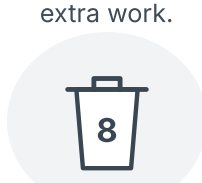
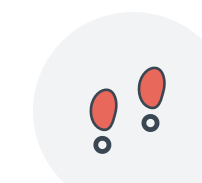
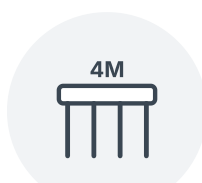
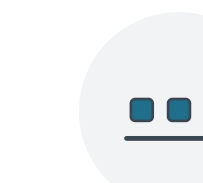
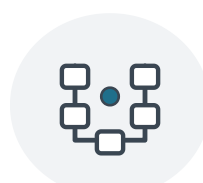
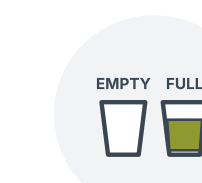
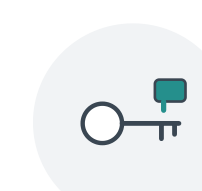
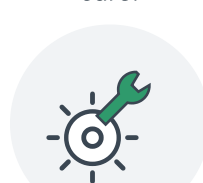
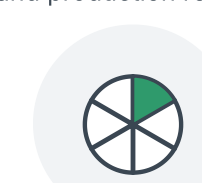
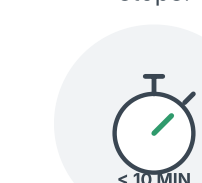
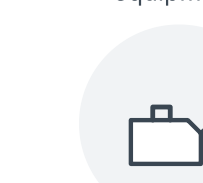
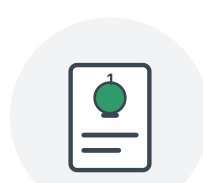
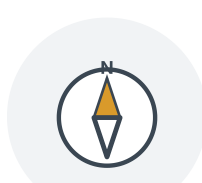
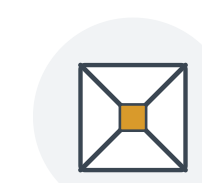
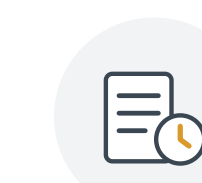
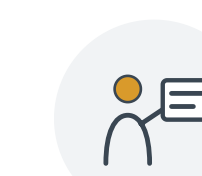
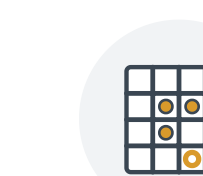


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LEAN TOOLS

FOUNDATIONS, FLOW, PULL, QUALITY, EQUIPMENT AND MANAGEMENT

TO KNOW AND USE

Foundations	Flow	Pull	Quality	Equipment	Management
01 Value What the customer will pay for, defined by the customer.  "They pay for certified pipe on time, not for the crane moves."	02 Eight wastes DOWNTIME: defects, overproduction, waiting, talent, transport, inventory, motion, extra work.  "A 30-minute walk fills all eight columns."	03 Gemba walk Leaders go where the work happens to see, ask and help.  "What got in your way this week?"	04 5S Sort, set in order, shine, standardise, sustain.  "An empty outline shows the missing check in seconds."	05 Standardized work The current best way: takt, sequence and standard WIP.  "One threading sequence for all crews halves rejects."	
06 Visual management Status and abnormalities visible to anyone at a glance.  "58 made against a plan of 60, reason written beside it."	07 Basic stability People, machines, material and methods predictable first.  "Fix the welder's downtime before adding kanban."	08 Waste walk A walk with one job: observe and record waste.  "One coil followed yard to saw: 31 observations."	09 Takt time Available time divided by customer demand: the beat to match.  "1,260 minutes for 420 joints: one every 3 minutes."	10 Continuous flow One piece at a time, step to step, without stopping.  "Saw to hydrotest in 40 minutes, not two days."	
11 Cellular layout A product family's machines together, in process order.  "Four stations in one U-shaped cell: zero forklift moves."	12 Line balancing Share the work so every station sits just under takt.  "Moving the stencil step brings both stations under takt."	13 Yamazumi chart Stacked work elements per station against the takt line.  "Station 4 at 3.4 minutes stands out against takt of 3."	14 Spaghetti diagram The real path walked, drawn on the layout.  "One inspector, one shift: 1.4 km of walking."	15 Value stream map Material and information flow for one family, with a lead-time ladder.  "23 days of lead time, 41 minutes of value added."	
16 Little's Law WIP equals throughput times lead time.  "1,200 joints at 400 a day means 3 days of waiting."	17 Bottleneck The step that limits the output of the whole system.  "A faster welder adds nothing while UT limits output."	18 Kanban A signal that authorises making or moving a fixed quantity.  "Empty coupling rack, card goes back: make one more."	19 Supermarket A small, controlled store the next process pulls from.  "The mill takes a coil; the slitter makes its replacement."	20 FIFO lane First in, first out, with a hard maximum between two steps.  "Lane full at eight pipes: the bevel operator stops."	
21 Heijunka Level volume and mix over time to steady demand upstream.  "Alternate wall sizes daily, not by the week."	22 Pacemaker process The one point that receives the customer schedule.  "Only the pipe mill gets the schedule; the rest follows."	23 EPEI Every product every interval: how often each item can be run.  "Faster roll changes: every size weekly, not every three weeks."	24 Two-bin system Use the second bin while the empty first is refilled.  "An empty bin on the cart is the order."	25 CONWIP A fixed cap on total work in a line, by card count.  "Two hundred pipe specs, one cap of 60 orders."	
26 Milk run A fixed route and timetable for small, frequent deliveries.  "One daily loop past three local fabricators."	27 Jidoka Stop at the first abnormality so defects never move on.  "The weld monitor stops the mill, not the inspector."	28 Poka-yoke Mistake-proofing: make the error impossible or obvious.  "A keyed gauge only fits the right coupling."	29 Andon A visual signal that calls for help when a problem appears.  "Yellow means help needed; red means stopped."	30 Line stop Everyone may stop the line rather than pass on a defect.  "Three short pipes in a row: stop, the wheel is slipping."	
31 5 Whys Ask why until you reach a cause you can fix.  "Pinhole, dirty edge, oiler drip, worn seal, not on the PM list."	32 Fishbone diagram Possible causes sorted into branches such as the 6Ms.  "26 causes of ovality, three worth testing."	33 A3 report The whole problem-solving story on one sheet.  "Problem to countermeasure, signed off in 15 minutes."	34 PDCA Plan, do, check, act: the cycle behind every improvement.  "Trial on one shift, check the data, then standardise."	35 First pass yield Share of units right the first time, with no rework.  "962 of 1,000 pass hydrotest first time: 96.2%."	
36 TPM Operators, maintenance and engineering share equipment care.  "Operators clean and check; maintenance rebuilds."	37 OEE Availability times performance times quality.  "85% x 90% x 97% gives an OEE of 74%."	38 Six big losses Breakdowns, setups, small stops, slow running, startup and production rejects.  "Small stops cost more hours than breakdowns."	39 SMED Cut changeovers by doing setup work before the machine stops.  "Roll change: from 4 hours to 70 minutes."	40 Autonomous maintenance Operators clean, inspect, lubricate and tighten their own equipment.  "The cleaning round finds a weeping hose a week early."	
41 One-point lesson One skill on one mostly visual page, taught in minutes.  "Three photos: the right way to seat the test seal."	42 Hoshin kanri A few breakthrough goals, aligned through every level.  "Halve claims and cut lead time 40%: nothing else."	43 X-matrix One page linking objectives, priorities, metrics and owners.  "A project that supports no objective gets dropped."	44 Leader standard work The daily routine of checks, walks and coaching for leaders.  "Huddle at 7, andon walk at 10, two standards checked."	45 Tiered huddles Short daily stand-ups from team to plant that escalate problems.  "Raised at 7:00, owned by maintenance at 8:30."	
46 Hour-by-hour board Planned versus actual output each hour, with reasons.  "Three hours short: 'waiting for crane' every time."	47 Kaizen event A focused workshop week to redesign one process.  "Five days: two machines moved, walking cut 60%."	48 Toyota Kata A daily routine of small experiments toward a target condition.  "What is your next step, and what do you expect?"	49 TWI Job Instruction Prepare, present, try out, follow up: how to teach a job.  "New operators at standard in four shifts, not three weeks."	50 Skills matrix Who can do which job, and who can teach it.  "Only one person can set the bevel machine at night."	