OPERATIONAL REFERENCE / OR 001

The Hotel Laundry Handbook

Selected chapters: capacity and decision-making

PREPUBLICATION SAMPLE

Chapters 8-11: from daily workload to a balanced laundry system.
Chapter 32: a complete worked case for a 60-room city hotel.
Selected source notes are included at the end.

The technical chapters use a 150-room illustration; the city-hotel case is a separate example. All model inputs are illustrative, not industry benchmarks or project-specific recommendations.

LCU means local currency units; OPL means on-premise laundry.
N-1 tests capacity with one unit unavailable.

Original chapter text and layout are preserved. Editorial checks and external professional review remain to be completed.

Full contents: operationalreference.com/or-001/
Independent professional handbooks

8. From kg/day to kg/hour

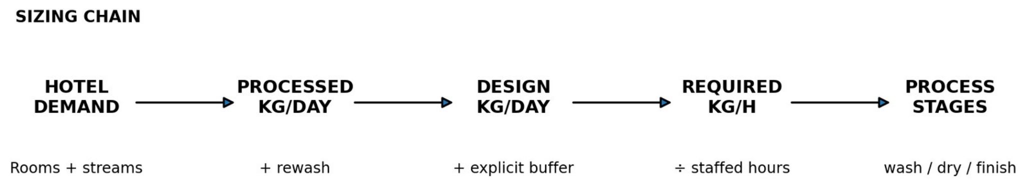

FIGURE 08-01 Sizing chain - hotel demand becomes process-stage capacity through explicit assumptions.

> **A machine is not sized by how much laundry the hotel owns. It is sized by how quickly the operation must move that laundry through the process.**

Chapter 6 converted the hotel into a production requirement. Our worked example reached 1,176 kg/day of design workload and 147 kg/hour across an eight-hour staffed production window. That number is the beginning of equipment sizing, not the answer.

8.1 Think in stages

Laundry is a linked sequence. Every kilogram enters washing, but not every kilogram follows the same route afterwards. Terry may be tumble-dried; sheets may be conditioned and ironed; uniforms may be dried and finished differently; selected guest items may require separate handling.

Stage	Design question
Washing	Can the washer-extractor bank accept and complete the required incoming kg/hour?
Extraction	How much water remains in each textile stream after the final spin?
Tumble drying	What share needs drying, and how long does each real load take?
Flatwork finishing	How much linen must be fed, dried/conditioned, ironed, folded and stacked per hour?
Handling / staging	Can people, carts and buffers keep the machines supplied without queues or starvation?

8.2 Nominal capacity is not production capacity

A 60 kg washer does not automatically produce 60 kg every cycle, and it certainly does not produce 60 kg every hour. Real throughput depends on the usable load for the textile, formula time, loading/unloading, operational interruptions and how consistently the machine can be kept supplied.

Effective kg/hour = **quantity × nominal kg × load factor × (60 ÷ effective cycle minutes) × operational efficiency**

Milnor planning material explicitly sizes production using required output, efficiency, loads per hour and loading factors.[12] Its operator guidance also warns that the published machine capacity does not reflect every goods type or soil condition and that both underloading and overloading can reduce performance.[13]

Treat the equation as a planning model, not a physical law. Load factor, effective cycle time and operational efficiency are assumptions to expose and validate with the proposed machine, representative hotel goods and actual operating practice. Finishing may also need a pieces/hour or evaporation-capacity check in addition to kg/hour.

DO NOT HIDE ASSUMPTIONS
If a supplier says a washer bank produces 250 kg/hour, ask to see the assumed load weight, program time, changeover time, efficiency and linen mix. A throughput number without those assumptions is not yet a design calculation.

8.3 Split the 147 kg/hour by downstream route

The full 147 kg/hour enters the wash stage. Downstream demand depends on mix. The illustrative companion model assumes that 55% of total throughput is exposed to tumble drying and 35% requires flatwork finishing. Replace those shares with the hotel's measured textile mix.

Illustrative requirement	Calculation	Result
Wash stage	147 × 100%	147 kg/h (324 lb/h)
Tumble-dryer exposure	147 × 55%	81 kg/h (179 lb/h)
Flatwork finishing	147 × 35%	51 kg/h (112 lb/h)

The drying and flatwork shares can overlap. Some flatwork may be pre-dried/conditioned before ironing; some modern finishing systems can accept higher residual moisture. The route must reflect the actual process.

8.4 Capacity is a flow problem

A balanced laundry does not require every stage to show the same nameplate kg/hour. It requires every stage to have enough effective capacity for the share of the workload that reaches it. Oversizing one stage does not compensate for undersizing the next.

Example	Installed effective capacity	Required	Coverage
Washers	245 kg/h	147 kg/h	167%
Tumble dryers	138 kg/h	81 kg/h	170%
Flatwork line	72 kg/h	51 kg/h	140%

All three stages appear adequate in normal operation. But capacity margin is not the only question. Chapter 11 will show why the finishing line is still the most exposed stage in this illustrative configuration.

8.5 Four reasons to avoid one giant machine

Reason	Why it matters
Load matching	Several smaller pockets may match real linen batches better than one oversized cylinder.
Scheduling	Different streams can run simultaneously instead of queuing behind one formula.
Resilience	Losing one of several machines leaves some capacity; losing the only large machine may stop the stage.

Reason	Why it matters
Growth / phasing	Capacity can sometimes be added progressively instead of installed all at once.

The reverse is also true: too many small machines can consume floor space, increase handling, complicate maintenance and add connections. UniMac's current OPL guidance makes the same broader point: average/peak pounds, operating hours, staffing, realistic cycle times and workflow should be considered together rather than simply buying for a worst-case peak.[14]

9. Washer-Extractor Capacity

> **The washer-extractor is not just the first machine. Its load discipline and extraction performance shape the capacity and cost of the machines that follow it.**

9.1 Start with the actual load, not the brochure load

Commercial washer-extractors are sold with a rated capacity. That rating is necessary for comparison, but it is not a promise that every hotel textile should be loaded to the same weight. Bulky items, delicate items, soil level and wash formula can change the appropriate load.

Milnor's current operator guide states that the published capacity does not account for goods type and soil content, and recommends weighing loads because incorrect loading can cause repeated balancing attempts, longer formula times, machine stress and poor wash quality. [13]

Input to request from supplier	Why
Rated dry-load capacity	Common catalogue reference.
Recommended load by textile stream	Shows whether 60 kg of sheets is treated like 60 kg of bulky terry.
Formula / cycle time by stream	Determines loads per hour.
Maximum extraction G-force / programmable extraction	Affects residual moisture and downstream drying.
Water and energy assumptions	Needed for lifecycle cost.
Door/loading height and optional tilt	Affects handling and ergonomics.

9.2 Extraction belongs in the sizing decision

The washer finishes its job by leaving water behind in the textile. That remaining water becomes work for the dryer or finishing system. Higher extraction generally removes more water before drying, but the correct setting depends on the goods and process.

SECOND-ORDER EFFECT
Higher extraction can increase the effective capacity of the dryer bank without buying another dryer. The washer decision therefore changes downstream CAPEX, energy use and cycle time.

UniMac's 2026 technical guidance describes this chain directly: higher G-force generally reduces residual moisture; lower residual moisture shortens drying and can increase throughput. It also warns that delicate goods may need gentler settings.[15] Current hotel-capable machines illustrate how wide the range can be: Girbau lists HS models from 8 to 110 kg with extraction around 283 to 405 G depending on model, while Speed Queen lists hardmount and softmount families with materially different extraction capabilities.[16][17] These figures illustrate technology choices; they are not a recommendation for a specific hotel.

9.3 Worked washer-bank example

The companion workbook currently tests this deliberately conservative illustrative bank:

Input	Illustrative assumption
Quantity	4 washer-extractors
Nominal capacity	60 kg each (132 lb each)
Effective cycle	45 minutes
Load factor	90%
Operational efficiency	85%

$$4 \times 60 \times 0.90 \times (60/45) \times 0.85 = 244.8 \text{ kg/hour effective}$$

Against the 147 kg/hour design requirement, this provides 167% normal coverage. If one 60 kg machine is unavailable, the remaining three provide 183.6 kg/hour under the same assumptions, or approximately 125% of required throughput.

9.4 Do not confuse deliberate resilience with oversizing

The example above has substantial wash headroom because it also passes a full N-1 test. That may be sensible for a remote resort and wasteful for a city hotel with same-day external backup. The workbook therefore shows both normal coverage and N-1 coverage; management decides how much resilience is worth buying.

Configuration	Normal effective capacity	N-1 capacity	Design interpretation
3 × 60 kg	184 kg/h	122 kg/h	Passes peak normally; does not maintain full design throughput after one unit fails.
4 × 60 kg	245 kg/h	184 kg/h	Passes both normal peak and illustrative full N-1 test.
5 × 45 kg	230 kg/h	184 kg/h	Similar N-1 result with more, smaller machines.
4 × 45 kg	184 kg/h	138 kg/h	Normal peak passes; N-1 falls slightly below design throughput.

All capacities above use the same illustrative 45-minute cycle, 90% load factor and 85% operational efficiency. They are not supplier quotations.

9.5 The acceptance question

Before purchase, ask the supplier to demonstrate how its proposed configuration reaches the required output with the stated hotel linen mix. A good proposal should make assumptions visible enough that the hotel can reproduce the calculation.

1. Which loads and formulas were used to calculate throughput?
2. What usable load was assumed for sheets, terry, uniforms and other major streams?
3. What extraction setting and residual-moisture expectation are assumed before drying or finishing?
4. What loading/unloading or changeover allowance is embedded in the cycle?
5. What is throughput with the largest washer unavailable?
6. What utilities and drainage performance are required to achieve the stated cycle time?

10. Drying Capacity

> **A dryer is not sized against washer nameplate capacity. It is sized against the wet load that actually arrives, with the moisture that actually remains.**

10.1 Why dryers become bottlenecks

Drying is sensitive to textile type, load size, airflow, heat source, incoming residual moisture and the endpoint the operation is trying to reach. Two nominally identical 45 kg loads can require materially different time if one is heavy terry and the other is conditioned flatwork.

UniMac's 2026 specification guidance warns that pairing washers and dryers by rated pounds alone is a common mistake because dryers respond strongly to goods type and moisture remaining after extraction.[14] Speed Queen makes the same operational point: tumble drying is a potential bottleneck, so adequate pockets and high-speed extraction on the washer side matter.[18]

10.2 Model the share that actually reaches tumble drying

Not all hotel linen must be fully tumble-dried. Flatwork may be conditioned before ironing or fed to a system that completes drying during finishing. Guest garments and uniforms may follow their own processes. Start with route shares, then model each material group if cycle times differ materially.

Drying input	What to establish
kg/hour arriving	Share of the total workload that reaches tumble drying.
Residual moisture	Driven largely by textile and washer extraction.
Dryer usable load	The real batch weight for the goods, not simply catalogue maximum.
Effective cycle minutes	Heat-up, drying, cool-down and realistic changeover.
Moisture endpoint	Avoid both underdrying and unnecessary overdrying.
Heat / airflow infrastructure	Gas, electric, steam, exhaust and make-up air must support the promised cycle.

10.3 Moisture sensing changes the operating question

Time-only drying can continue heating a load after its useful endpoint. Current commercial dryers increasingly offer moisture sensing or controls intended to stop or adjust the cycle based on the textile condition. Girbau's current ED range, for example, spans roughly 13 to 62.5 kg per cycle and offers moisture sensing on applicable models alongside gas, electric and steam heating options.[19] Product features are manufacturer claims, but the underlying design question is independent: how will the hotel prevent systematic under- or over-drying?

LINEN-LIFE CONNECTION

Overdrying is not only an energy issue. It can also increase handling time, heat exposure and textile wear. The "cheapest" dryer setting may therefore be the one that reliably hits the correct endpoint, not the shortest or hottest program.

10.4 Worked dryer-bank example

The illustrative model assumes that 55% of the 147 kg/hour design flow is exposed to tumble drying, creating an 80.9 kg/hour requirement. It then tests two 45 kg dryers with a 30-minute effective cycle, 90% load factor and 85% operational efficiency.

$$2 \times 45 \times 0.90 \times (60/30) \times 0.85 = 137.7 \text{ kg/hour effective}$$

Normal coverage is strong at about 170% of the modelled drying requirement. But with one dryer unavailable, capacity falls to 68.9 kg/hour, only about 85% of the requirement. The drying stage therefore passes normal peak demand but not a full N-1 requirement.

Question	Illustrative answer
Normal dryer coverage	137.7 ÷ 80.9 ≈ 170%
N-1 dryer coverage	68.9 ÷ 80.9 ≈ 85%
Operational implication	A single dryer failure creates a deficit unless the hotel can extend hours, divert loads, reduce dryer exposure or use external backup.

10.5 Drying capacity can be increased without buying a dryer

Lever	Possible effect
Higher effective washer extraction	Less moisture for the dryer to evaporate; shorter cycles may result.
Better load discipline	More repeatable drying and less cycling variation.
Moisture-based endpoint control	Reduces avoidable overdrying where suitable.
Improved airflow / clean lint path	Protects designed drying performance.
Longer production window	Lowers kg/hour required, but may increase labour cost.
Change process route	Some flatwork may be conditioned/finished differently rather than fully tumble-dried.

This is why drying should be sized after extraction and process routing are defined. Buying a larger dryer before understanding incoming moisture can solve the wrong problem.

CHAPTER OUTPUT

You should now be able to state required tumble-dry kg/hour, the assumptions behind cycle time, and the capacity remaining after a dryer failure.

11. Finishing and the Real Bottleneck

> **The bottleneck is the stage with the least usable capacity relative to the work that reaches it - not necessarily the most expensive or largest machine.**

11.1 Flatwork finishing is a different kind of capacity problem

Ironers and finishing lines are often described by roller width, diameter, speed, pieces per hour or kilograms per hour. Automation can add feeding, folding and stacking. Those specifications are not directly interchangeable, and theoretical cylinder speed does not tell a hotel how many acceptable sheets will reach the clean-linen store each hour.

Current products illustrate the range. Electrolux Professional offers multiple Line 6000 configurations from basic ironers through integrated feeding, folding and stacking; one IC648 family lists ironing speeds of roughly 1.5 to 9 m/min depending on configuration.[20] Girbau's current Compact PRO combines feeding, drying, ironing, folding and stacking and publishes maximum production of 175 or 220 kg/hour depending on model.[21] These are manufacturer specifications, not hotel benchmarks. They show why finishing should be evaluated as a complete line on the hotel's actual linen mix.

11.2 Ask for demonstrated output on your linen

Specification	Why it is insufficient on its own
Roller width	Shows what can physically fit, not the sustainable pieces/hour.
m/min	Does not reveal feeding efficiency, moisture, item length, quality standard or folding interruptions.
kg/hour	Useful only if linen mix, residual moisture and staffing assumptions are disclosed.
Pieces/hour	Useful only if item size and acceptable finish quality are comparable.
"Automatic"	Automation can mean feeding, folding, stacking or only one of them; labour requirement still needs to be specified.

BEST PROCUREMENT QUESTION
Show us the expected finished output per hour for our principal sheet and table-linen items, at our expected residual moisture, with the proposed number of operators.

11.3 The bottleneck test

CAPACITY COVERAGE / N-1

WASH	TUMBLE DRY	FLATWORK
147.0 required	80.9 required	51.5 required
244.8 effective	137.7 effective	72.0 effective
167% normal	**170% normal**	**140% normal**
125% N-1	85% N-1	0% N-1

Lowest normal coverage = bottleneck; resilience can be different

FIGURE 11-01 Capacity coverage and N-1 - normal bottleneck and resilience are different questions.

Capacity coverage = installed effective capacity ÷ required process capacity

Compare the coverage of every major stage. The smallest ratio is the operating bottleneck under the modelled conditions.

Stage	Required	Installed effective	Coverage	N-1 coverage
Wash	147.0 kg/h	244.8 kg/h	167%	125%
Tumble drying	80.9 kg/h	137.7 kg/h	170%	85%
Flatwork finishing	51.5 kg/h	72.0 kg/h	140%	0%

In normal operation, flatwork finishing has the lowest coverage at roughly 140%, so it is the modelled bottleneck even though it still has comfortable peak capacity. Under an N-1 test, the single-line finishing configuration has no equivalent spare line. The practical resilience conclusion therefore depends on whether another process route or external backup exists.

11.4 A bottleneck is not always a machine

Potential bottleneck	What it looks like
Sorting / staging	Washers wait for correctly built loads despite enough installed capacity.
Washer bank	Soiled linen queues while dryers/finishers wait.
Drying	Wet carts accumulate after extraction; washer output must slow.
Feeding / ironing	Flatwork accumulates; the ironer is rated highly but staff cannot feed it at that rate.
Folding / stacking	Finished items back up at the discharge end.
Clean storage / carts	Production slows because finished linen cannot be moved out.
Utilities	Hot water recovery, gas, steam, exhaust or drainage prevents machines achieving quoted cycles.

This is why the equipment model uses an operational-efficiency factor. Real laundries spend time loading, unloading, changing formulas, cleaning filters, moving carts, waiting for linen and responding to small disruptions. The correct goal is sustained good output, not a perfect-hour catalogue calculation.

11.5 Automation is a labour-capital trade-off

Finishing is one of the clearest places where automation changes both throughput and labour. Integrated feeding, folding and stacking may raise CAPEX and space requirements while reducing manual handling or the number of operators required for a given output. Electrolux explicitly offers multiple levels of automation within the same ironer family, and its current brochure shows operator efficiency changing with the automation selected.[20]

Evaluate automation with…	Not merely…
Finished pieces or kg per labour hour	Maximum machine speed
Operators required at sustained output	Number of automation features
Incremental CAPEX and maintenance	Purchase price alone
Quality consistency and rework	Headline throughput
Space and material flow	Machine footprint alone

11.6 The design loop

Sizing is iterative. If one stage is too tight, the answer is not automatically “buy a bigger machine.” Test the other levers first.

1. Confirm that the demand and route-share assumptions are correct.
2. Confirm usable load and cycle assumptions from the actual textile mix.
3. Identify whether the bottleneck is equipment, labour, utilities or handling.
4. Test longer operating hours or a different schedule.
5. Test whether better extraction or route changes reduce downstream demand.
6. Test additional equipment or automation and compare lifecycle economics.
7. Re-run normal peak and failure scenarios before freezing the specification.

PART III OUTPUT

You now have a balanced process requirement: wash, drying and finishing throughput; normal and N-1 coverage; the current bottleneck; and the assumptions each supplier must meet. Part IV turns that process into a physical laundry - flow, space, clean/dirty separation, ergonomics and utilities.

32. 60-Room City Hotel

This first case is deliberately small, urban and operationally simple. The hotel has no spa, pool or banqueting department, serves a limited breakfast and occupies expensive city-centre real estate. A reliable commercial laundry operates nearby. The point of the case is to show how space and management complexity can outweigh an apparently attractive in-house cash cost.

32.1 Hotel profile

Item	Illustrative assumption	Implication
Rooms	60	Small absolute workload
Average / design peak occupancy	78% / 95%	Peak occupied rooms = 57
Guest-room linen load	5.2 kg per occupied room	Planning input only; measure in the actual hotel
Other peak laundry	50 kg/day (110 lb/day)	Breakfast/F&B, uniforms and miscellaneous
Rewash	2.5%	Adds processed work, not guest demand
Staffed laundry window	7 hours/day	Short window raises required hourly output
Space	High opportunity cost	A compact OPL still consumes valuable back-of-house area
External market	Reliable same-day/next-day provider nearby	Makes outsourcing operationally credible

32.2 Build the workload

Step	Calculation	Result
Peak room linen	60 × 95% × 5.2 kg	296.4 kg/day
Add non-room streams	296.4 + 50	346.4 kg/day
Add 2.5% rewash	346.4 × 1.025	355.1 kg/day processed
Add 10% design buffer	355.1 × 1.10	390.6 kg/day design
Convert to hourly output	390.6 ÷ 7 hours	55.8 kg/hour

Average processed volume under the fictional assumptions is about 285 kg/day, or roughly 104,000 kg/year. The difference between average and design demand is material: buying against average daily volume would understate the capacity needed on busy days.

32.3 What would an OPL require?

At only 56 kg/hour of design requirement, the technical problem is not difficult. A small multi-machine configuration could provide adequate peak throughput and some redundancy. The business problem is harder: even a compact laundry needs working clearances, dirty/clean separation, carts, chemical storage, utilities, maintenance access and labour coverage.

SECOND-ORDER EFFECT
For a small urban hotel, the relevant question is not "Can two small washers process the linen?" It is "Is owning and managing a complete laundry system the highest-value use of the space, capital and management attention?"

32.4 Compare the system economics

Annual view	Illustrative amount	LCU/kg	What is included
OPL cash cost	103,000	0.99	Labour, utilities, chemicals, maintenance and routine operating costs
OPL capital + space add-on	54,000	0.52	Annualised installed capital plus high urban space opportunity cost
OPL economic cost	157,000	1.51	Cash + capital + space
Outsourced system cost	138,500	1.33	Supplier processing plus transport, internal handling, incremental linen and management costs

On these fictional inputs, OPL looks cheaper if management sees only cash cost. After capital and space are included, outsourcing is lower by about 18,500 LCU/year. This is exactly why the handbook separates cash and economic cost. The answer could reverse if rent/space value, labour, external rates or capital cost changed.

32.5 Linen and service design under outsourcing

The operating decision does not end with the supplier rate. The city hotel must define collection/delivery windows, rejection handling, emergency supply, linen ownership and the amount of circulation stock required while linen is off-site.

- Size room-linen inventory from full-house demand, not average occupancy.
- Add enough logistics buffer for the contracted turnaround and realistic delivery disruption.
- Hold a clearly defined emergency reserve rather than treating every extra sheet as "PAR."
- Count linen physically and reconcile unexplained loss whether the hotel or supplier owns the textile.

- Keep an escalation route for missed delivery, quality rejection and sudden occupancy spikes.

32.6 Case decision

> **ILLUSTRATIVE DECISION**
> **Outsource the base laundry service under a tightly defined SLA, with sufficient PAR/logistics buffer and an emergency plan. The choice is driven primarily by high space opportunity cost and credible local supply—not by an assumption that outsourcing is intrinsically better.**

The case also demonstrates why a small hotel should avoid installing a laundry merely because the equipment physically fits. A technically feasible OPL can still be the weaker hotel-level investment.

Selected source notes

Entries retain the numbering and wording of the full handbook. Commercial sources support technical discussion, not supplier recommendations.

[12] Pellerin Milnor, “Sizing and Planning a Laundry” (document B22SL94011/18323). Washer and dryer planning examples use production required, efficiency, loads/hour, load size and process time. Manufacturer planning guidance, used for method rather than brand selection. https://www.milnor.com/wp-content/uploads/2016/01/Sizing-and-Planning-a-Laundry_18323.pdf

[13] Pellerin Milnor, washer-extractor operator guide MKWFTO02U1. States that rated capacity does not reflect every goods type or soil condition; recommends correct weighed loads and warns that under/overloading can impair performance. https://www.milnor.com/operator-guides/mkwfto02u1/

[14] UniMac, “9 Common Mistakes When Spec’ing Washer-Extractors and Tumble Dryers for On-Premises Laundry” (June 8, 2026). Recommends sizing with average/peak volume, operating hours, staffing, realistic cycles, workflow, extraction and downstream capacity. Commercial source. https://unimac.com/news/9-common-mistakes-when-specing-washer-extractors-and-tumble-dryers-for-on-premises-laundry/

[15] UniMac, “G-Force Extraction in Washer-Extractors: Moisture Removal and Value” (March 26, 2026). Explains the relationship between extraction, residual moisture, dryer time, energy and throughput, with textile-specific caveats. Commercial source. https://unimac.com/news/g%E2%80%91force-extraction-in-washer%E2%80%91extractors-moisture-removal-and-value/

[16] Girbau, HS commercial washer-extractor range (current 2026 product data). Lists capacities from 8 to 110 kg and high-extraction G-force by model. Product data used only to illustrate the range of current equipment. https://www.girbau.com/commercial-washers/hs/

[17] Speed Queen Commercial, hardmount/softmount washer-extractor product information. Current product families illustrate differing capacities and extraction capabilities. Manufacturer claims are not treated as independent economic evidence. https://speedqueencommercial.com/en-us/products/hardmount-washer-extractor-commercial/

[18] Speed Queen Commercial, “Let’s Talk Tumble Dryers.” Advises matching tumble-dryer capacity to washer- extractor output and notes the role of high-speed extraction in reducing dryer load. Commercial source. https://speedqueencommercial.com/en-us/news/lets-talk-tumble-dryers/

[19] Girbau, ED commercial dryers (current 2026 product data). Range spans about 13 to 62.5 kg per cycle and includes moisture-control options and multiple heat sources. Product data used to illustrate sizing variables. https://www.girbau.com/commercial-dryers/ed/

[20] Electrolux Professional, Line 6000 flatwork ironers (current product information). Multiple configurations include feeding, folding and stacking; published product pages show varying widths and operating speeds. Used to demonstrate why finishing capacity and labour depend on configuration. https://www.electroluxprofessional.com/commercial-laundry-equipment/hot-cylinder-ironers/

[21] Girbau, Compact PRO finishing system (current product information). Published maximum production differs by model and integrates feeding, drying, ironing, folding and stacking. Used as an example of modern integrated finishing, not as a benchmark. https://www.girbau.com/compact-ironing/compact-pro/