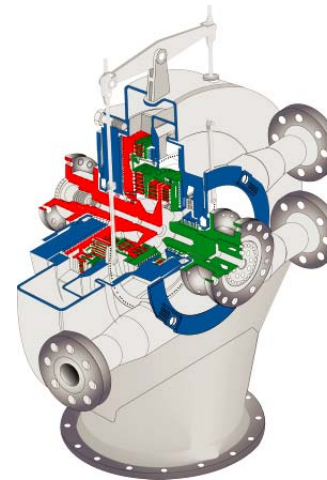
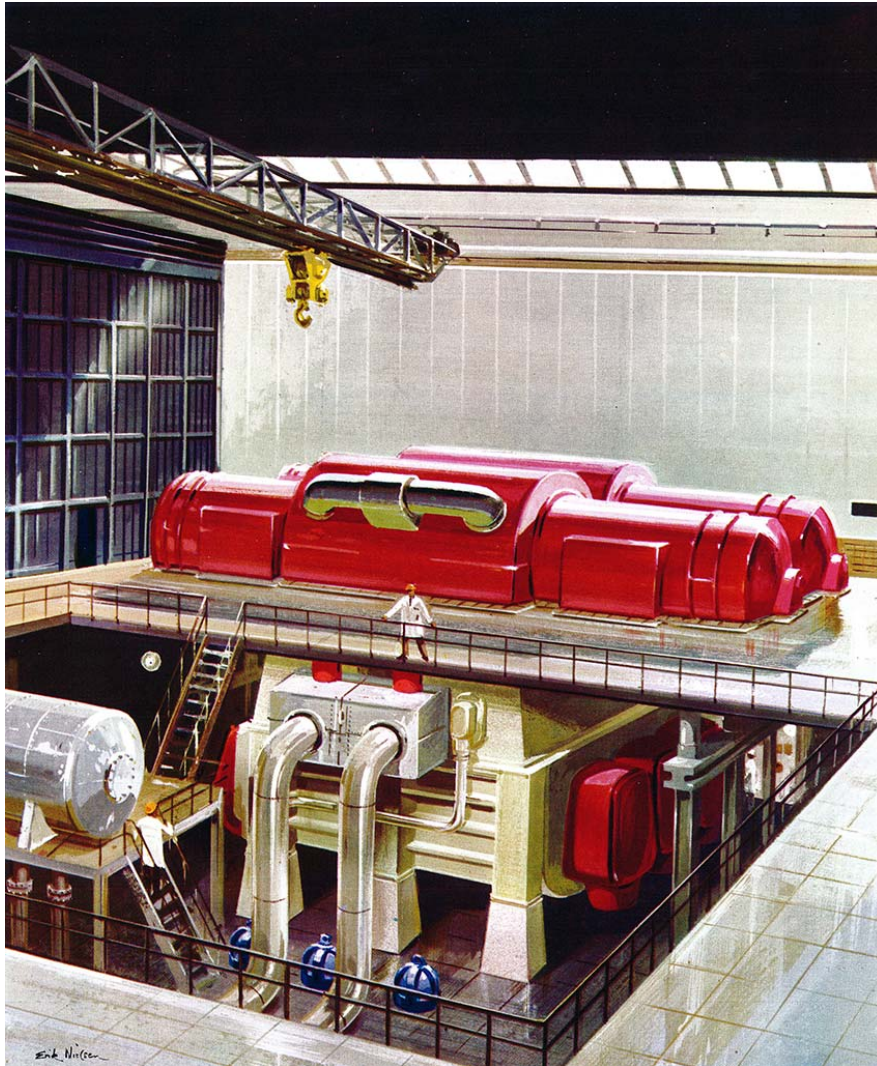
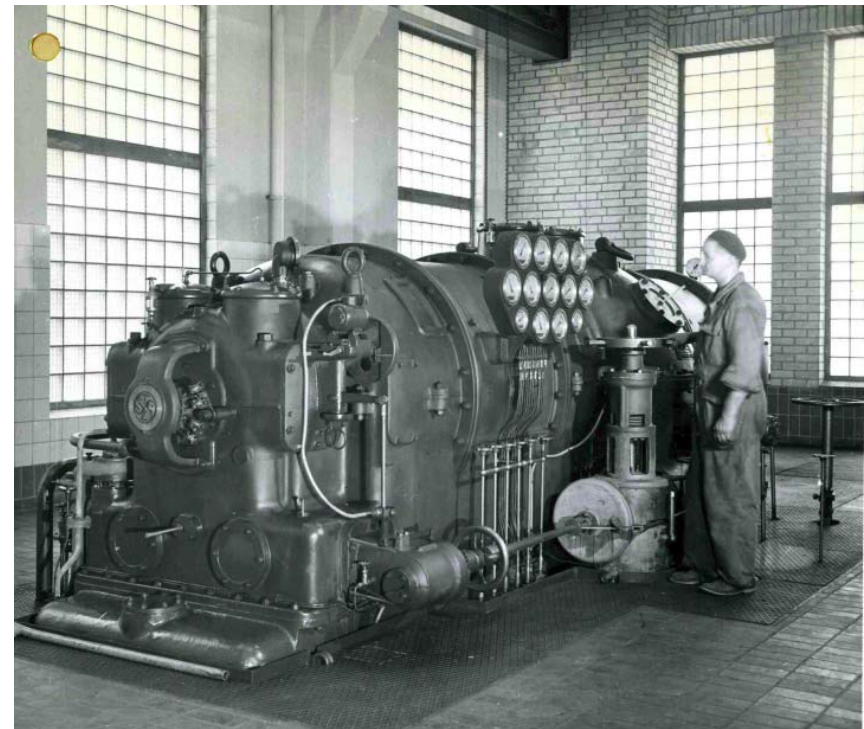
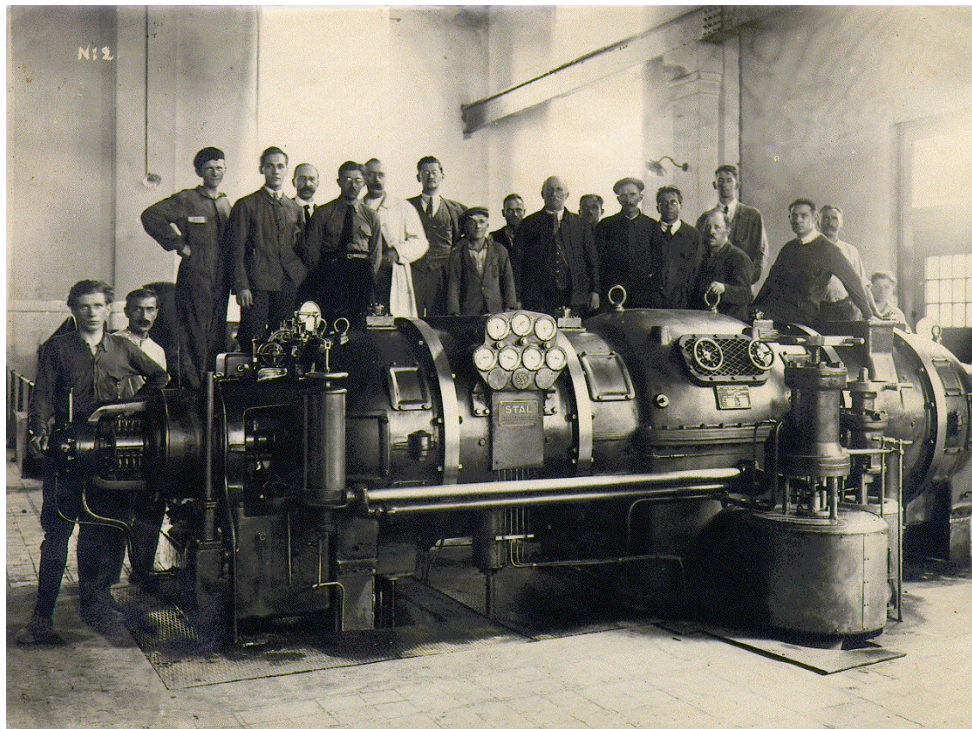


Swedish steam turbine technology...



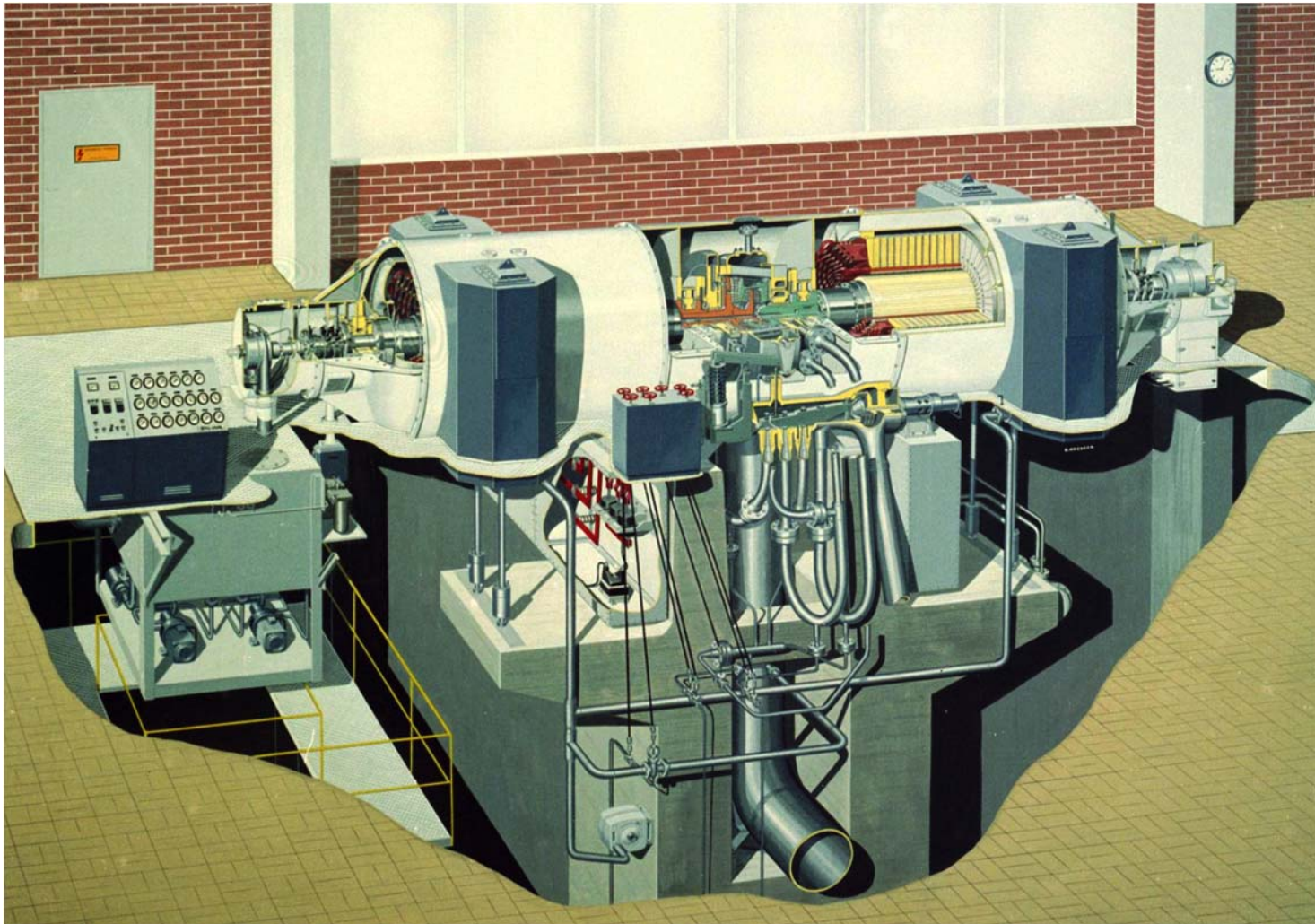
Old Ljungström turbine (STAL)



Svenska Turbinaktiebolaget Ljungström - STAL



Ljungström turbine (STAL)

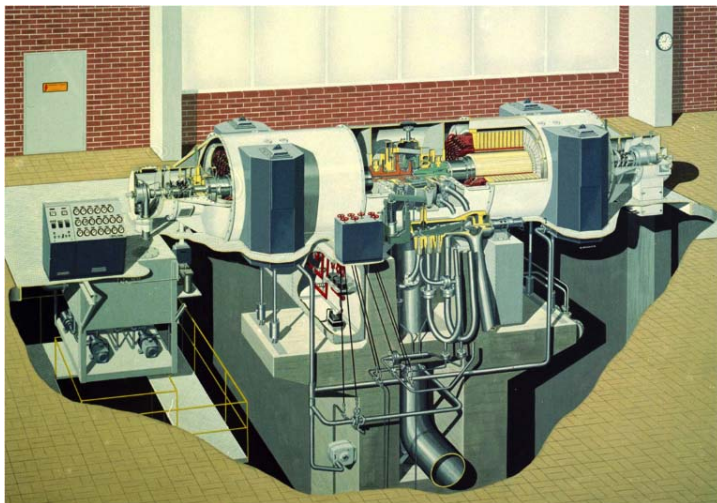


The Ljungström turbine – pros and cons



Pros:

- High stage heat drop
- Very high efficiency
 - ✓ Tall and untwisted blades
- Fast start
 - ✓ Heat in the center
 - ✓ No long rotor

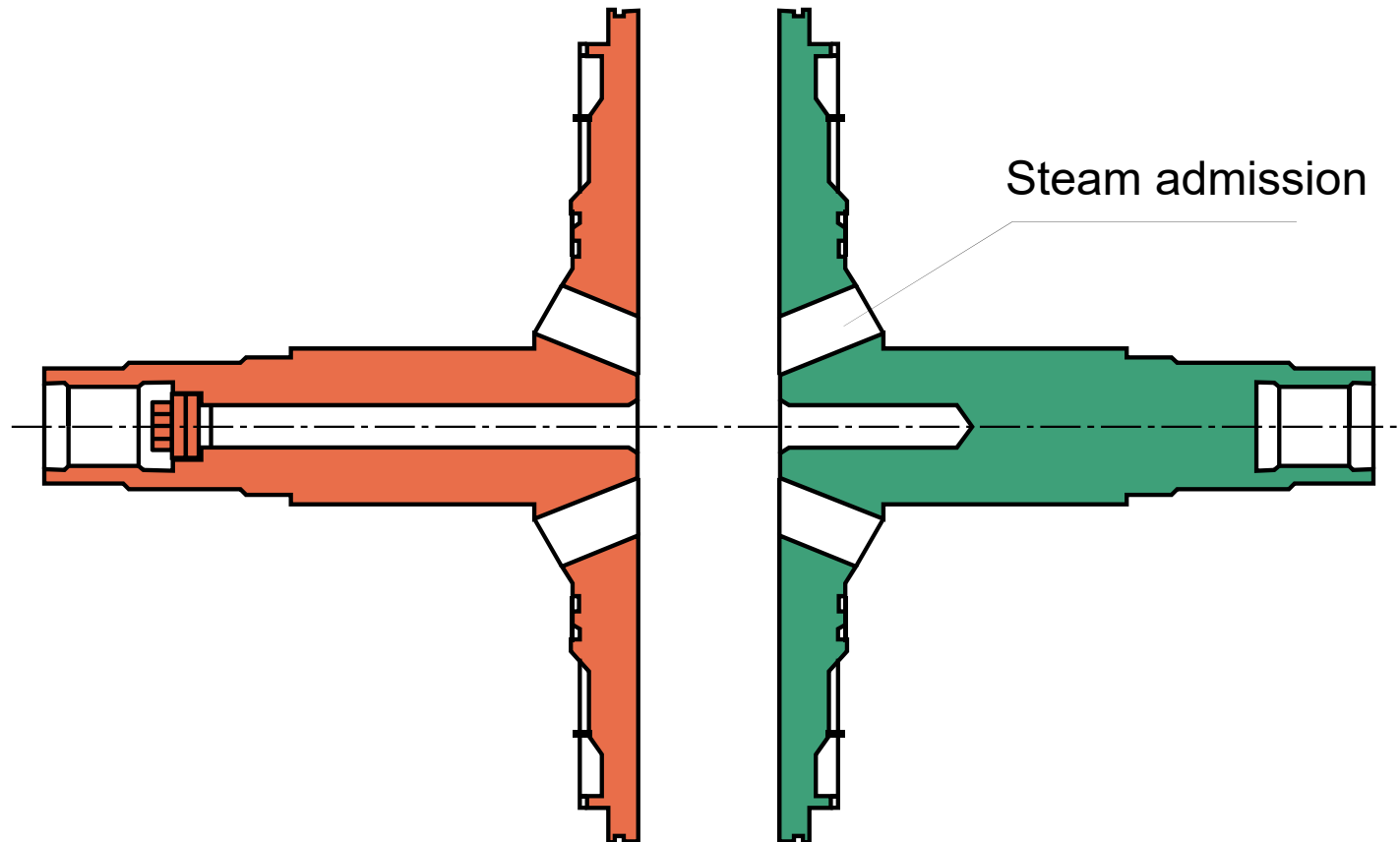


Cons:

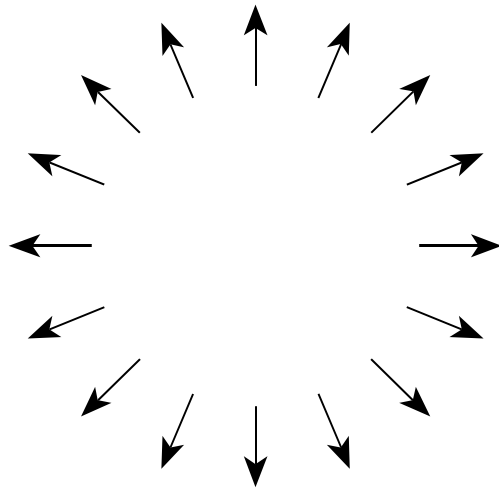
- Expensive
 - ✓ Complicated
 - ✓ Two generators
 - ✓ High fouling
- Volumetric flow issues
 - ✓ Short exit blades
 - ✓ I.e. only back-pressure applications
 - ✓ Wiberg™ and Durax™
- Extractions



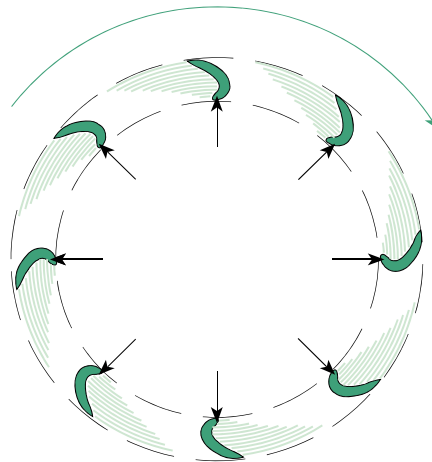
Ljungström turbine – turbine discs



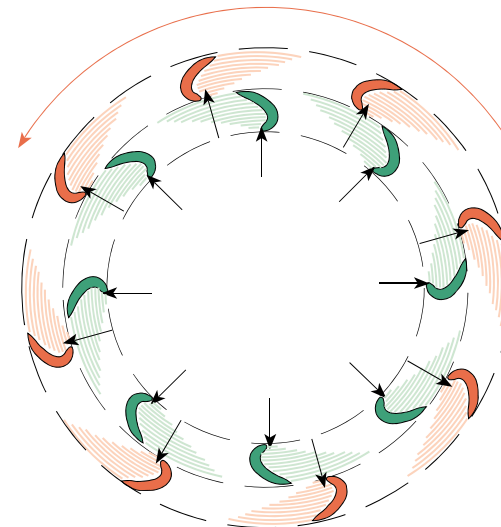
Ljungström turbine – outward expansion



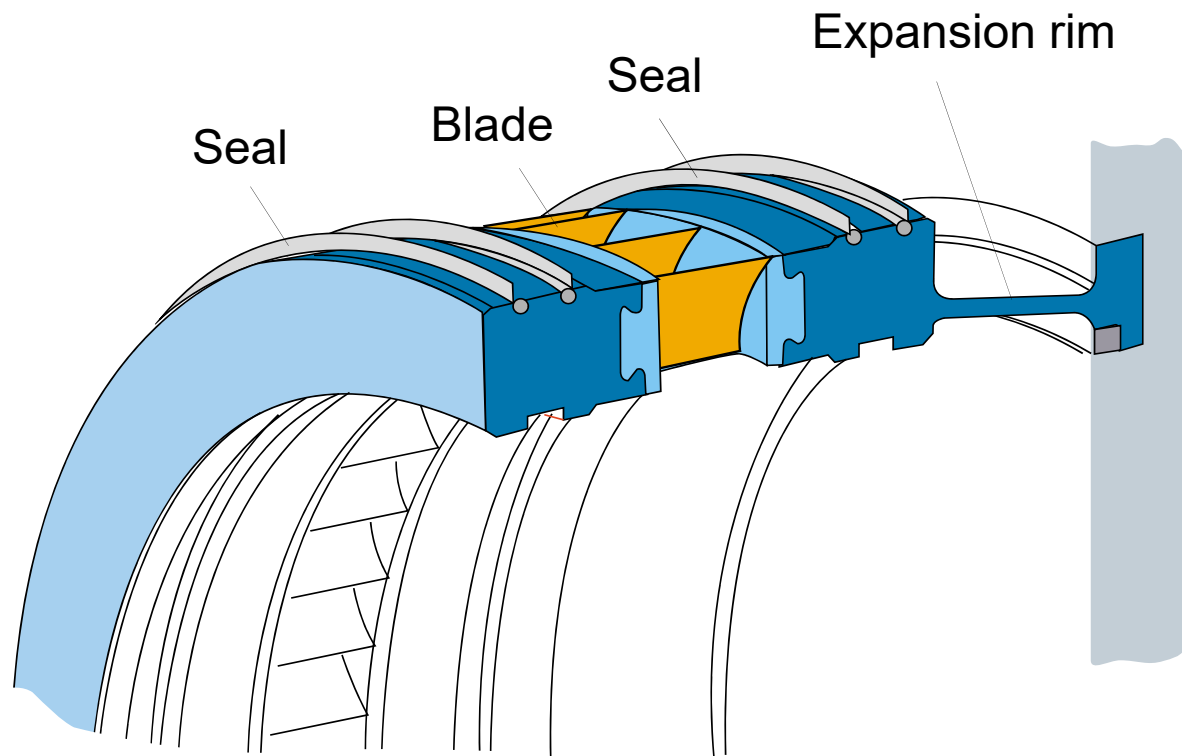
Direction of rotation



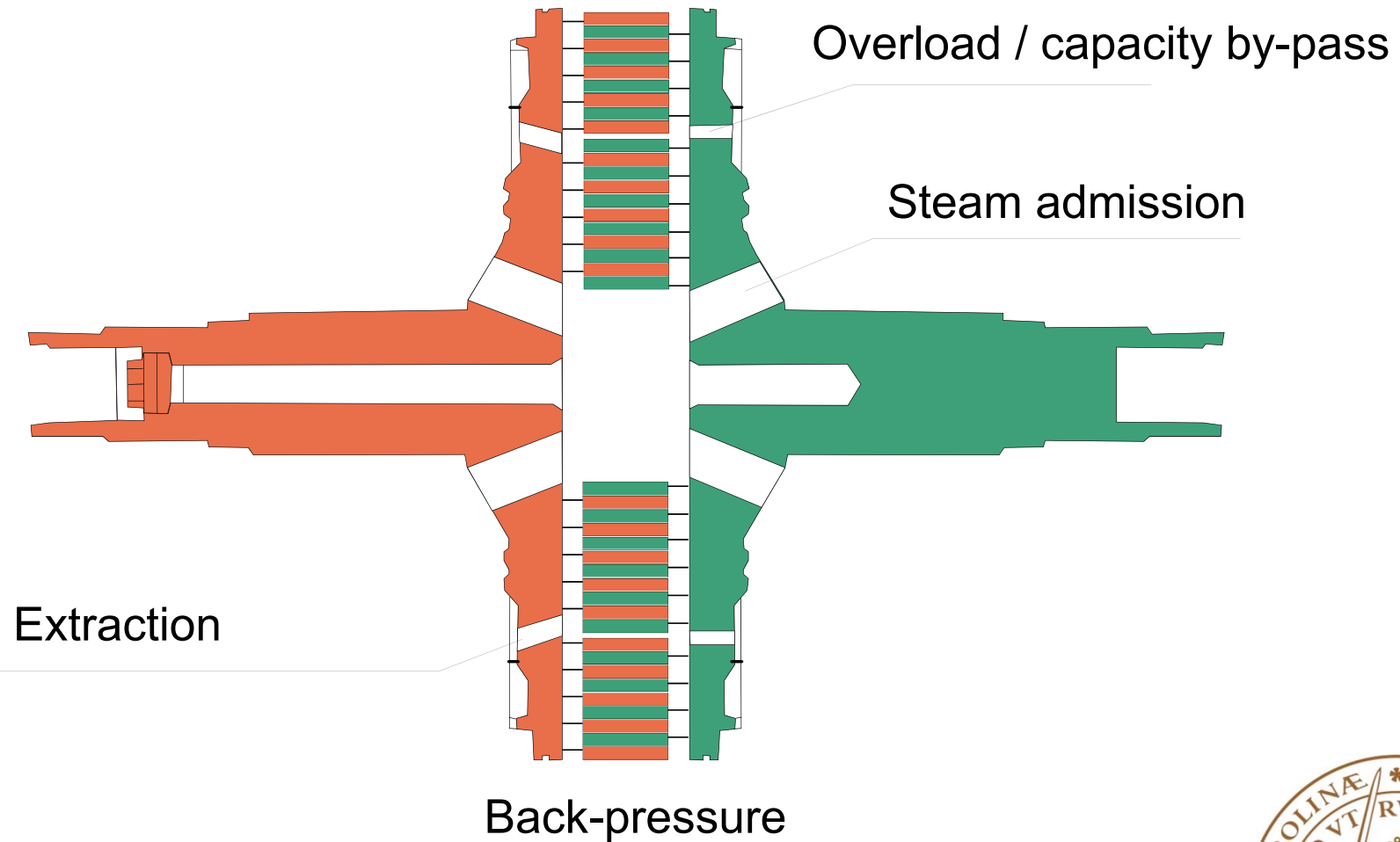
Direction of rotation



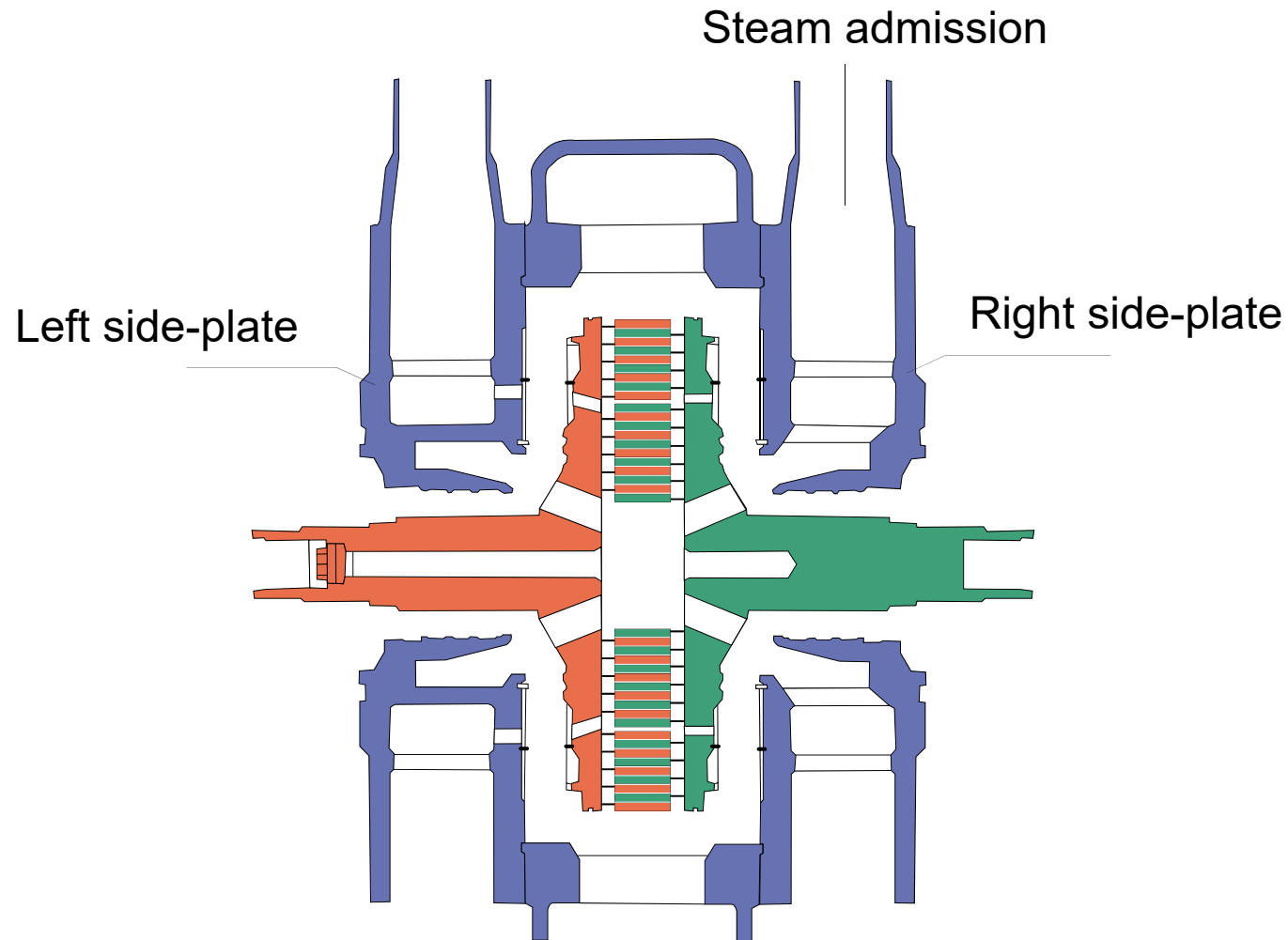
Ljungström turbine – ring with “dog bone”



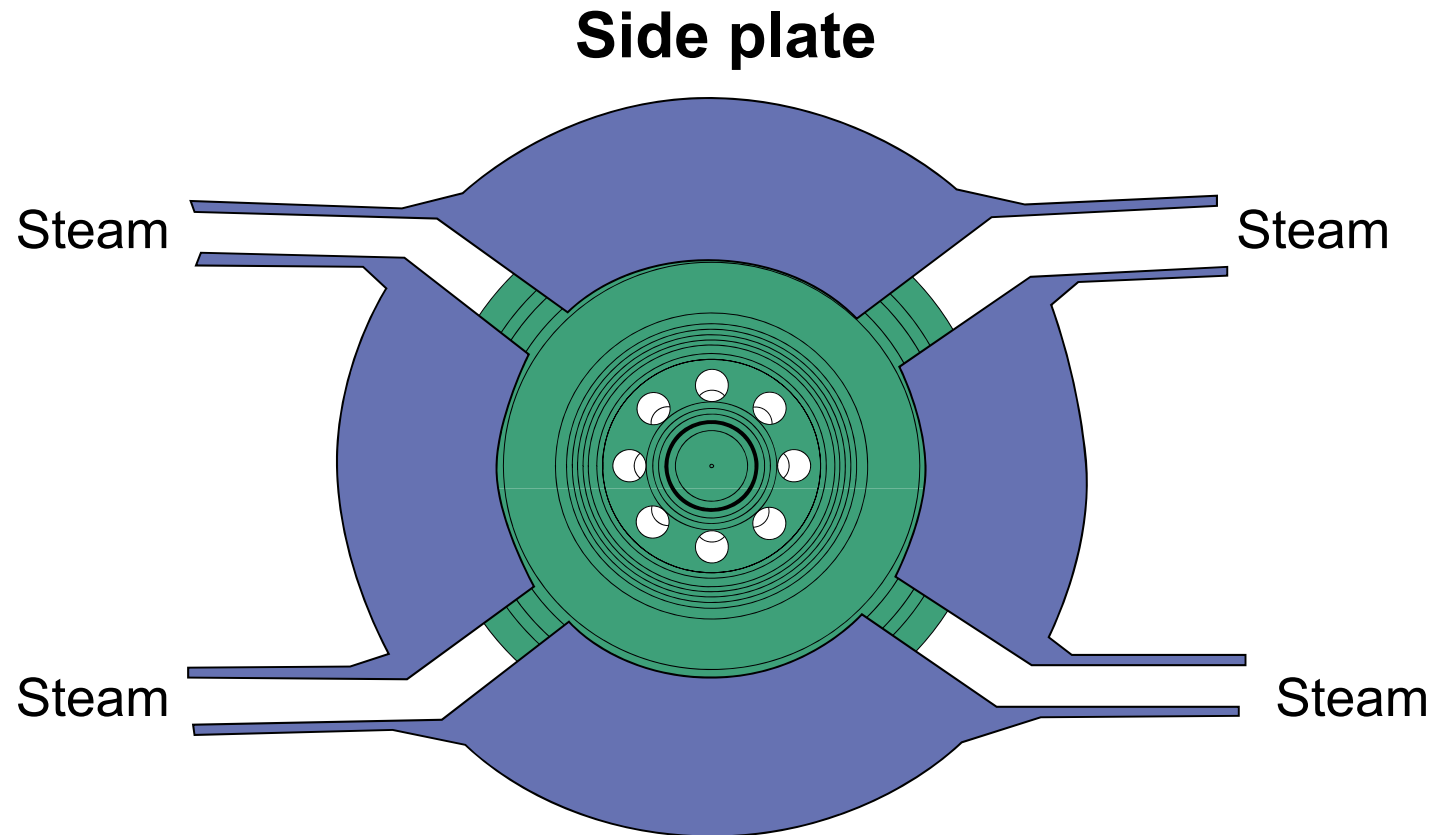
Ljungström turbine – blading system



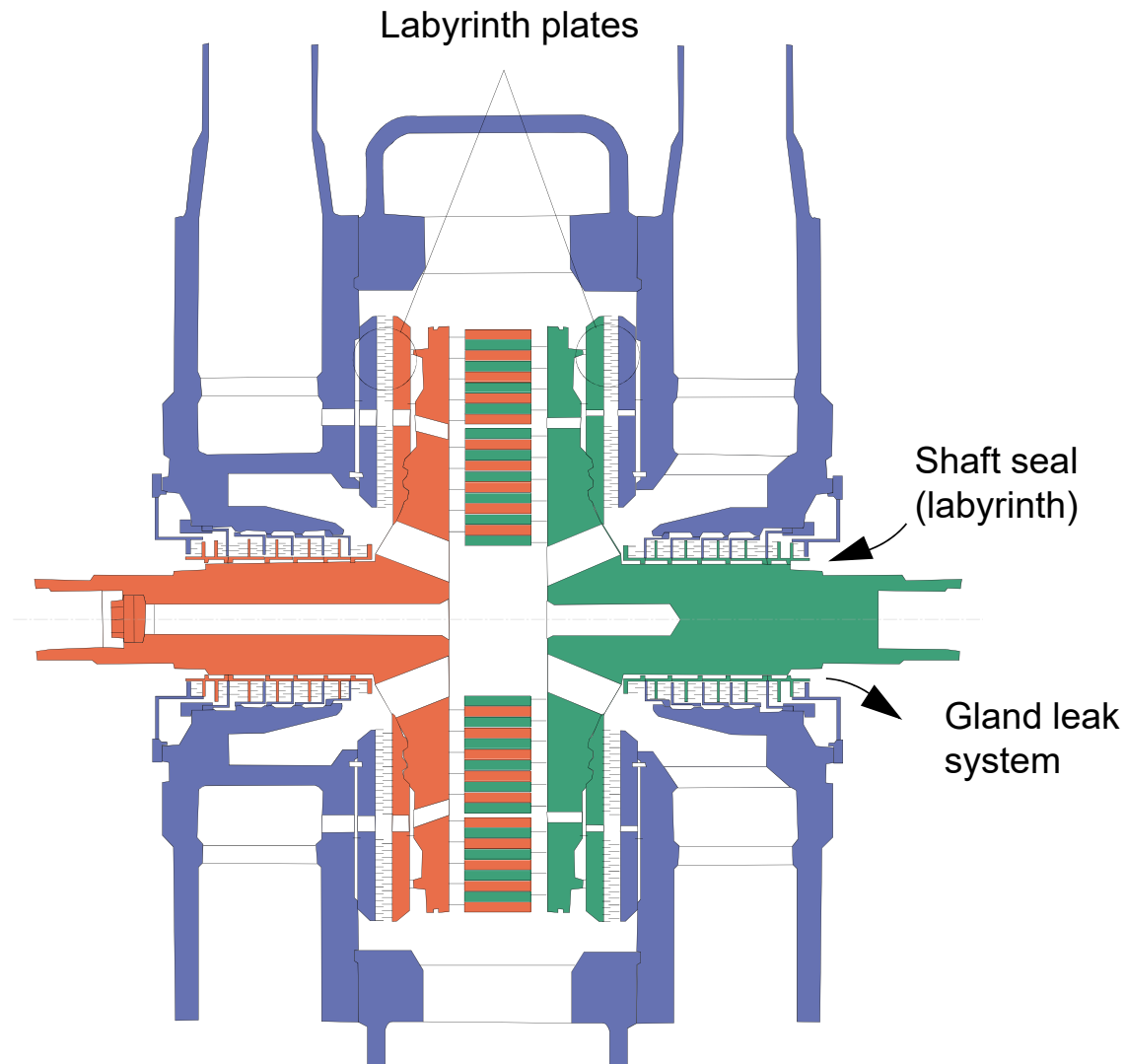
Ljungström turbine – end plates



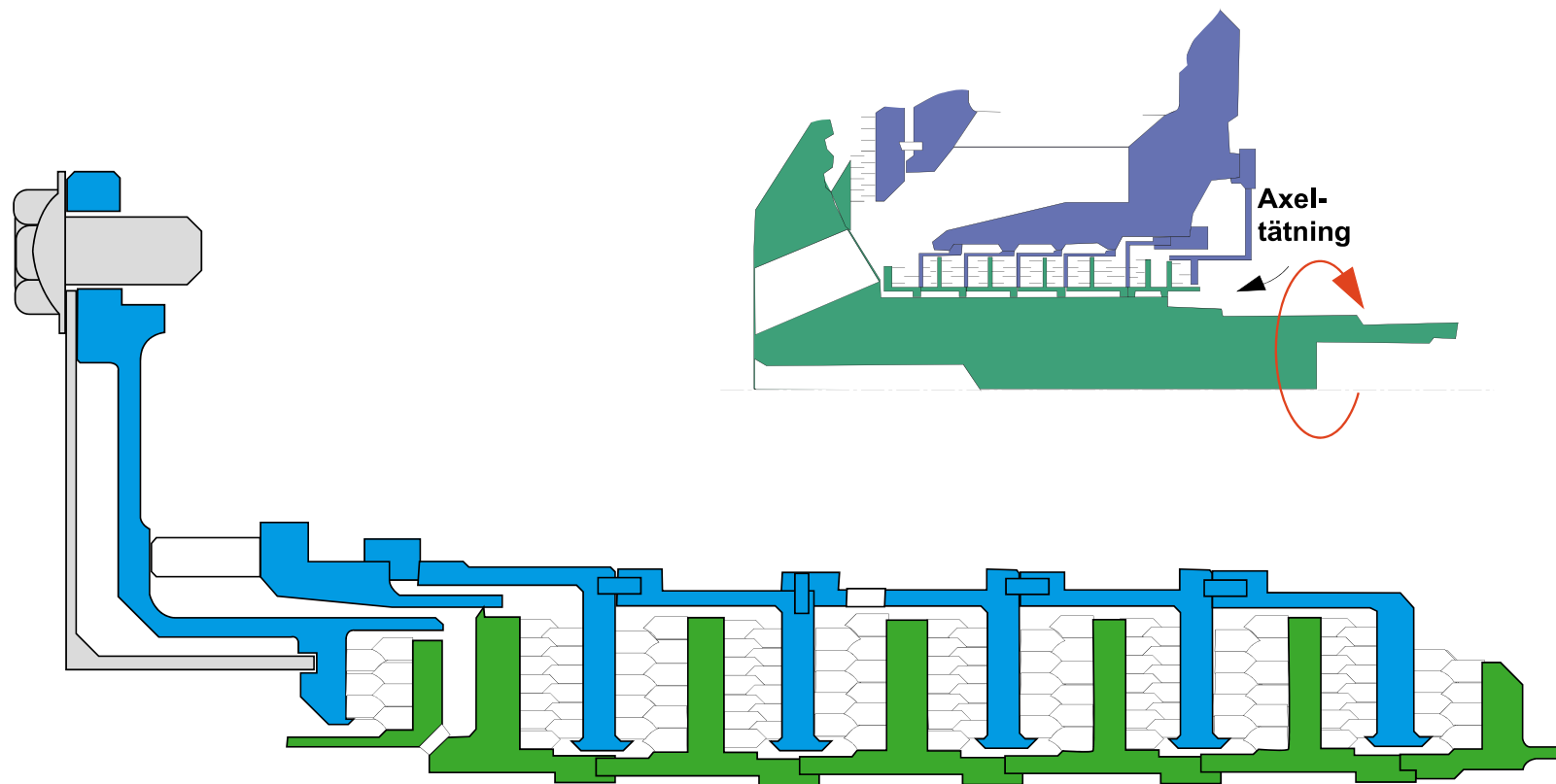
Ljungström turbine – side plate



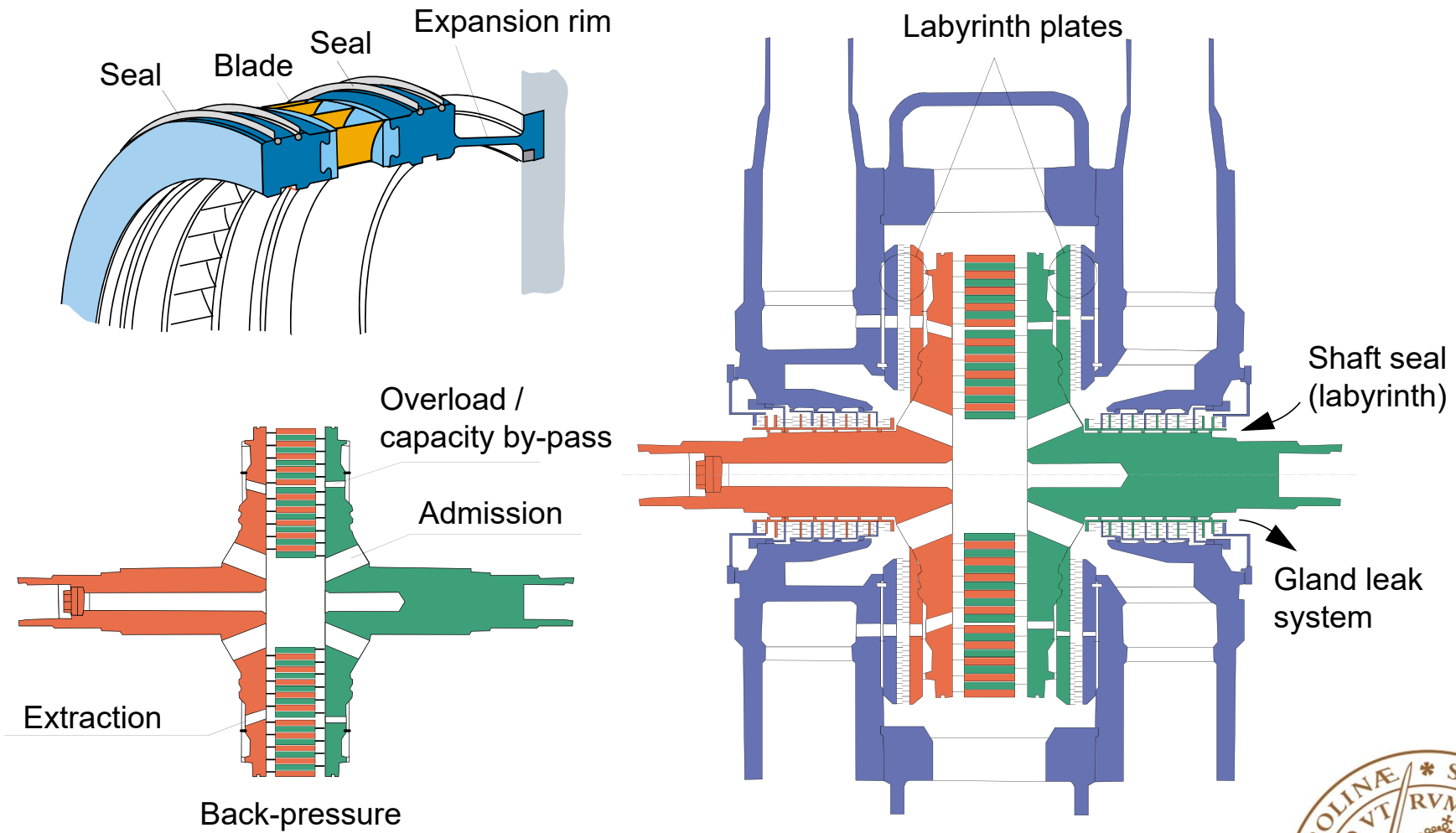
Ljungström turbine



Ljungström turbine – shaft seal



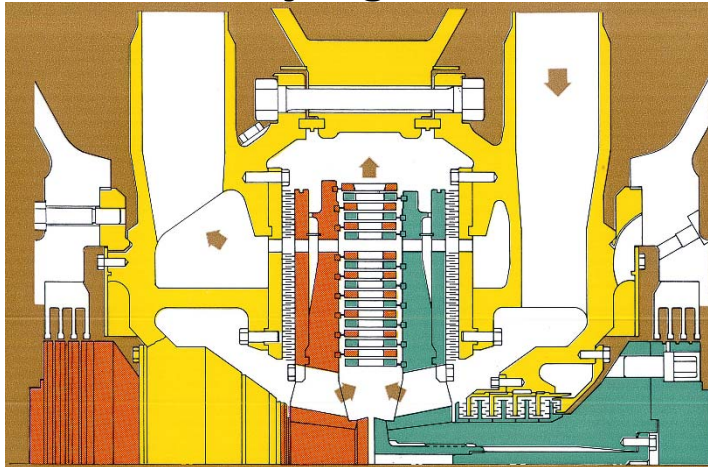
Ljungström turbine



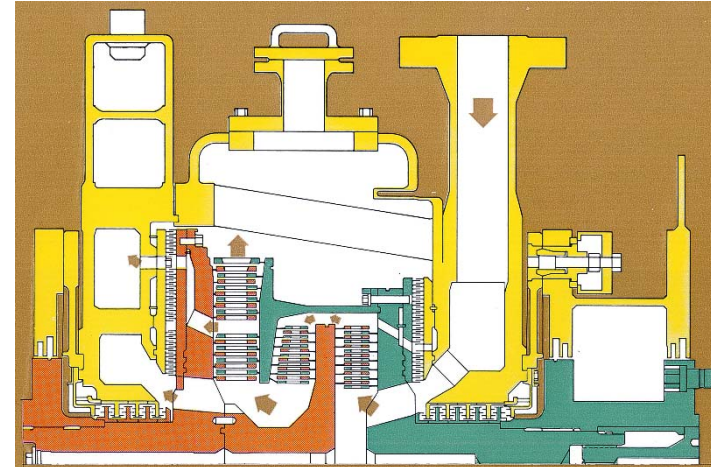
STAL Ljungström-type turbines



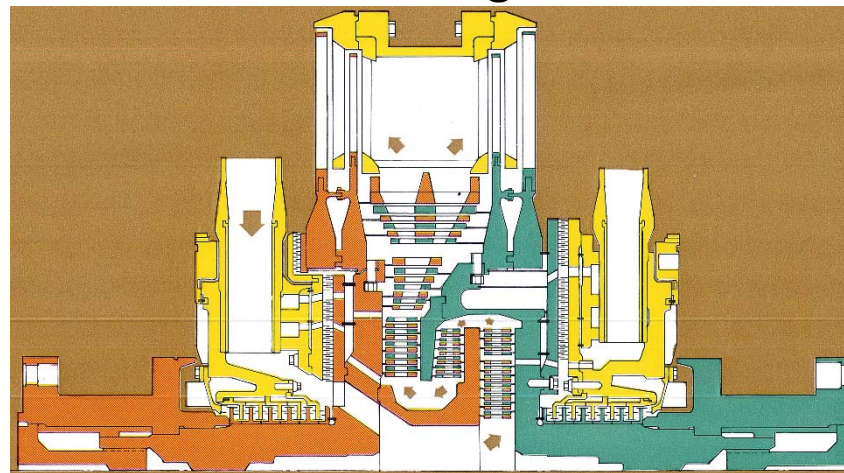
Ljungström



Möller



Wiberg

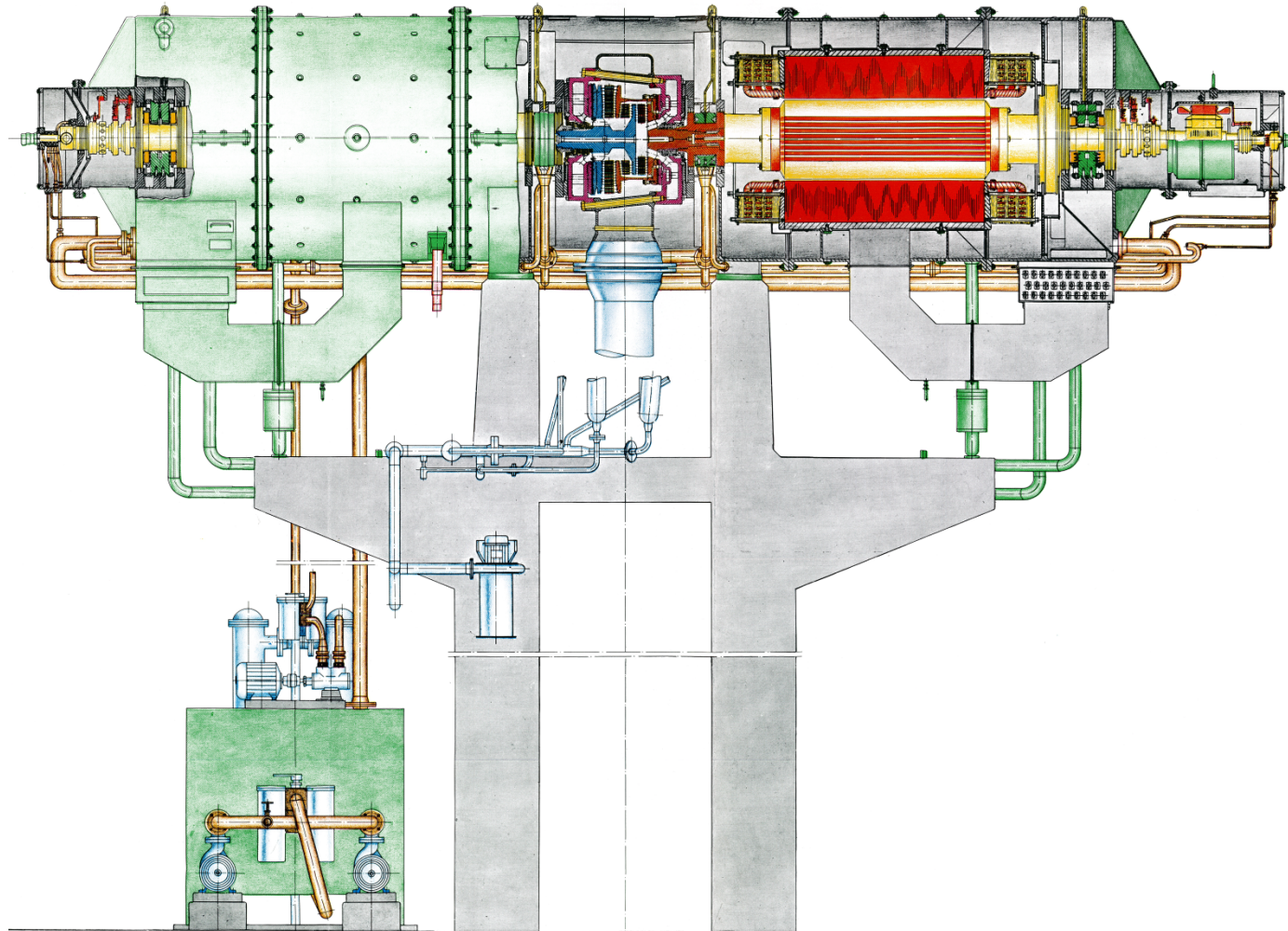


Back-pressure unit



STAL-LAVAL
STAL-LAVAL TURBIN AB

6.000—10.000 KW STAL BACK PRESSURE TURBO-GENERATOR

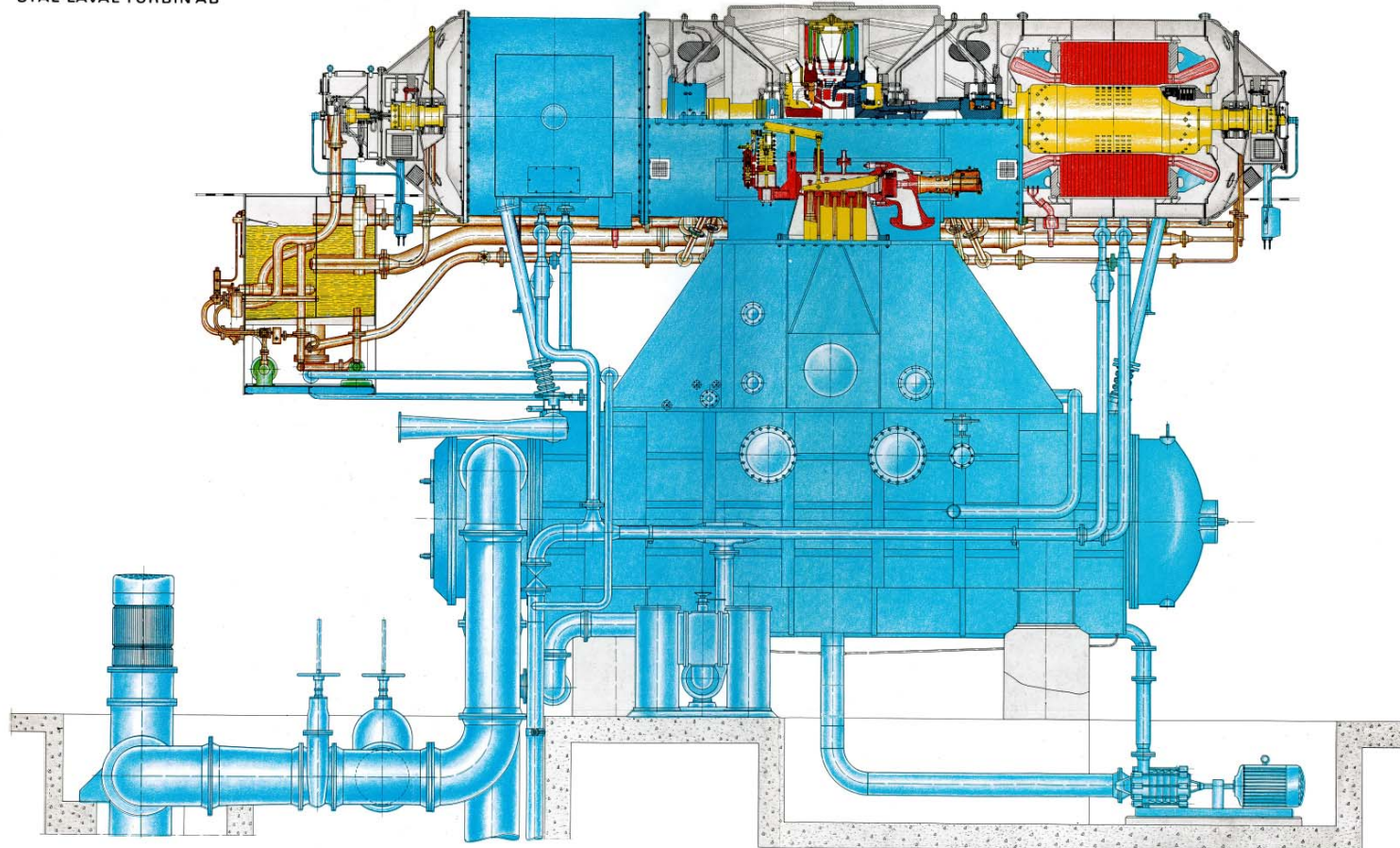


Condensing unit – Wiberg blading

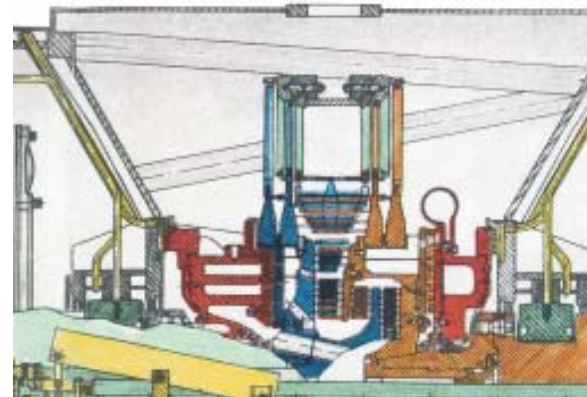
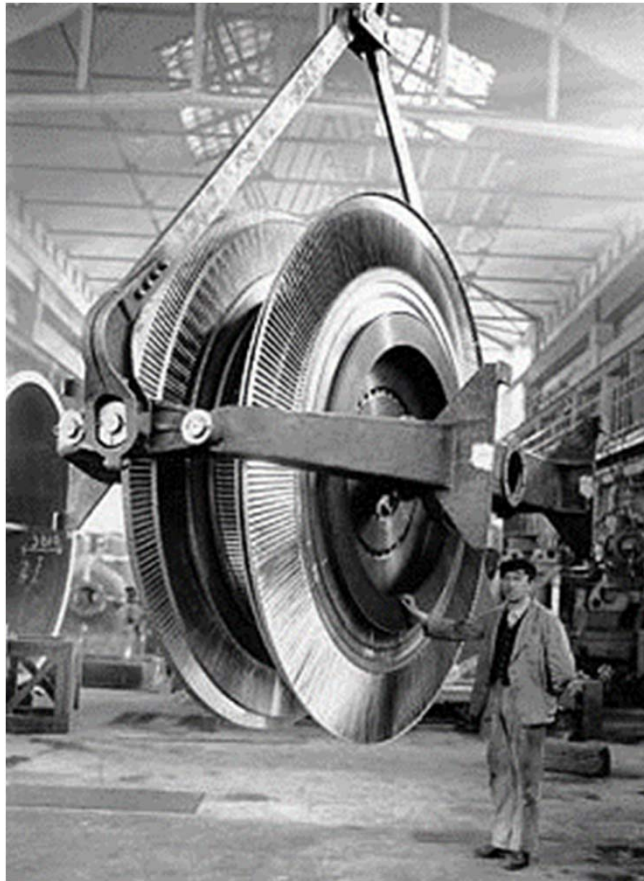


STAL-LAVAL
STAL-LAVAL TURBIN AB

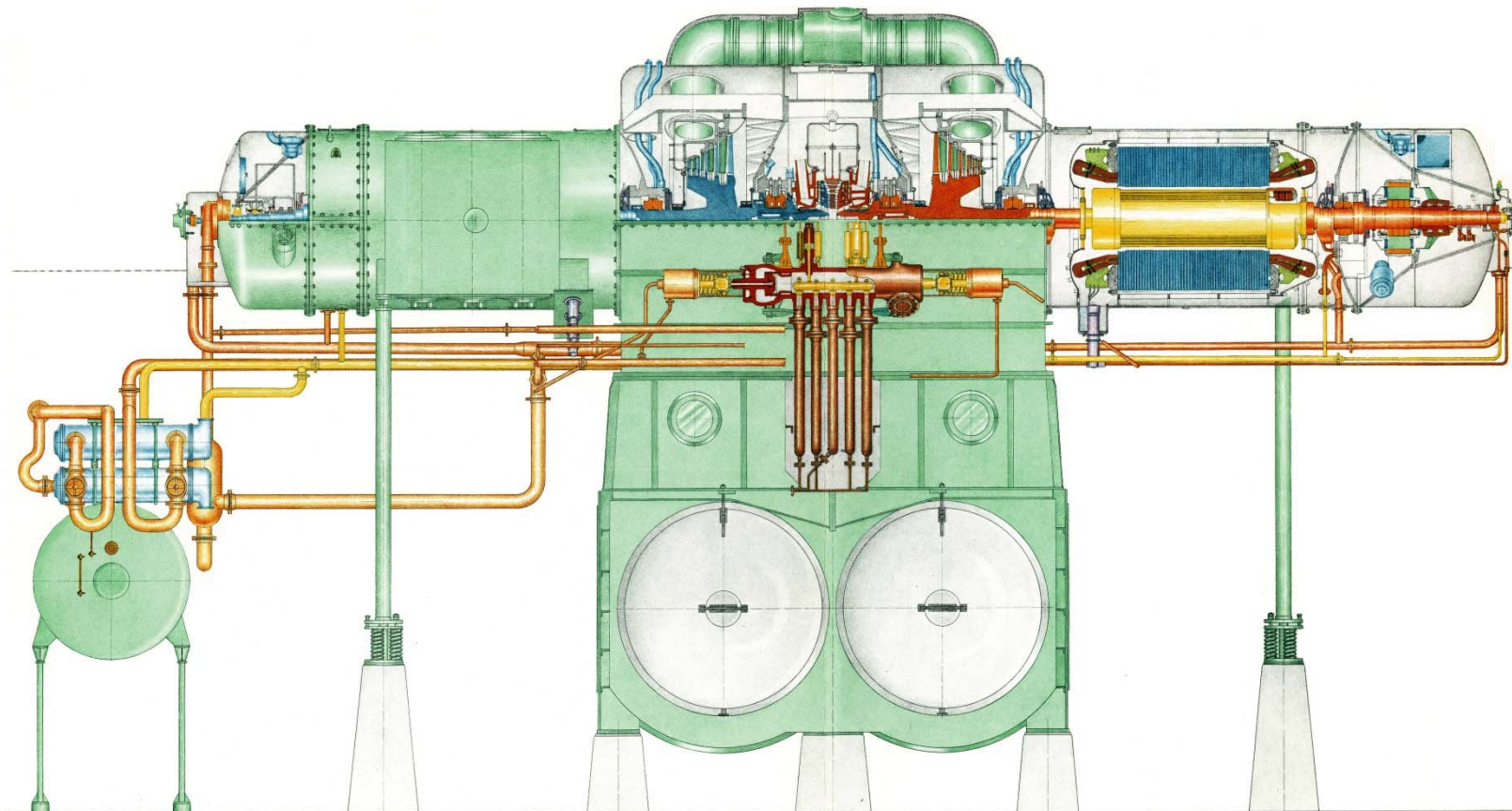
25–50 MW STAL CONDENSING TURBO-GENERATOR



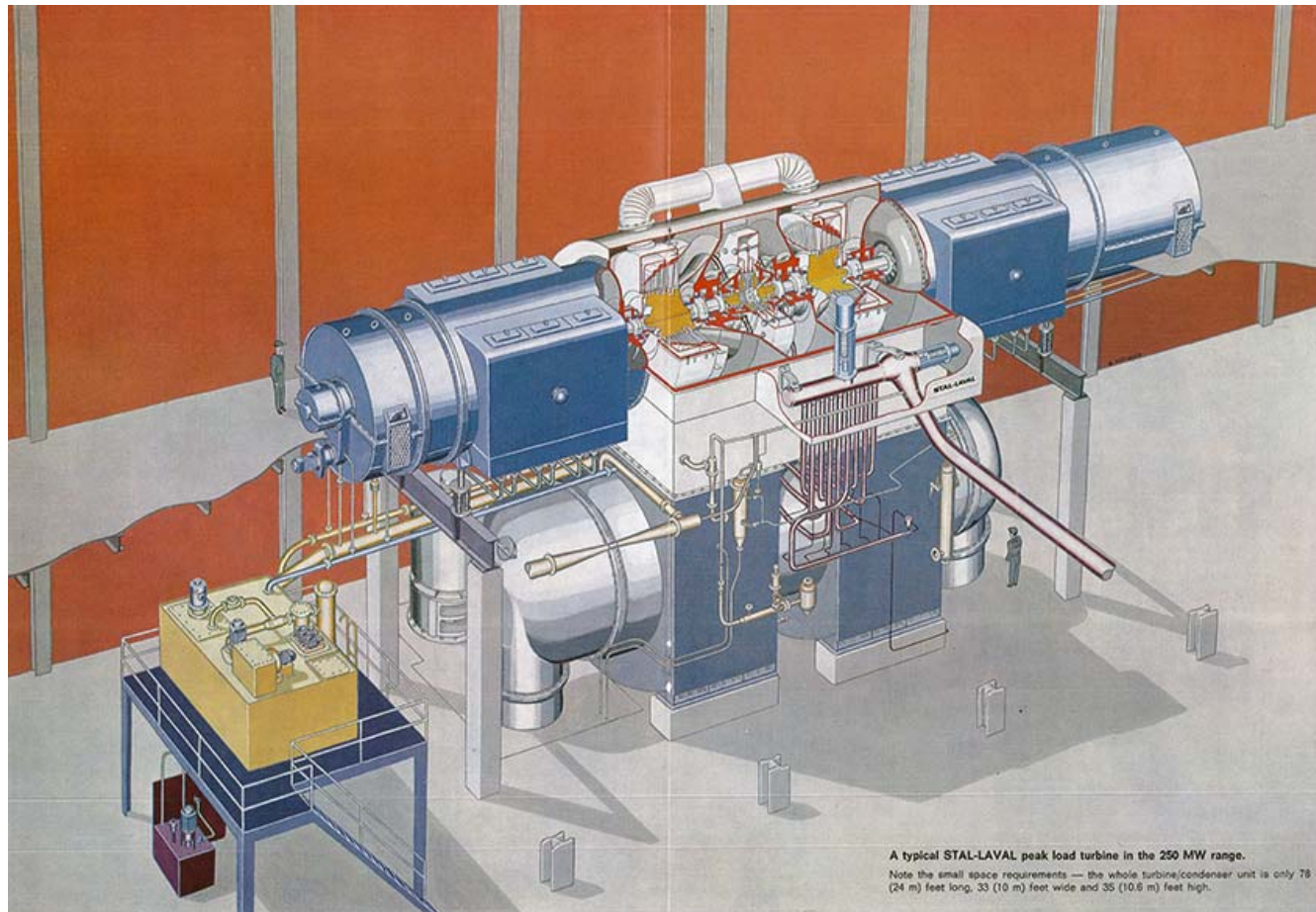
Condensing unit – Wiberg blading



Condensing unit – DURAX



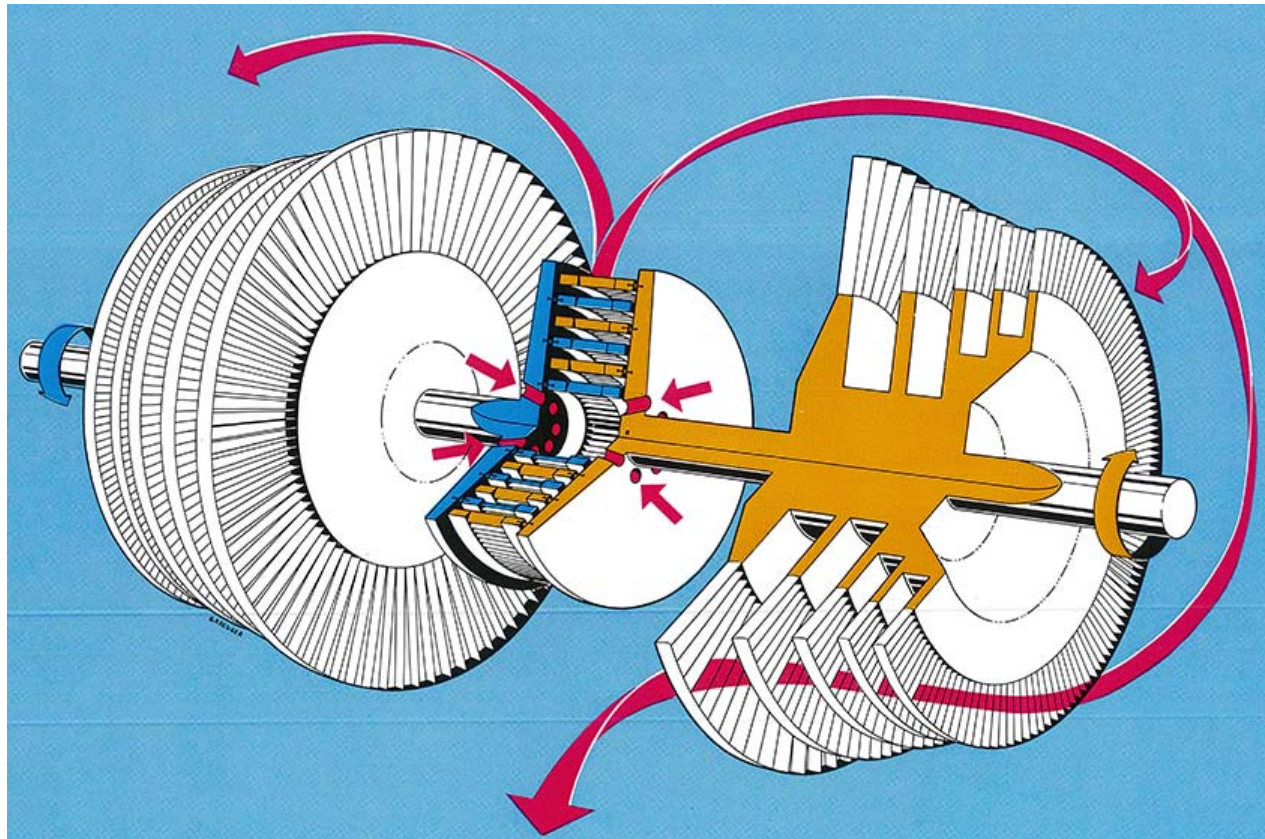
Condensing unit – DURAX



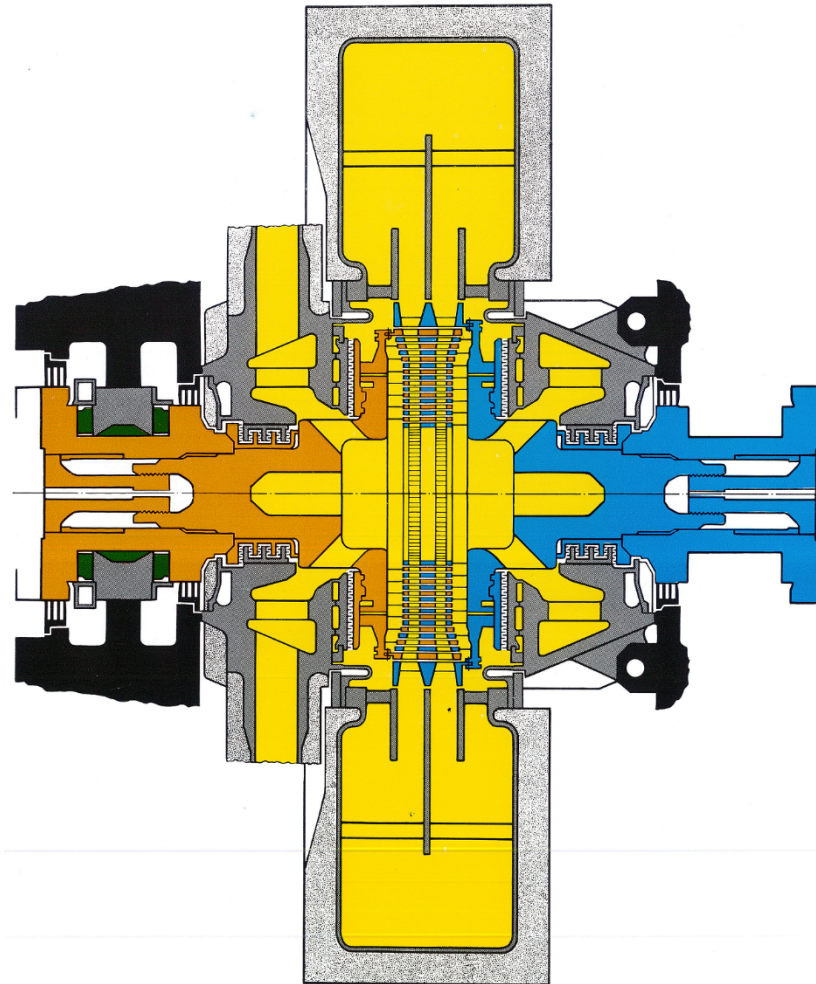
A typical STAL-LAVAL peak load turbine in the 250 MW range.
Note the small space requirements — the whole turbine/condenser unit is only 78 (24 m) feet long, 33 (10 m) feet wide and 35 (10.6 m) feet high.



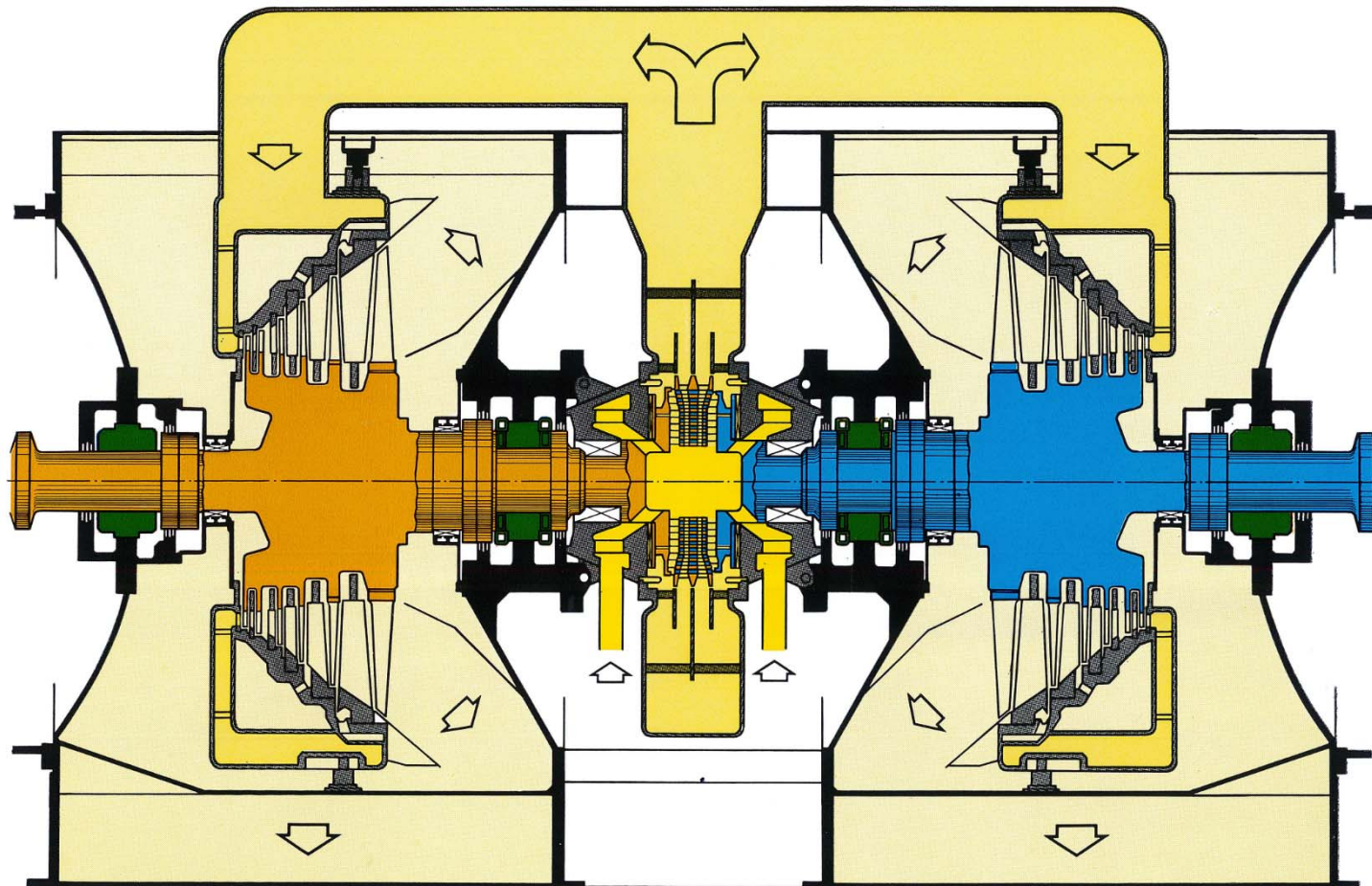
Condensing unit – DURAX



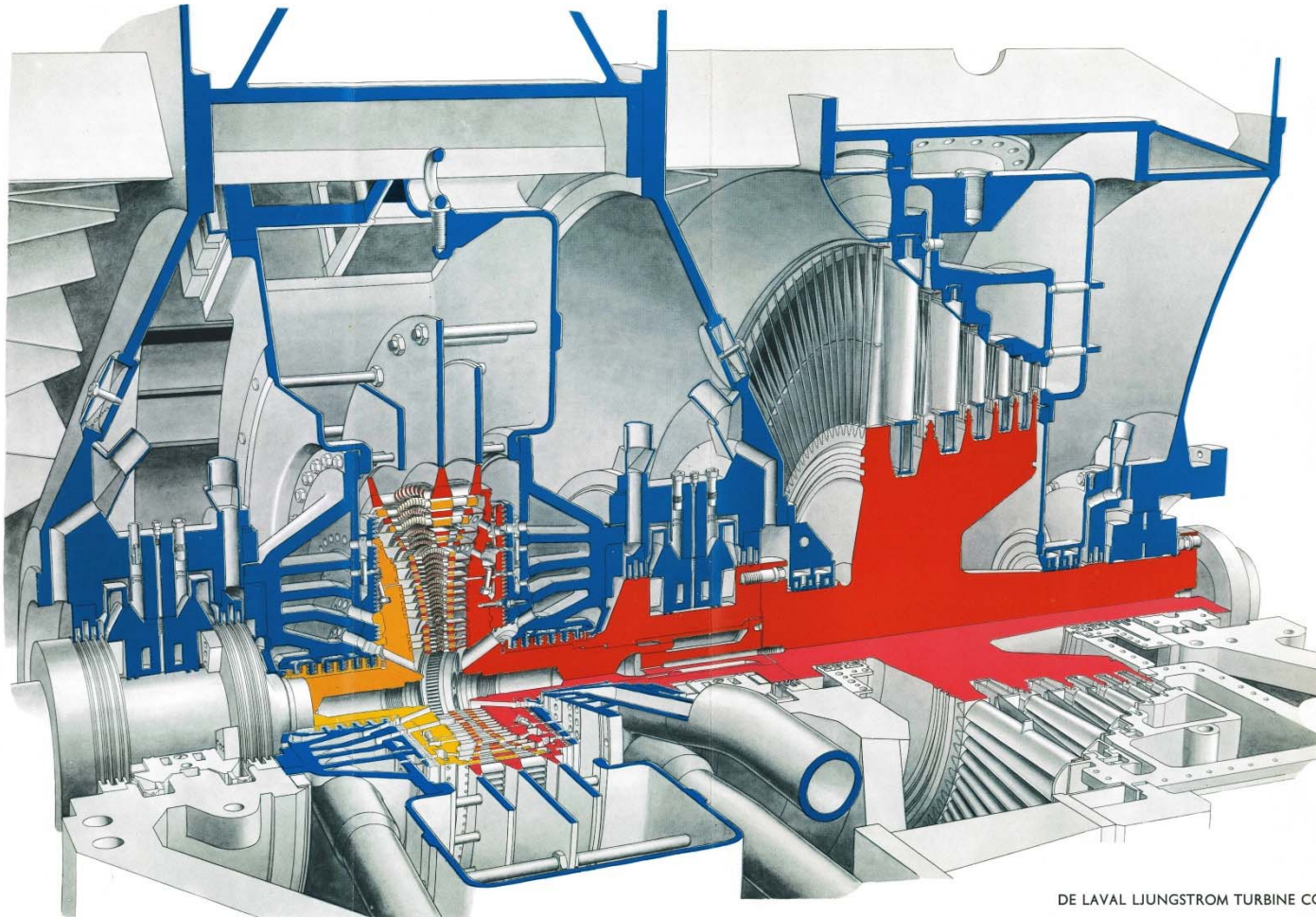
Condensing unit – DURAX



Condensing unit – DURAX



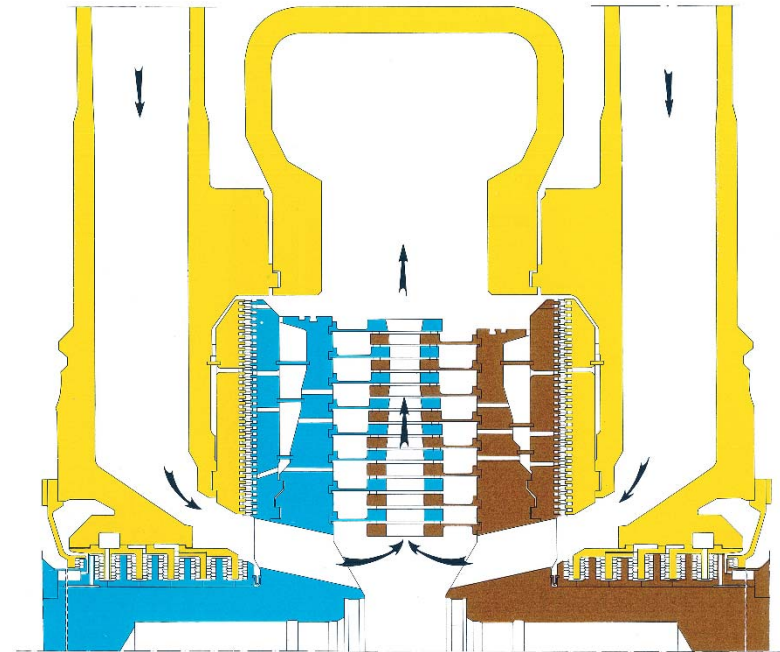
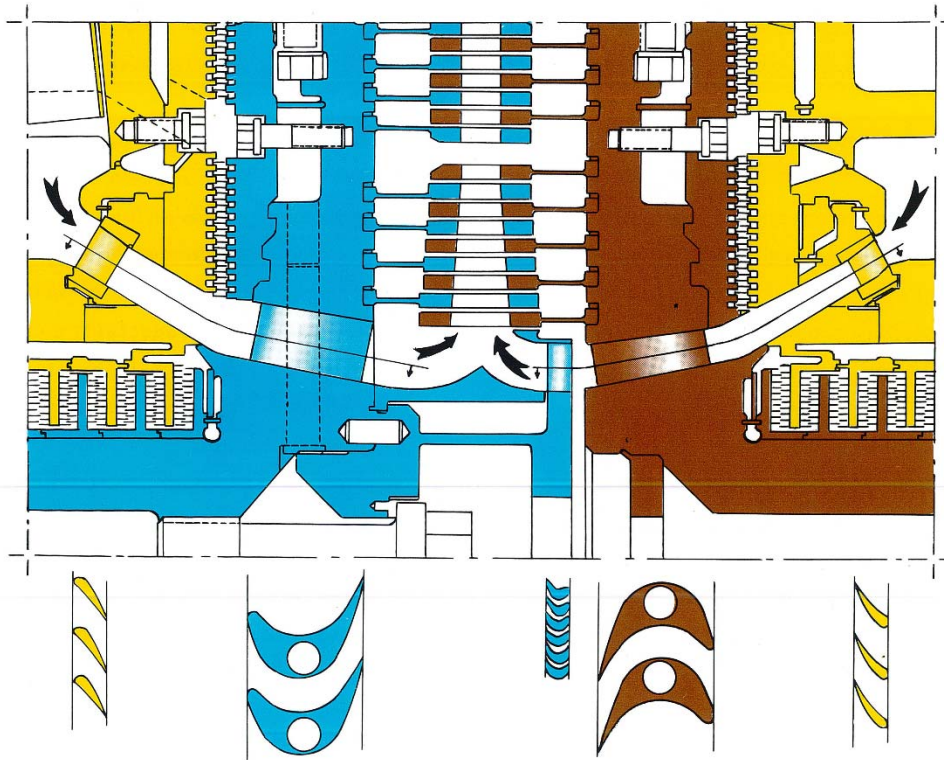
Condensing unit – DURAX



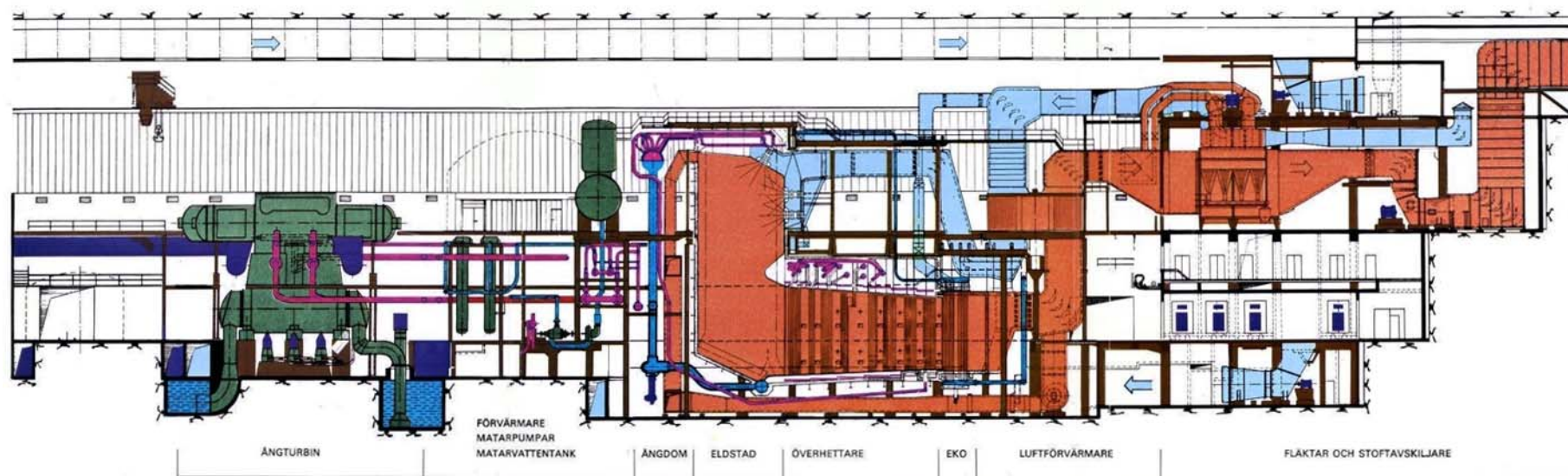
DE LAVAL LJUNGSTROM TURBINE CO.



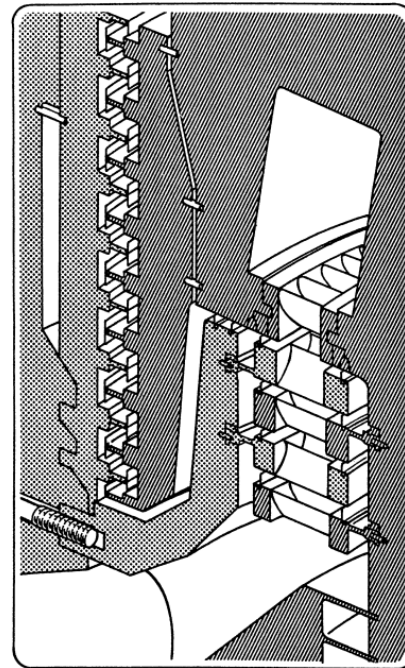
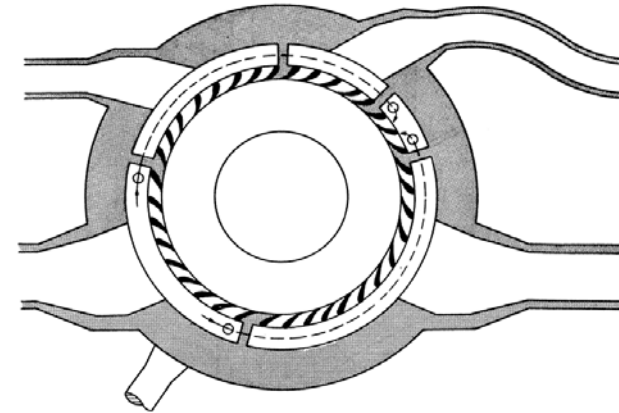
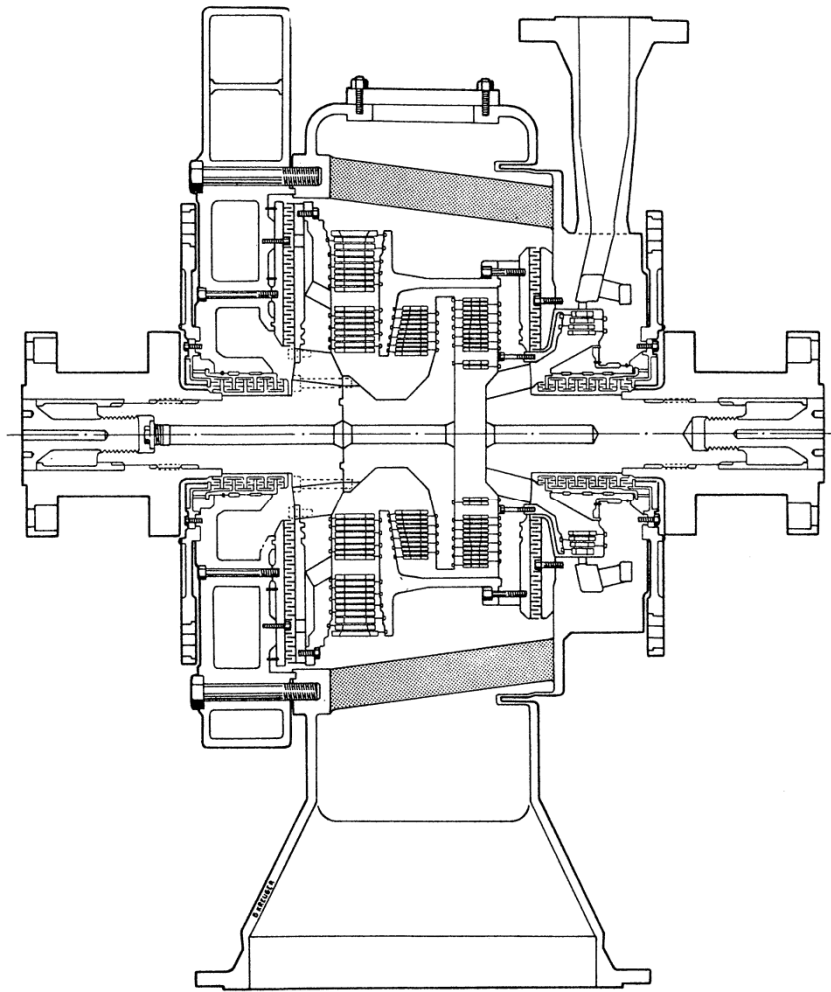
Control stage



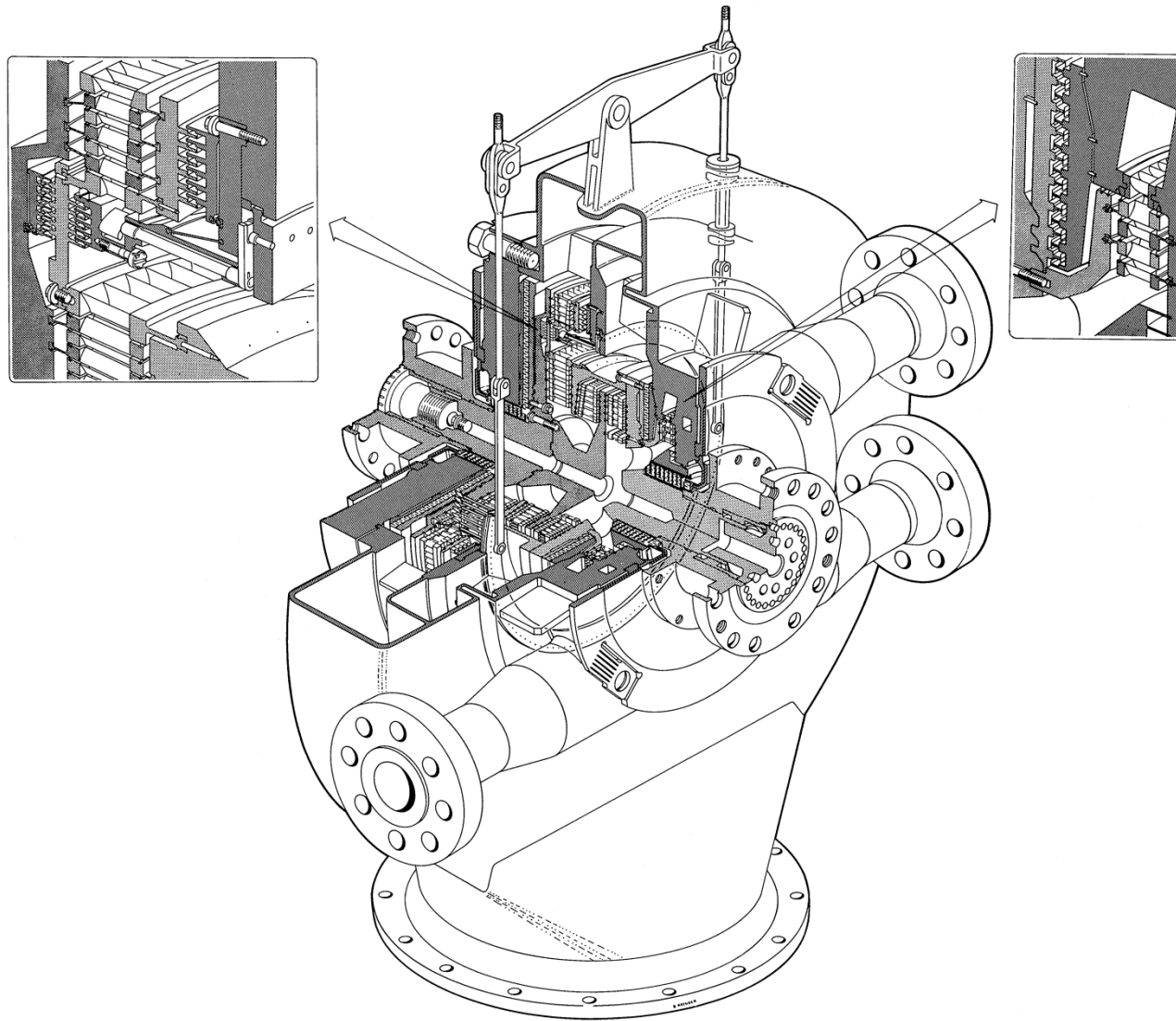
Stenungssund block 3&4



Advanced solutions – control stage



Advanced solutions – controlled extraction



Advanced solutions – controlled extraction

