privately discuss their concerns and wishes.
- Last but not least, creating **company dinners** celebrating success in projects or at meeting HQ travelers, or **creating a CNY party** by which all employees can demonstrate their personal talents, such as karaoke singing, dancing and comedy.

25. You implemented a suggestion system, to increase implementation of realized improvements from 0 to 283. What does that mean?

- The suggestion system was new for the employees. It wasn't done because HQ was afraid of disadvantages and bureaucratic work, but I was able to convince headquarters on the basis of a Lean success story:
 - Management evaluation process: We installed a management team, which evaluated the possible implementation of suggestions.
 - Implementation received follow-up by HR staff.
 - After implementation, we paid generous bonuses according to the individuals' contributions to the company. People were honored at monthly townhall meetings after being able to present their achievements to audience.

26. What was then your headquarters feedback, after you left this successfully made company?

The president of the group wrote the following affidavit on my behalf:



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Karl is a **proven senior general manager** who has a background in fast-paced manufacturing along with excellent English and good Chinese fluency. He **focuses on customer service** and has a proven record of dealing directly with customers and distributors.

He committed to the following in equal measure:

- **Operational excellence**
- **Commercial/business acumen** with full P&L responsibility
- **Leadership skills** and people development
- **Engineering** focus and background

Karl has an exceptional **sense of responsibility that extends** beyond what he must do independently. He also has specialized knowledge brought **convincing** work results. Furthermore, due to his experience he is creative, flexible and quick in decision-making at all **technical and commercial** fields. He has a **very high** commitment to his job.

He is **inspirable for new challenges** and updated and extended the specialized knowledge on his own initiative. He has always finished his tasks on time and good quality. **His negotiation skills** are outstanding.

His behavior in his interactions with customers, suppliers, superiors and colleagues **was always perfect**. He represented the best of our company every time.

I recommend him for a new position, again as a general manager. I should also mention that the recipient is welcome to contact me for further information regarding this employee.

We thank him for his **distinguished** performance and wish him the best for his future.



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Profitable Company Development & Restructuring

Do you want to go ahead in China and Asia-Pacific?

We would be happy to support you as a system doctor and problem solver in getting financially healthy, in restructuring and in increasing profits.

What are your advantages of booking us?

Just one of our success stories as an example for you:

Our engagement for an automotive customer who is the market leader in products for electric vehicles. Here we were able to achieve the following measurable results:

- Increase in sales by 30% while reducing the internal error rate by 86% and consequently as well the customer complaints from 56 units to 0.
- The number of workers has been reduced by 18%, and the absence and layoff rates have been significantly lower.
- As a result, the operating profit rose from 56000 to 2.6 Mio RMB/month.

How is that possible in such a short time? What is behind this success?

All our previous customers from Germany, US, France and Italy had the following advantages through our work:

- 100% loyal to the client
- Innovative thinking and quick actions
- 24-7 high performance culture
- Structured approach, reporting and coordination.

Why is that so important for you in Asia?

From our automotive experience you need a business partner:

- One with an effective cost reduction methodology
- One who can build a learning organization for you
- Someone with years of multicultural experience in East and West
- Tight communication and proactive motivation
- Experience in project management, negotiation technique and control

Now simply write an Email to contact@gtec.asia and arrange a conversation with us.



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Don't wait, Asia is fast! An efficient preparation and ramp-up phase must be well planned, so that you can achieve measurable success even faster.

Definitely, we will find an enthusiastic, quick and reasonably priced solution for you, due to our German, Chinese, Indian and Asian network.

Best regards
Karlheinz ZUERL

CEO of GTEC German Technology & Engineering Cooperation

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<https://www.linkedin.com/in/karlheinz-zuerl-04859b2b/detail/recent-activity/posts/>
https://www.xing.com/profile/Karlheinz_Zuerl2/cv

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- Executive consultancy for profit growth of Tier1-automotive suppliers
- General Manager in China for manufacturing, marketing and sales of machines for melting and casting of metals for automotive industry
- General Manager in China for manufacturing, marketing and sales of plastic-, metal- and ceramic parts for environmental protection business
- General Manager in China for manufacturing, marketing and sales of Electric motors, generators and controllers for e-motion market Asia
- Director Asia : Purchasing and Supplier Development of Automotive parts
- Cost Reduction Manager Shanghai HQ
- Compliance manager for legal Controlling of Beijing Office, reporting to German HQ
- Marketing and Sales manager of CNC machines in China, reporting to German HQ

GTEC German Technology & Engineering Cooperation focus on:

- Business development, restructuring, supply chain, operation of parts for automotive industry in China, Hongkong, Thailand, India, Malaysia, with focus on E-mobility, mechanical engineering.
- Engineering, Manufacturing and Maintenance of Die & Moulds and Components/ Parts (Aluminum Die Casting, Plastic Injection, Stamping/Deep drawing, Machining,
- Engineering & Installation and Maintenance of Automation, Industry 4.0, Manufacturing Execution Systems MES
- Profit Growth Academy (Training)