

APPENDIX A : INITIAL SIMULATION RESULTS.

1. Kruiplijn coaster.

1.1. Impact force.

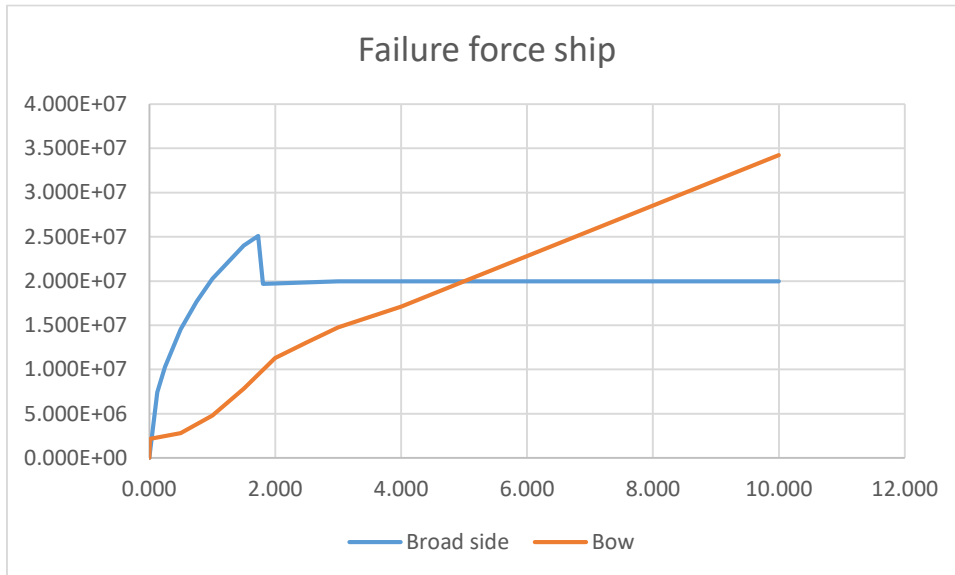


Figure A 1: Ship impact force or failure force.

1.2. Drifting.

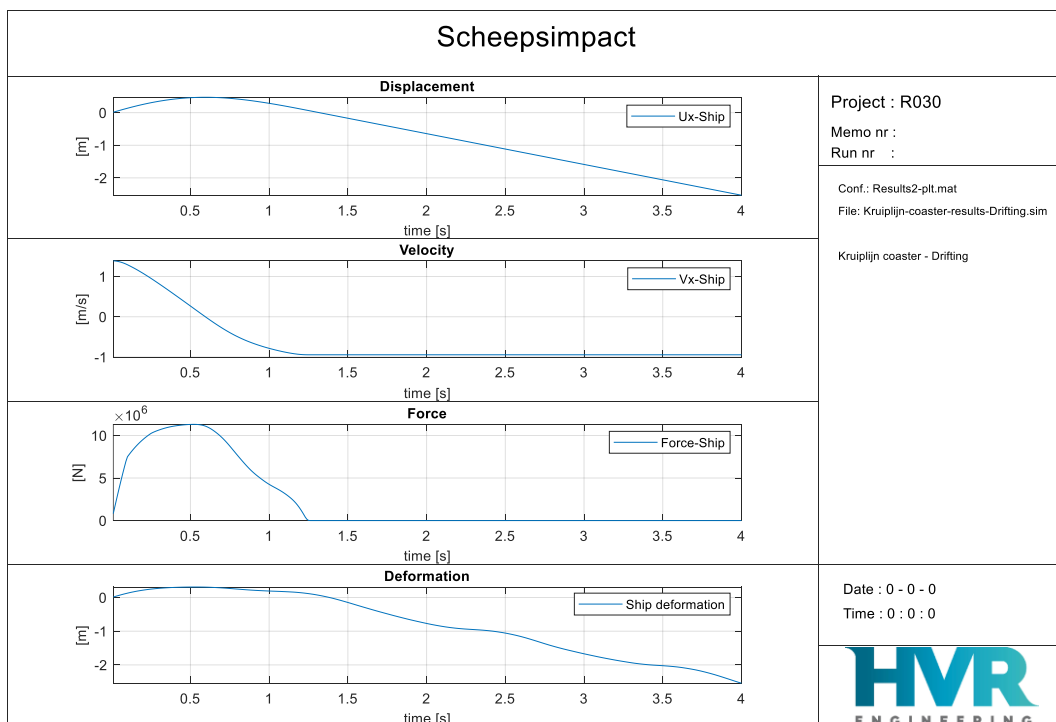


Figure A 2: Kruiplijn coaster, ship results, Drifting.

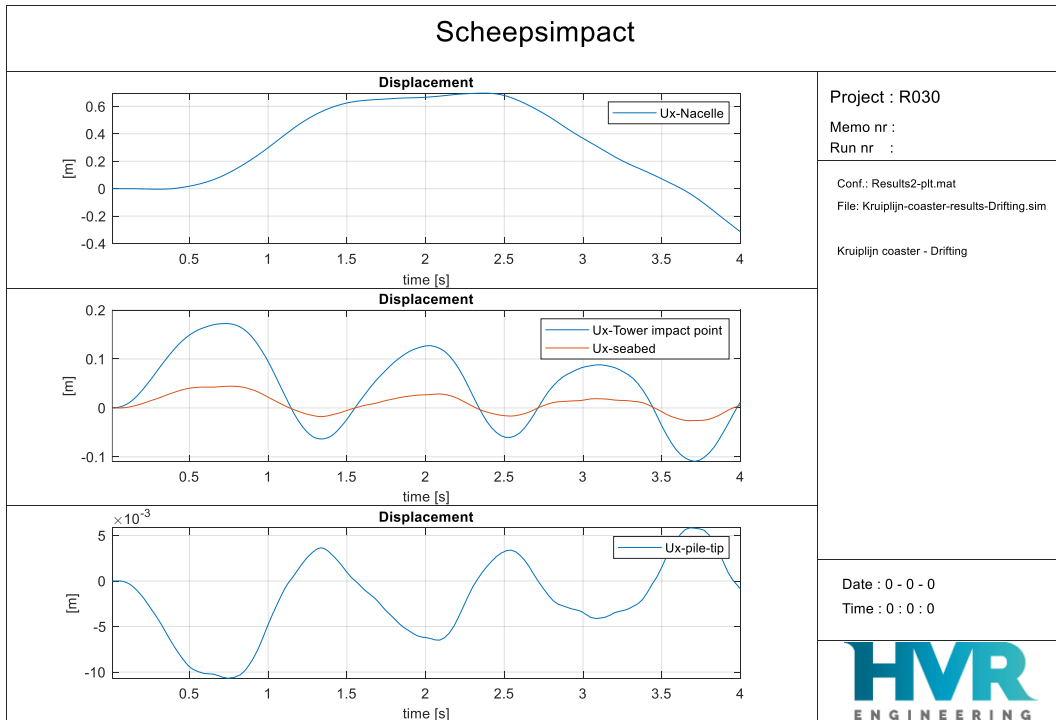


Figure A 3: Kruiplijn coaster, foundation results, Drifting.

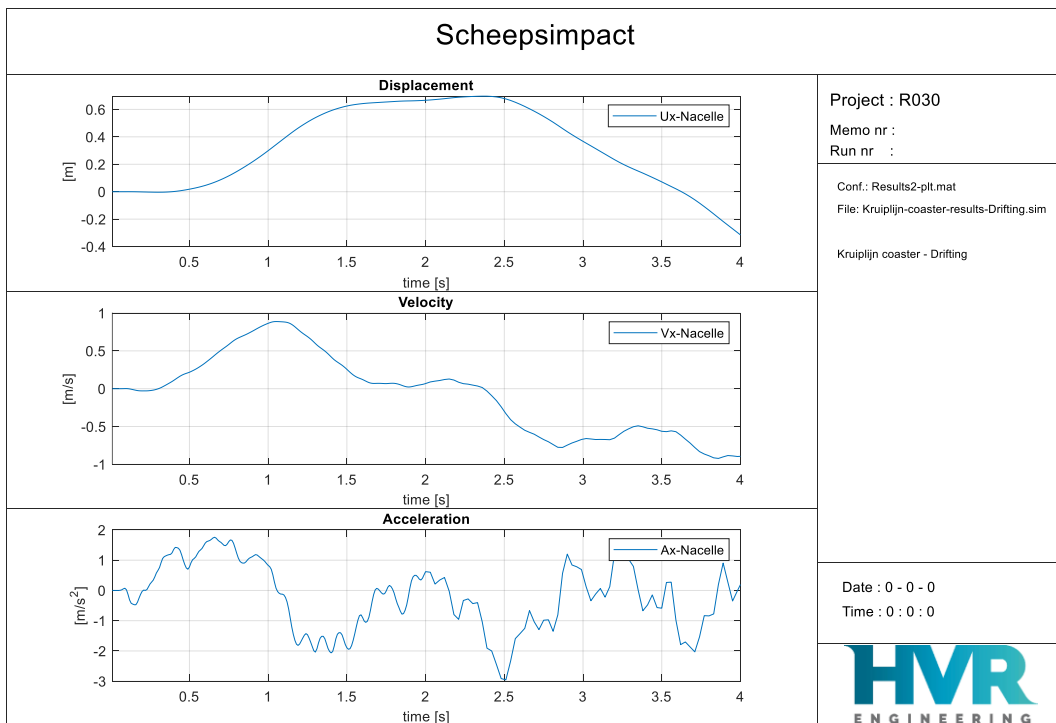


Figure A 4: Kruiplijn coaster, Nacelle results, Drifting.

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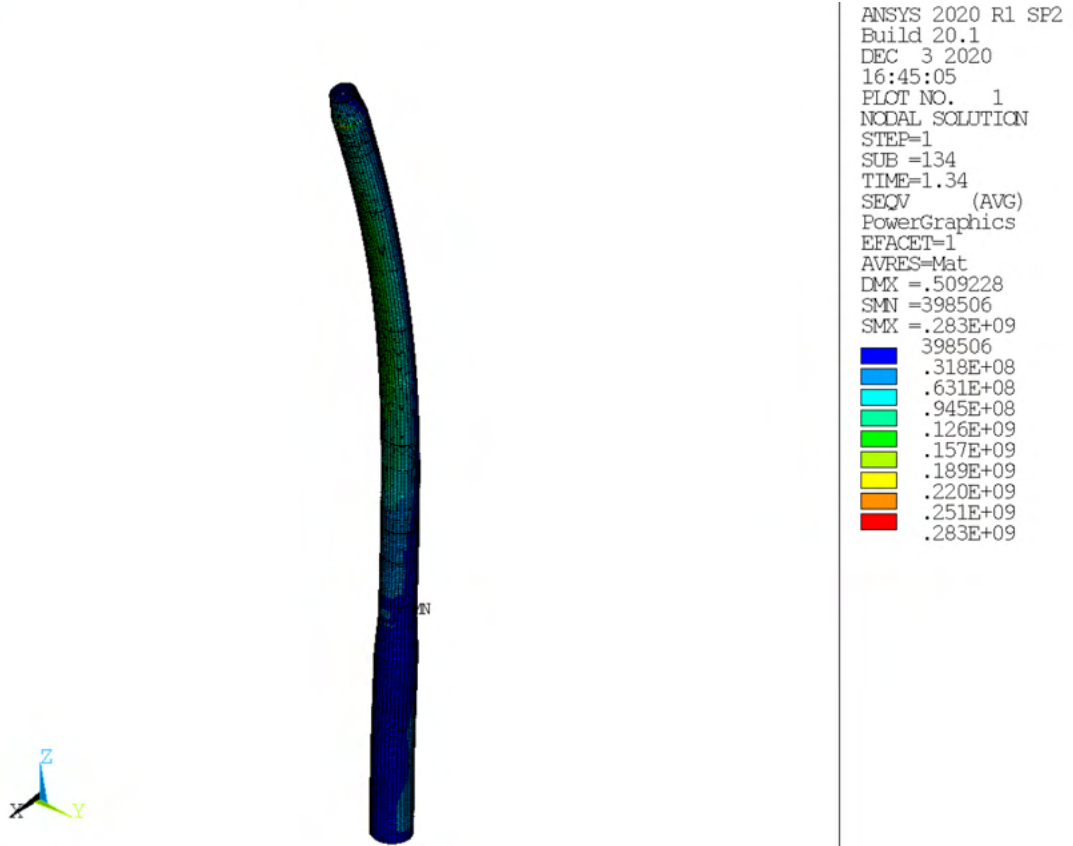


Figure A 5: Kruislijn coaster, end deformation and Von Mises stress in [Pa], Drifting.

1.3. Sailing.

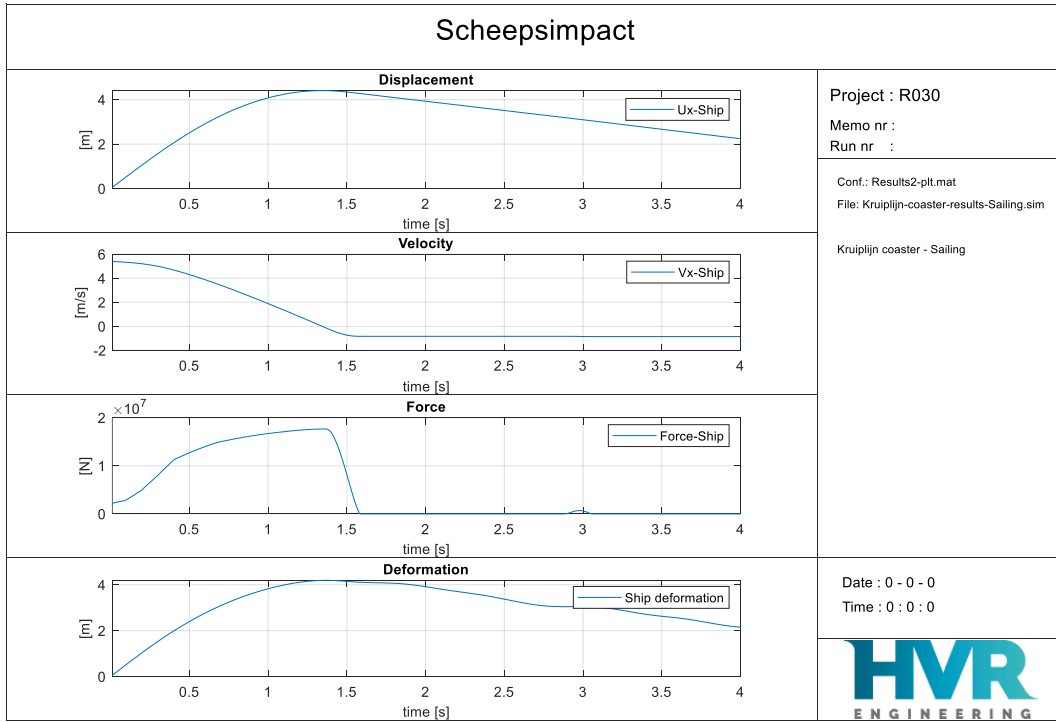


Figure A 6: Kruiplijn coaster, ship results, Sailing.

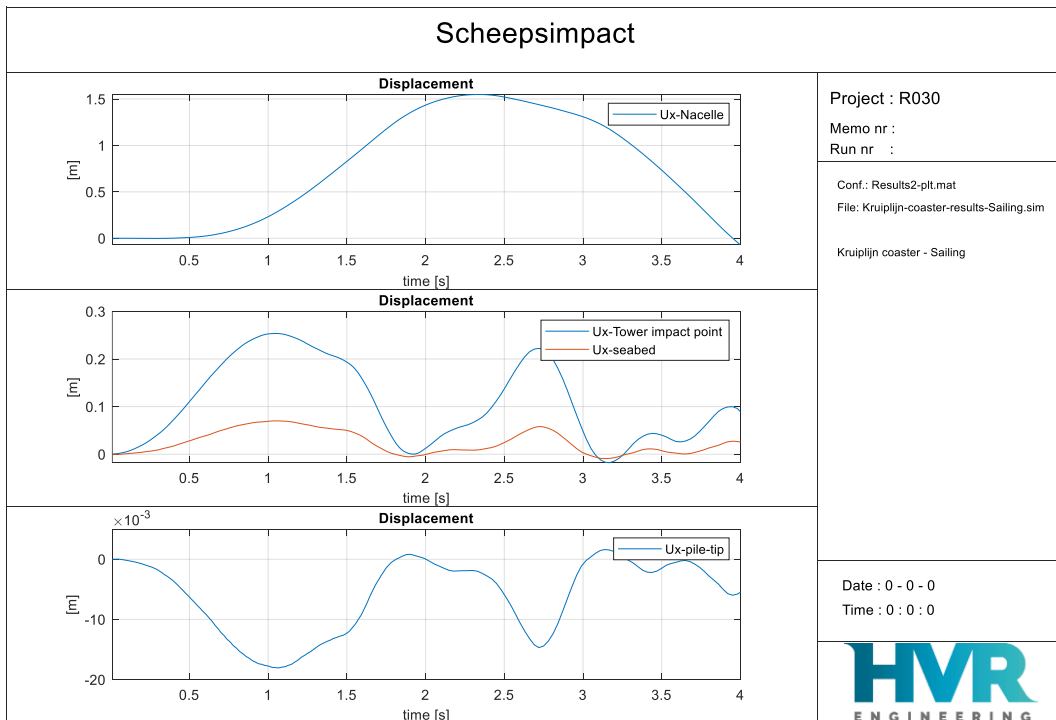


Figure A 7: Kruiplijn coaster, foundation results, Sailing.

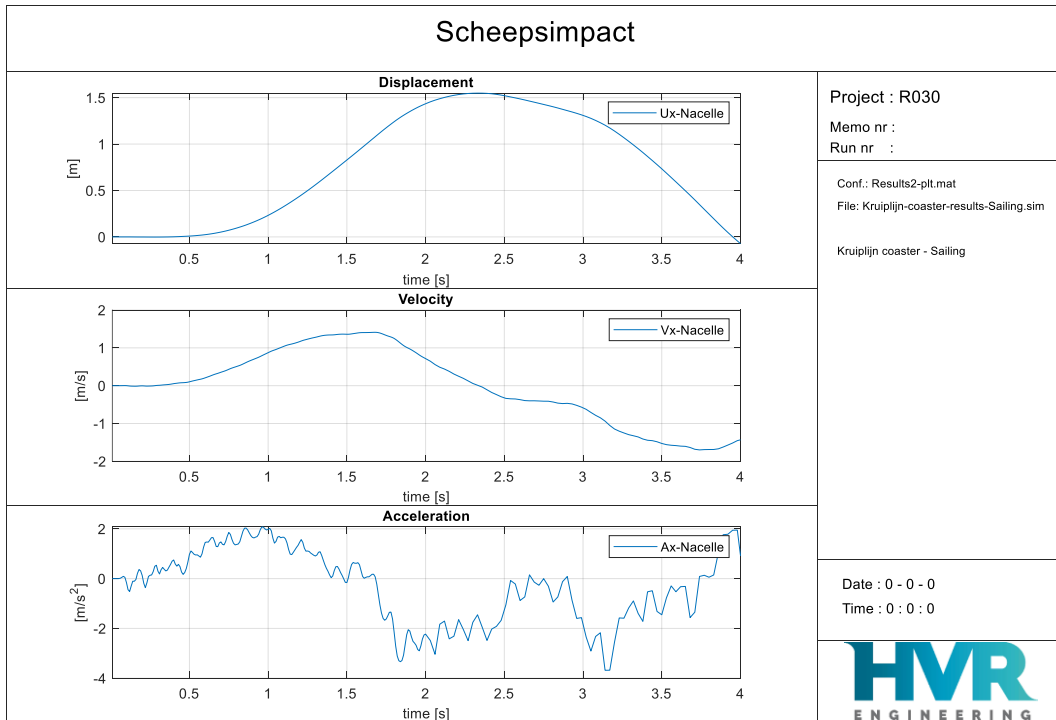


Figure A 8: Kruiplijn coaster, Nacelle results, Sailing.

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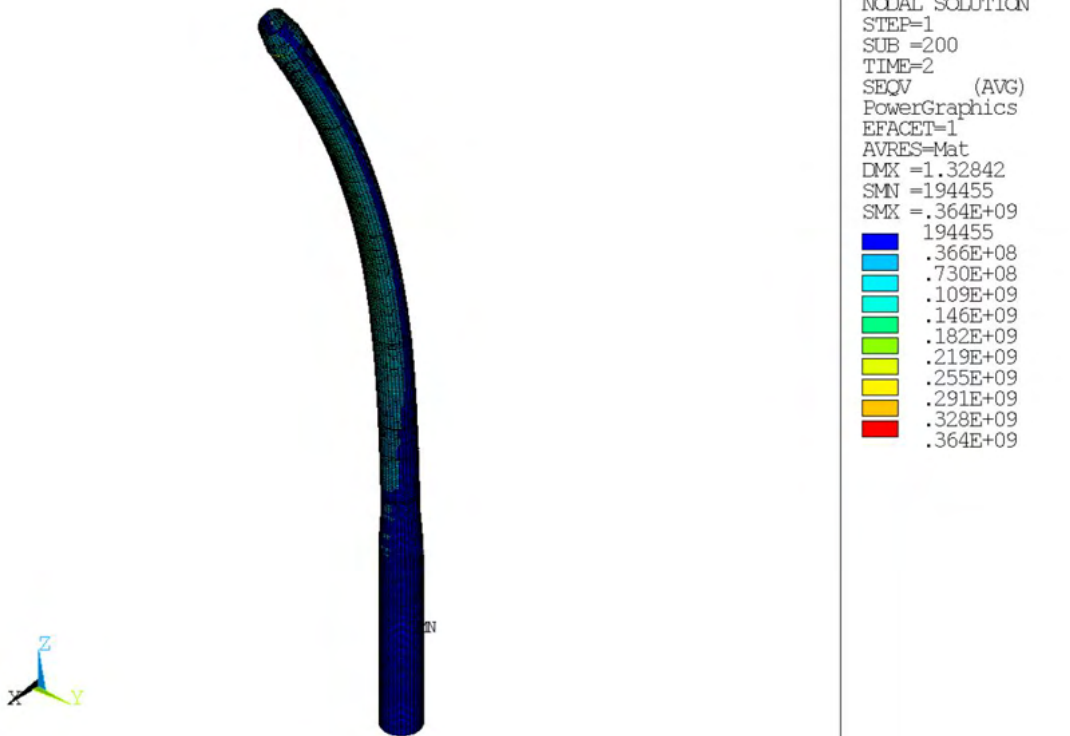


Figure A 9: Kruiplijn coaster, end deformation and Von Mises stress in [Pa], Sailing.

2. Supply vessel.

2.1. Impact force.

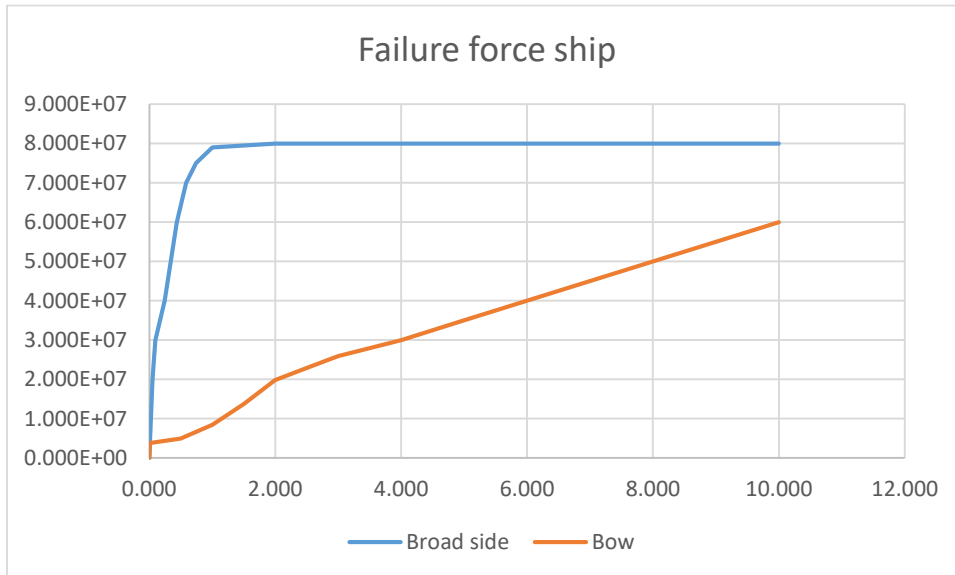


Figure A 10: Ship impact force or failure force.

2.2. Drifting.

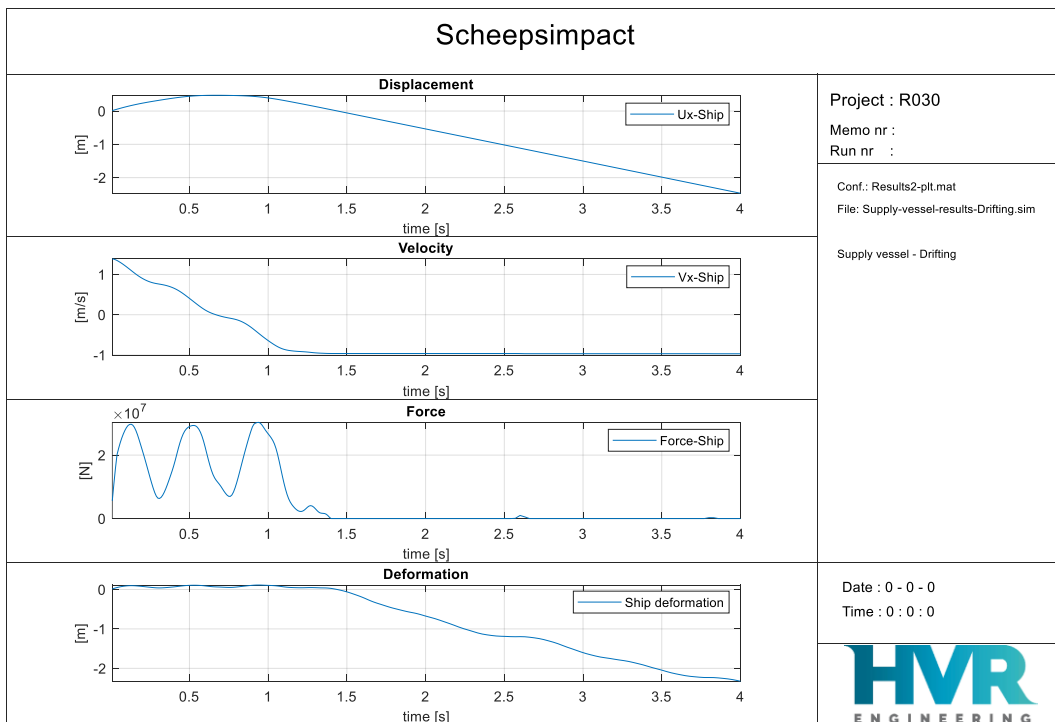


Figure A 11: Supply vessel, ship results, Drifting.

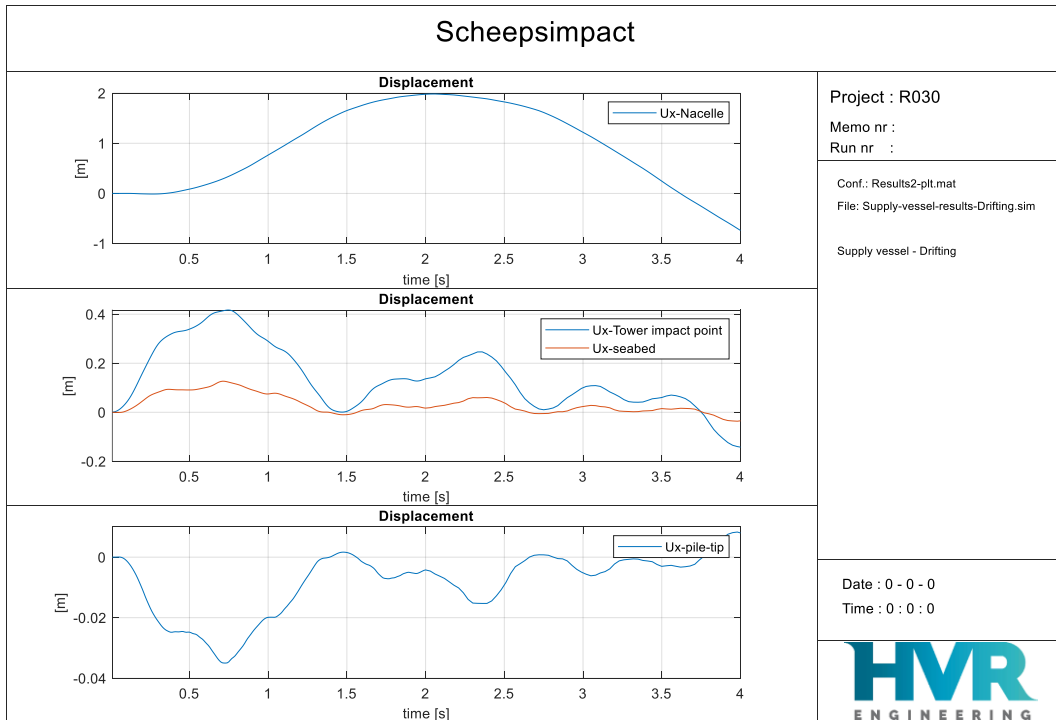


Figure A 12: Supply vessel, foundation results, Drifting.

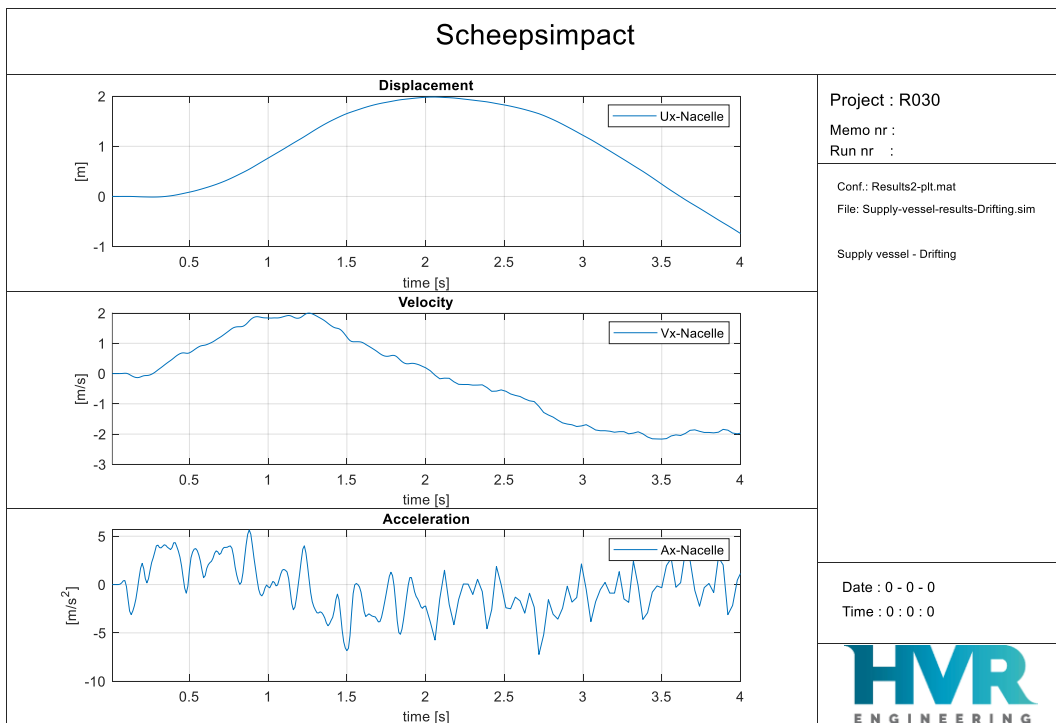


Figure A 13: Supply vessel, Nacelle results, Drifting.

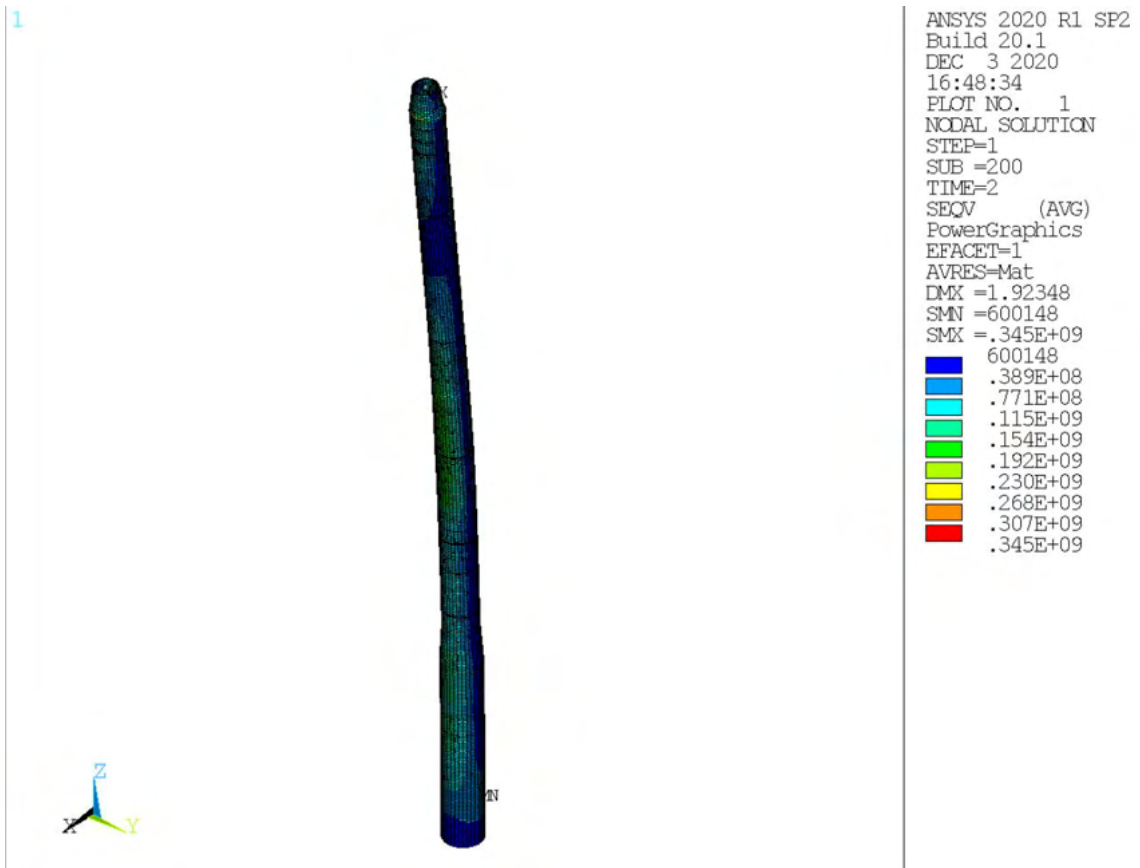


Figure A 14: Supply vessel, end deformation and Von Mises stress in [Pa], Drifting.

2.3. Sailing.

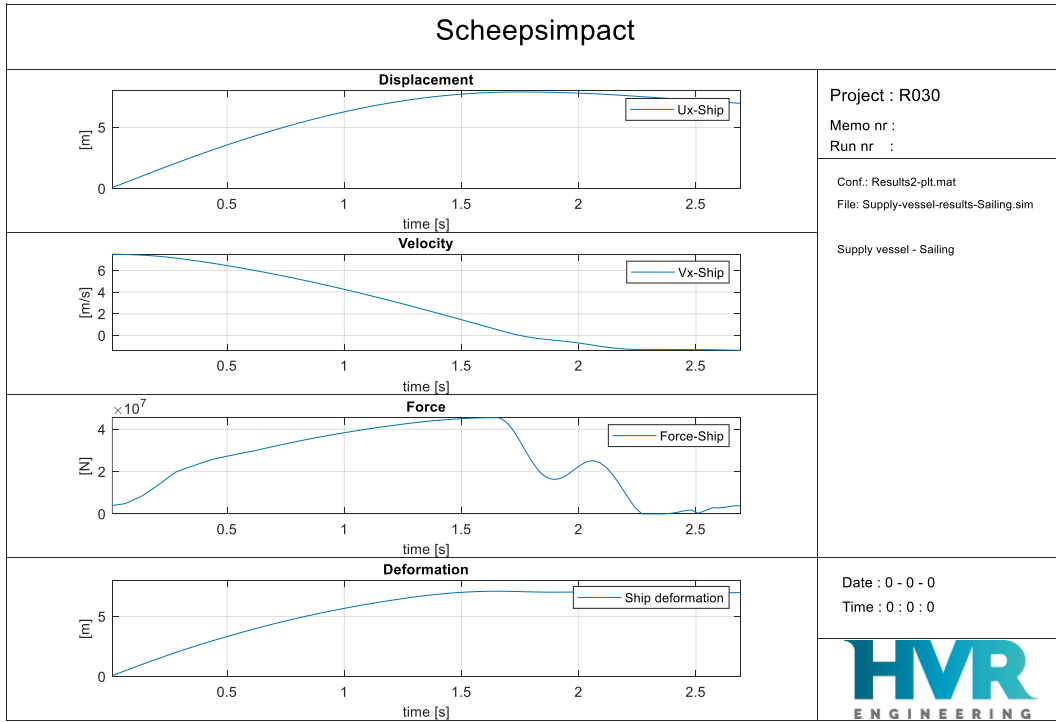


Figure A 15: Supply vessel, ship results, Sailing.

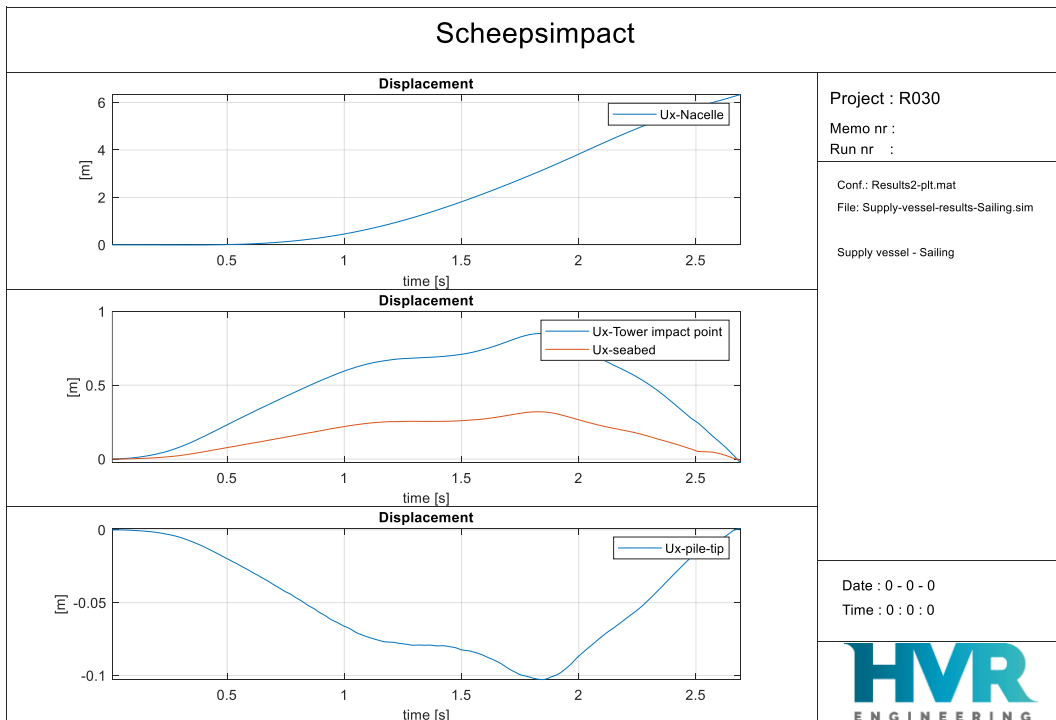


Figure A 16: Supply vessel, foundation results, Sailing.

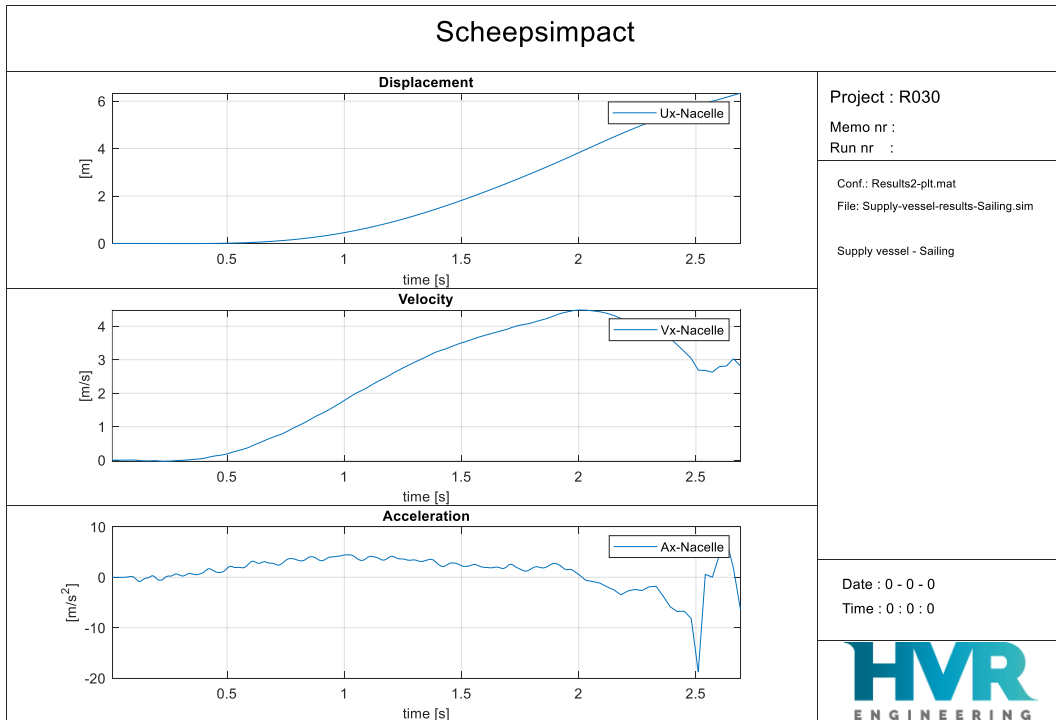


Figure A 17: Supply vessel, Nacelle results, Sailing.

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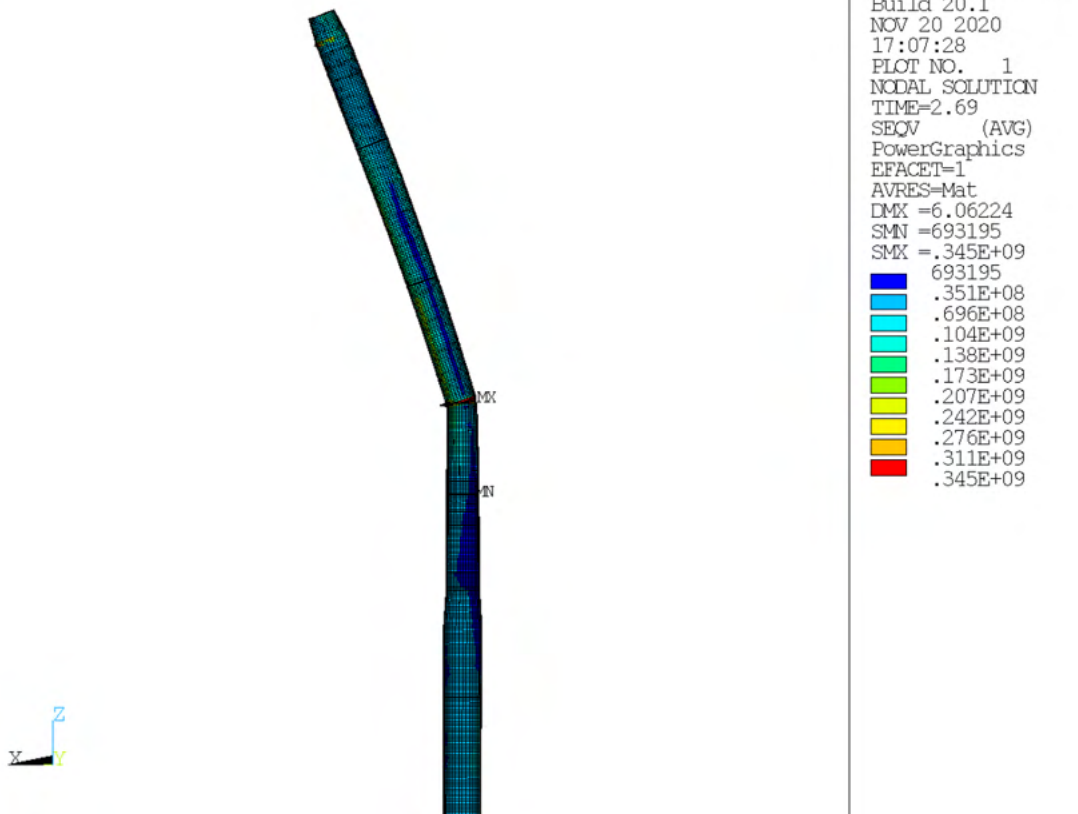


Figure A 18: Supply vessel, end deformation and Von Mises stress in [Pa], Sailing.

3. Chemical tanker.

3.1. Impact force.

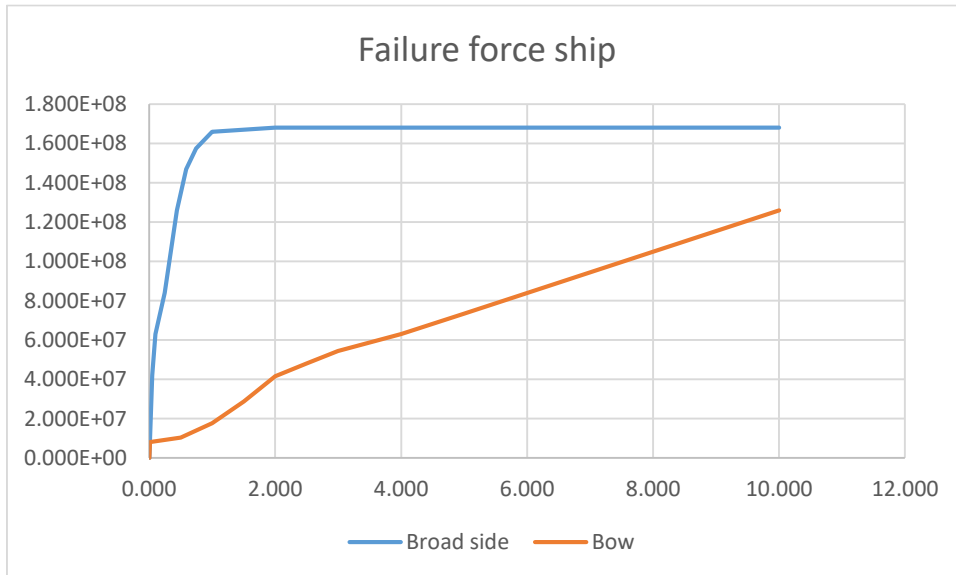


Figure A 19: Ship impact force or failure force.

3.2. Drifting.

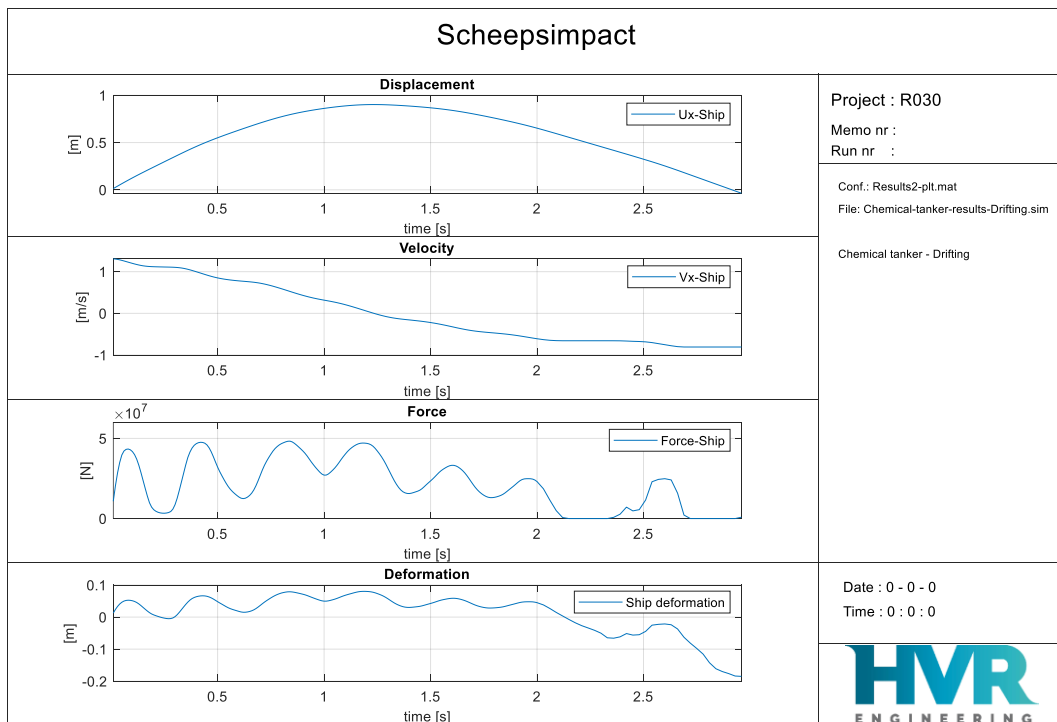


Figure A 20: Chemical tanker, ship results, Drifting.

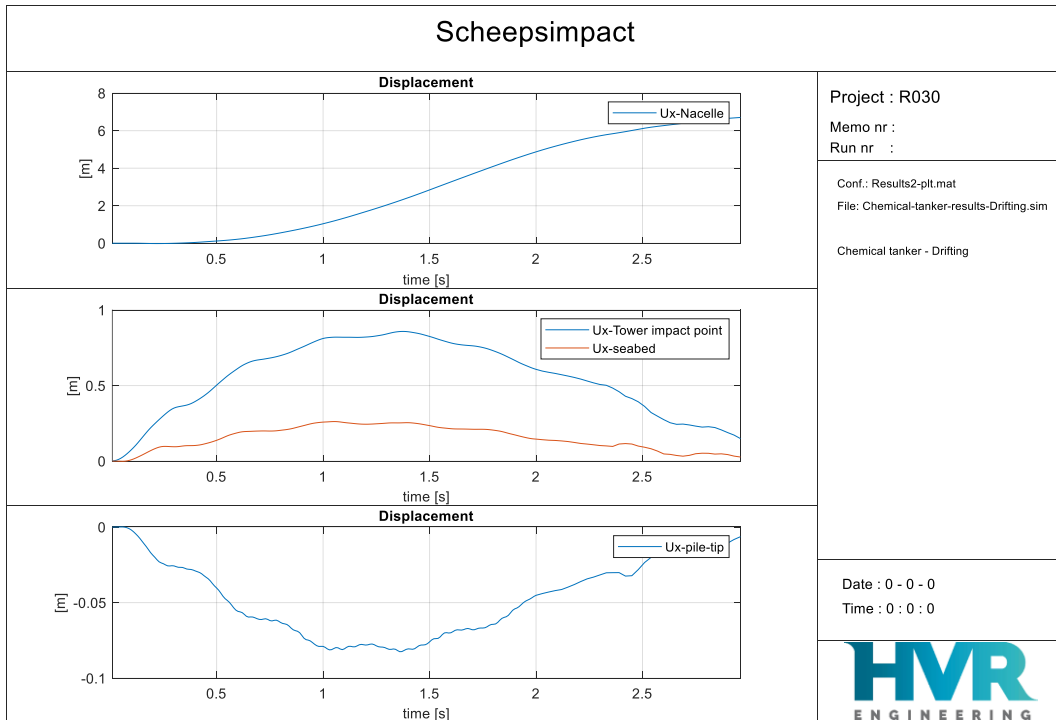


Figure A 21: Chemical tanker, foundation results, Drifting.

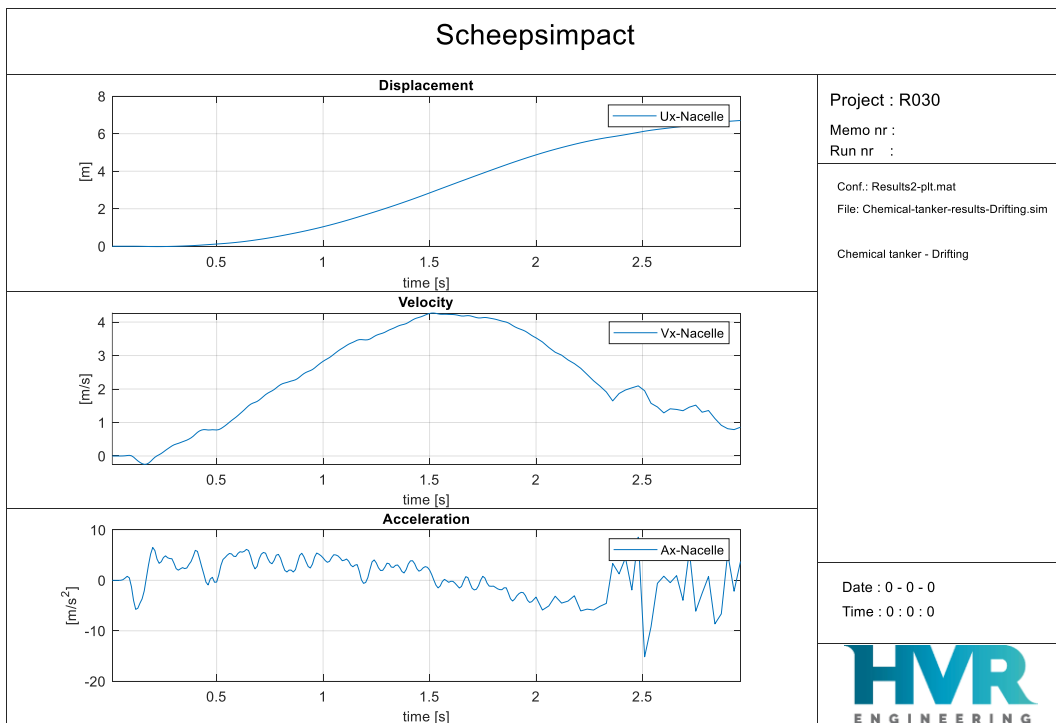


Figure A 22: Chemical tanker, Nacelle results, Drifting.

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Figure A 23: Chemical tanker , end deformation and Von Mises stress in [Pa], Drifting.

3.3. Sailing.

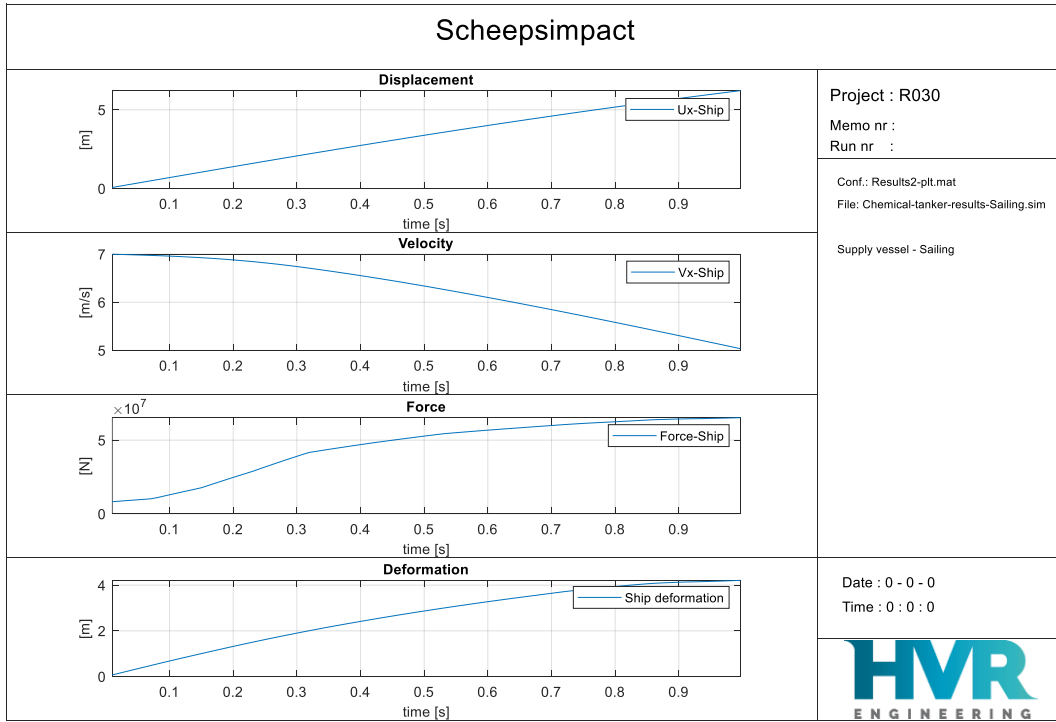


Figure A 24: Chemical tanker, ship results, Sailing.

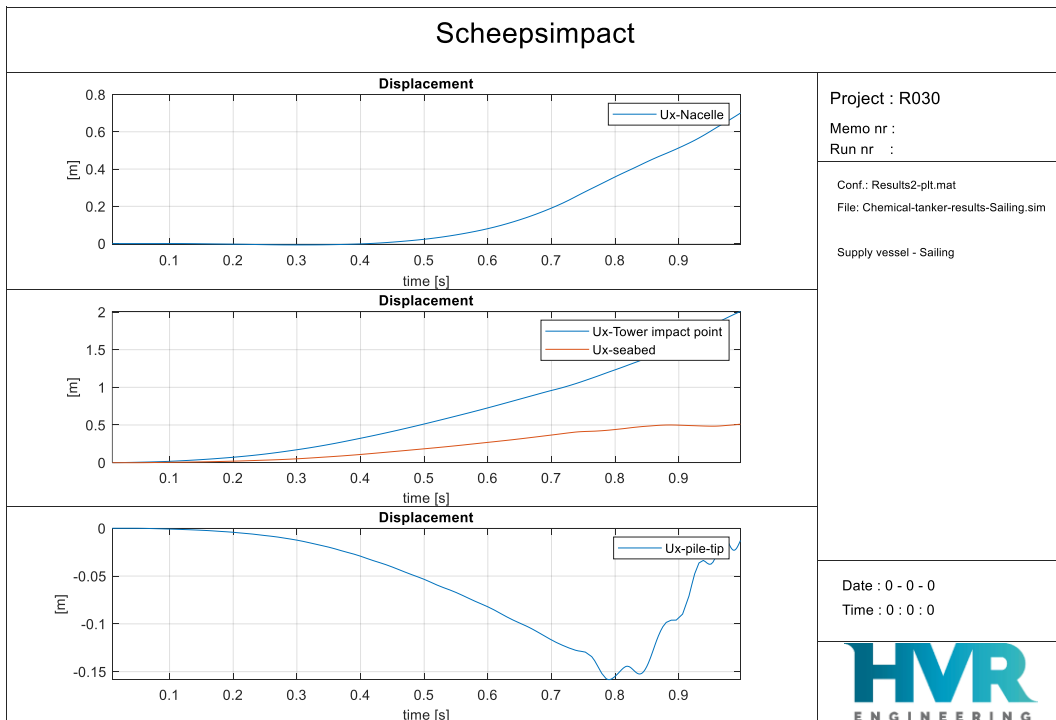


Figure A 25: Chemical tanker, foundation results, Sailing.

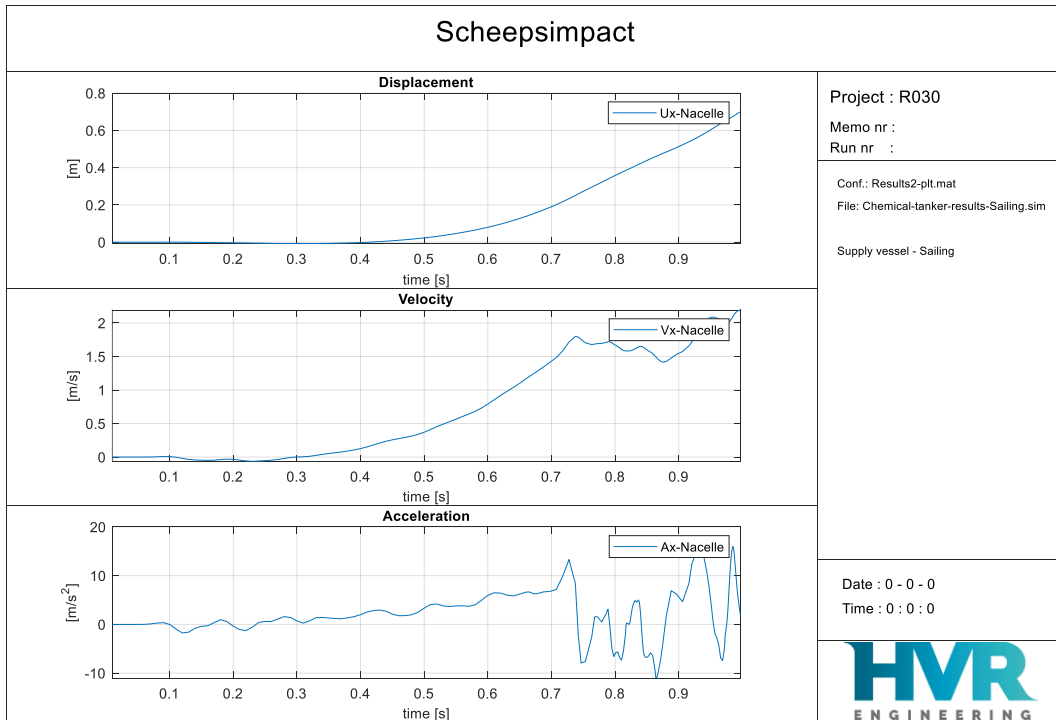


Figure A 26: Chemical tanker, Nacelle results, Sailing.

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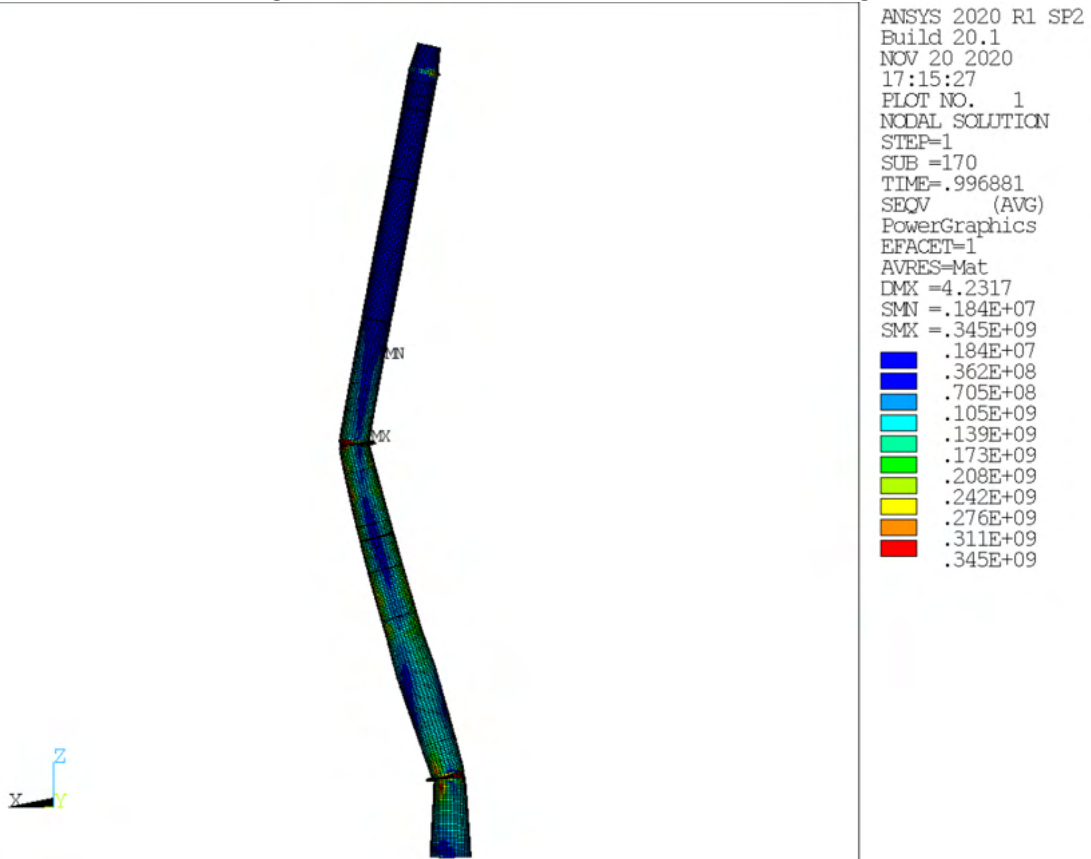


Figure A 27: Chemical tanker , end deformation and Von Mises stress in [Pa], Sailing.

4. Passenger vessel.

4.1. Impact force.

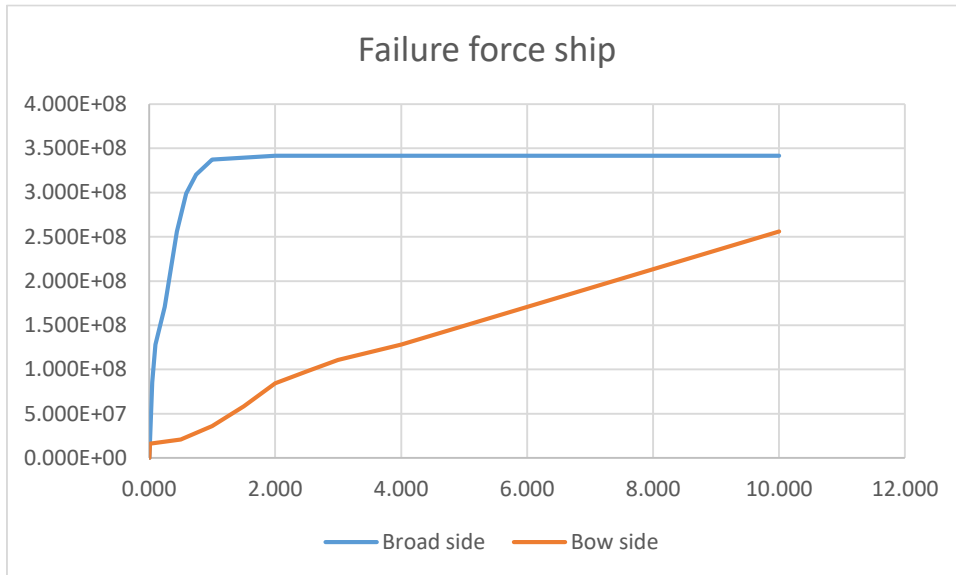


Figure A 28: Ship impact force or failure force.

4.2. Drifting.

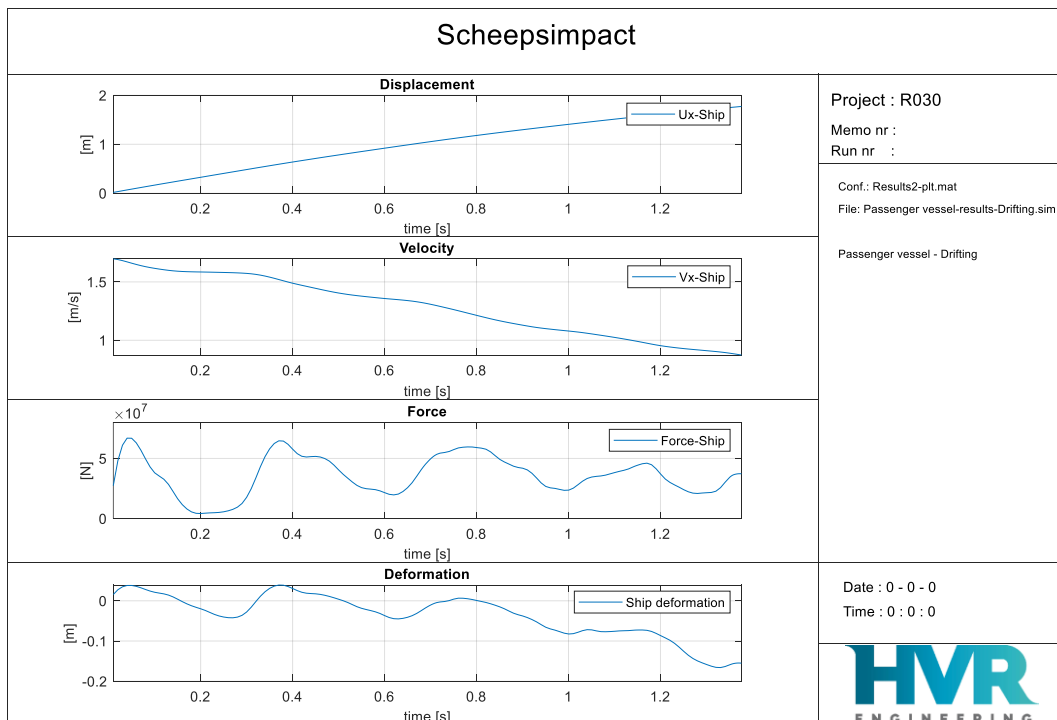


Figure A 29: Passenger vessel, ship results, Drifting.

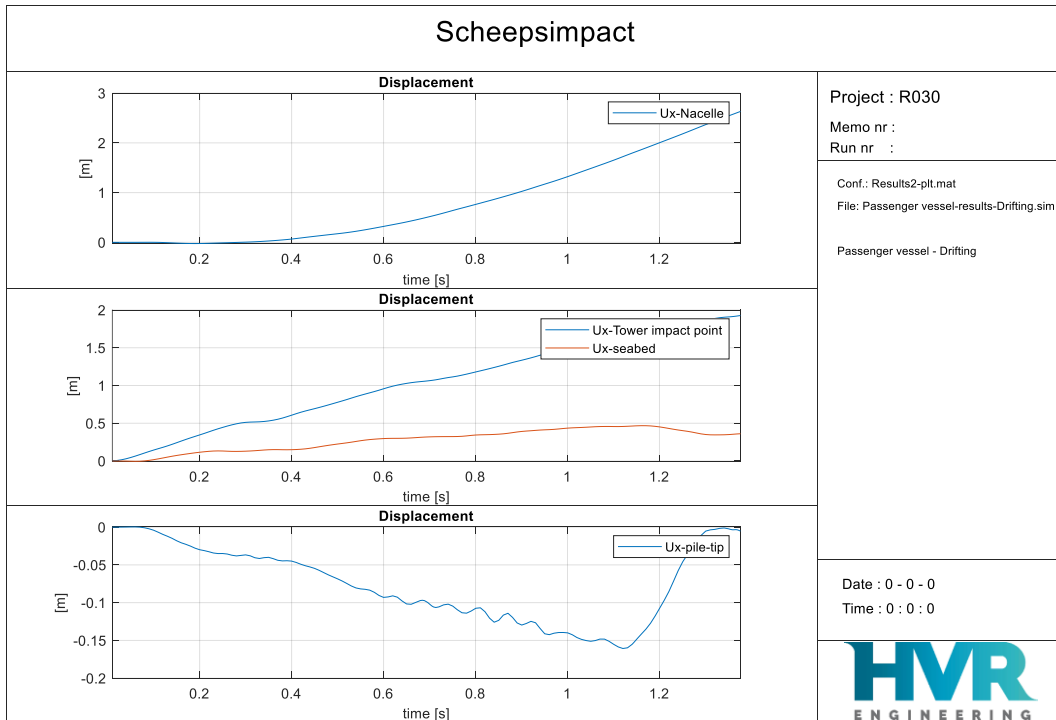


Figure A 30: Passenger vessel, foundation results, Drifting.

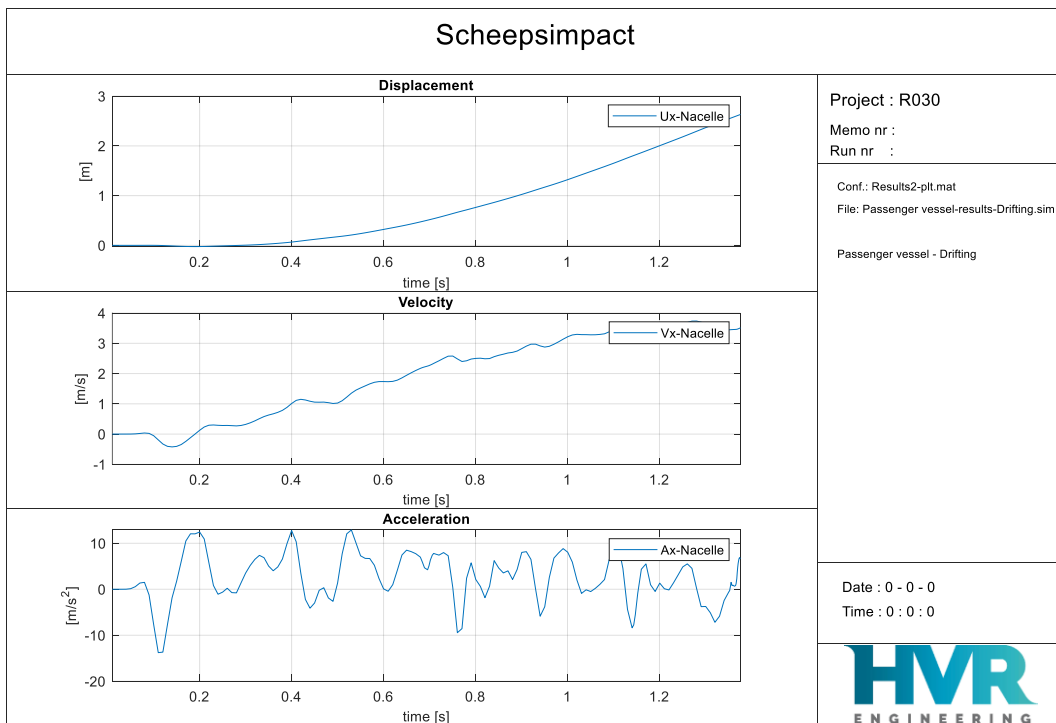


Figure A 31: Passenger vessel, Nacelle results, Drifting.

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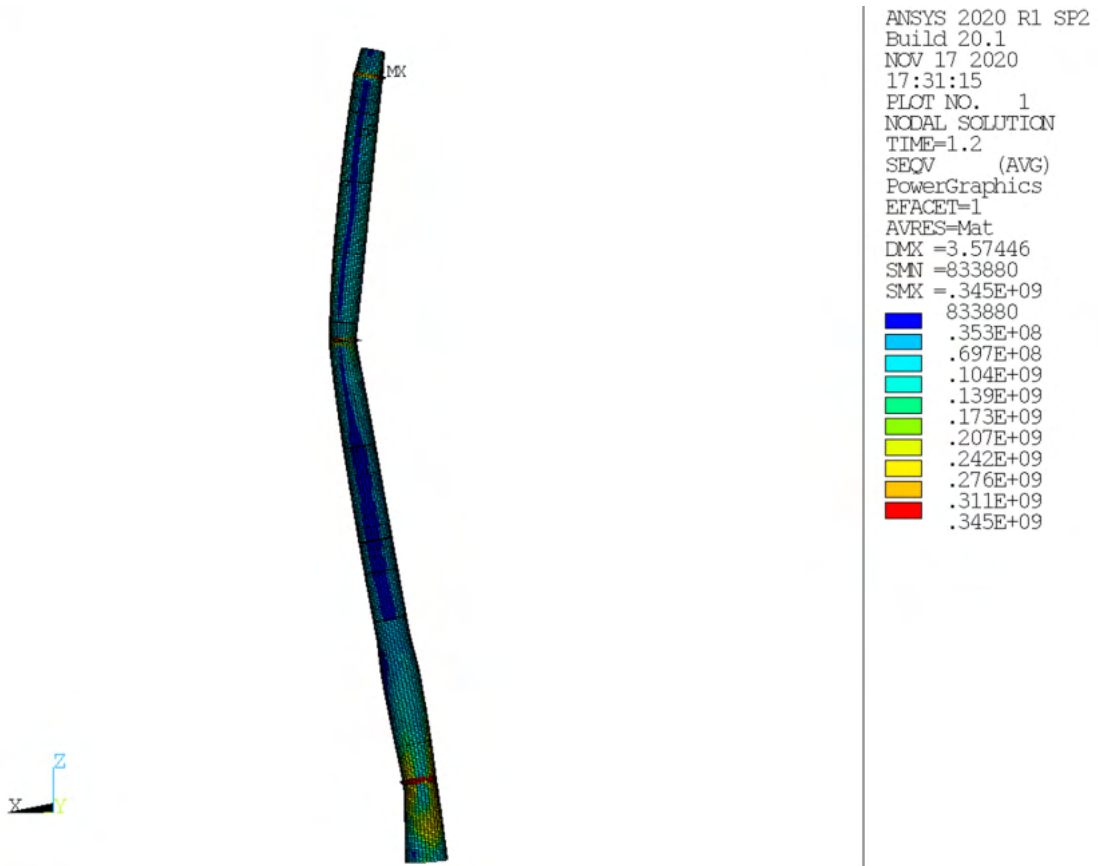


Figure A 32: Passenger vessel, end deformation and Von Mises stress in [Pa], Drifting.

4.3. Sailing.

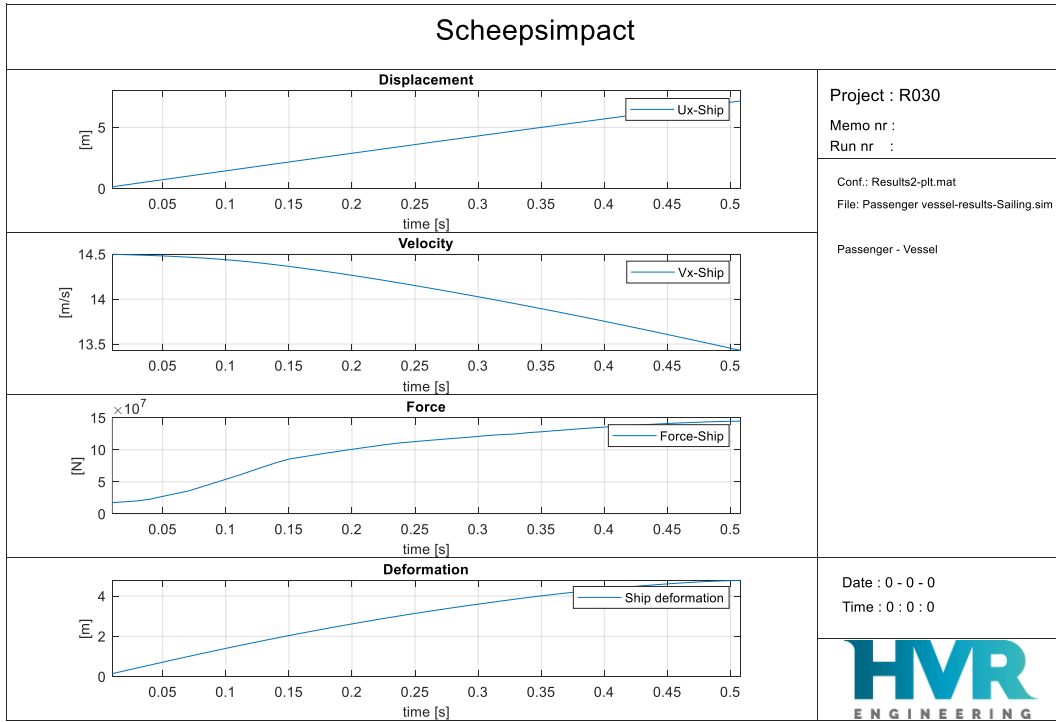


Figure A 33: Passenger vessel, ship results, Sailing.

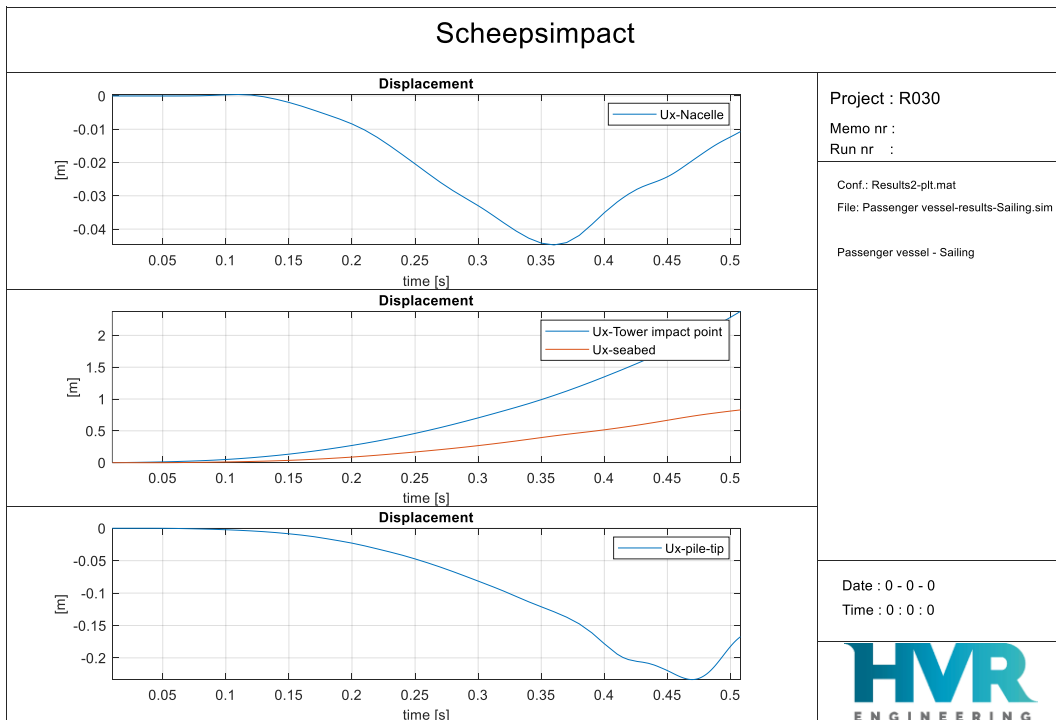


Figure A 34: Passenger vessel, foundation results, Sailing.

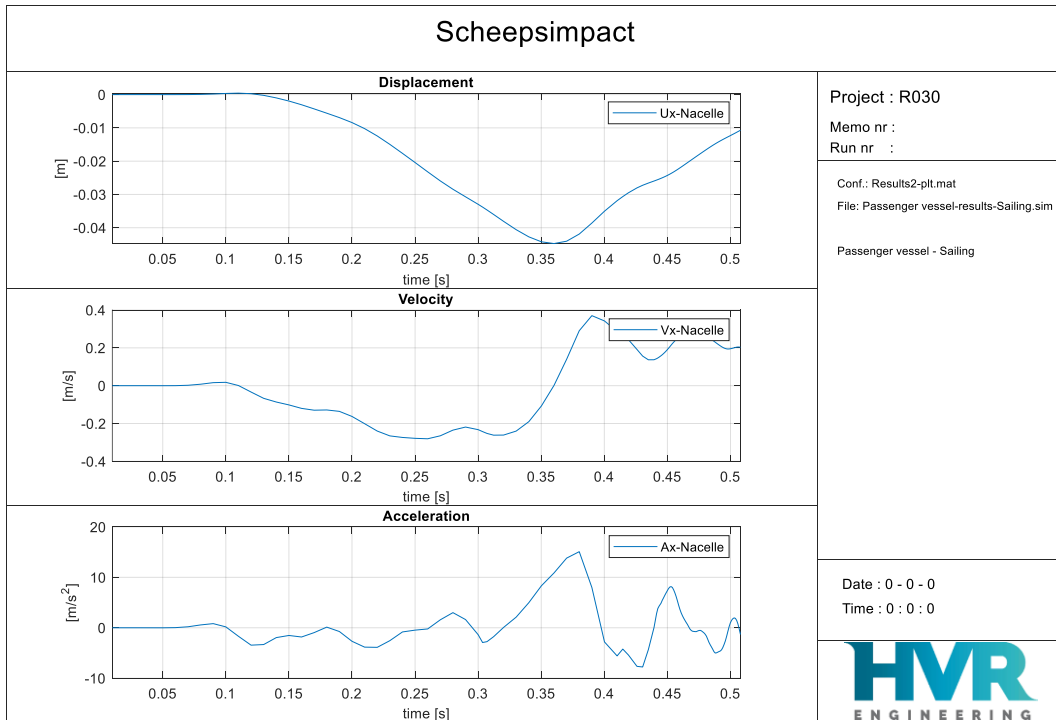
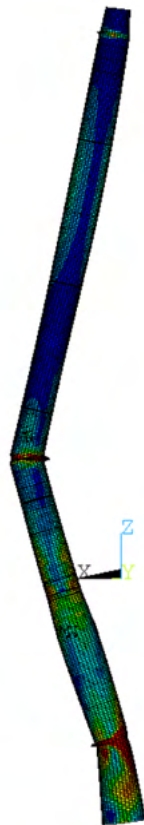


Figure A 35: Passenger vessel, Nacelle results, Sailing.

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SMX =.346E+09

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Light Blue	.706E+08
Cyan	.105E+09
Green	.139E+09
Light Green	.174E+09
Yellow-Green	.208E+09
Yellow	.243E+09
Orange	.277E+09
Red-Orange	.312E+09
Red	.346E+09

Figure A 36: Passenger vessel, end deformation and Von Mises stress in [Pa], Sailing.

5. Container ship.

5.1. Impact force.

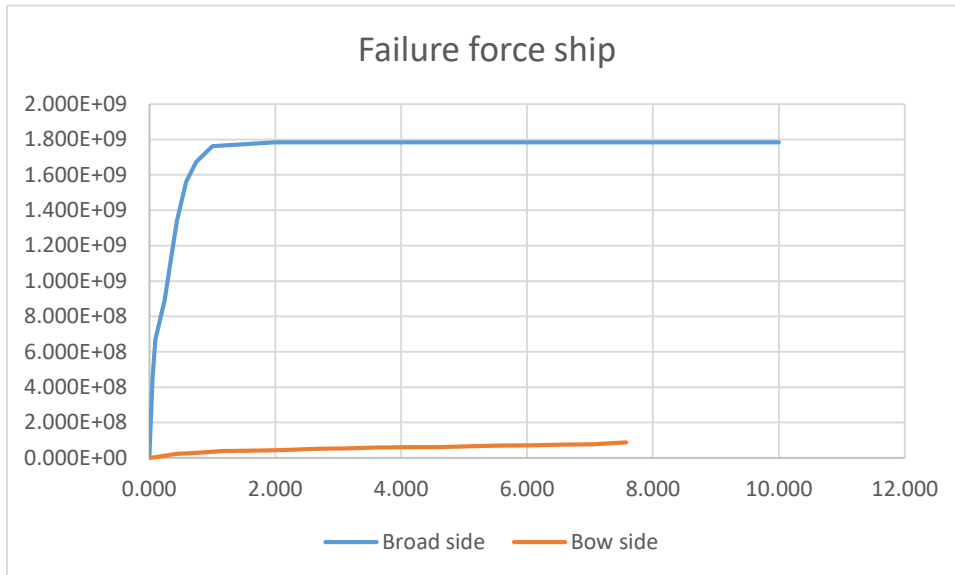


Figure A 37: Ship impact force or failure force.

5.2. Drifting.

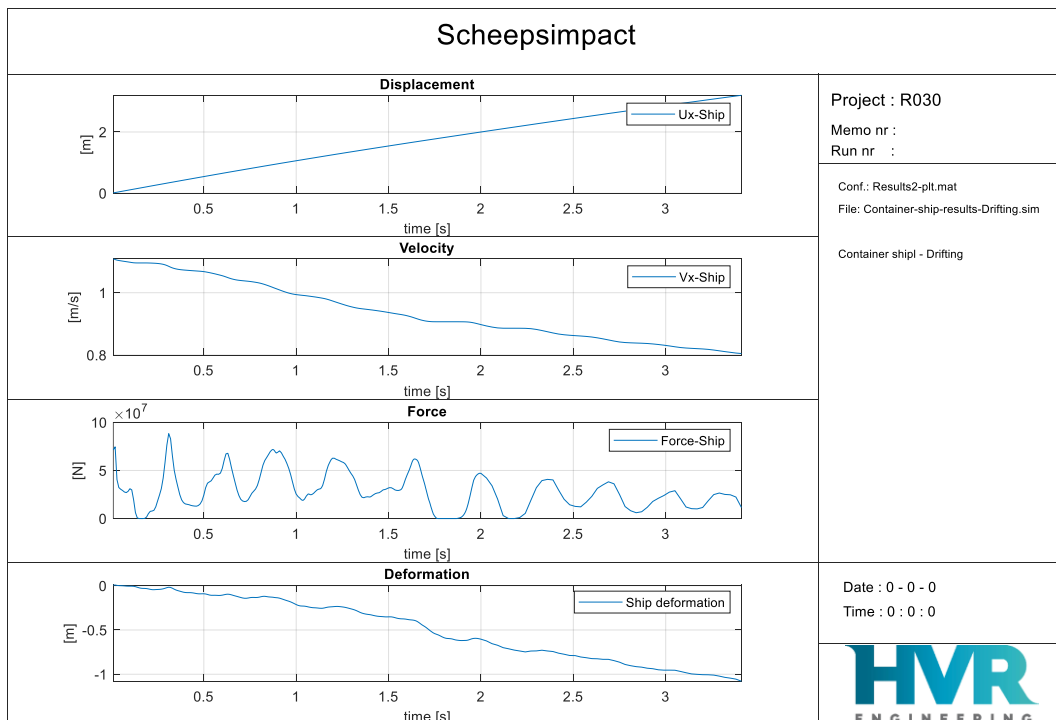


Figure A 38: Container ship, ship results, Drifting.

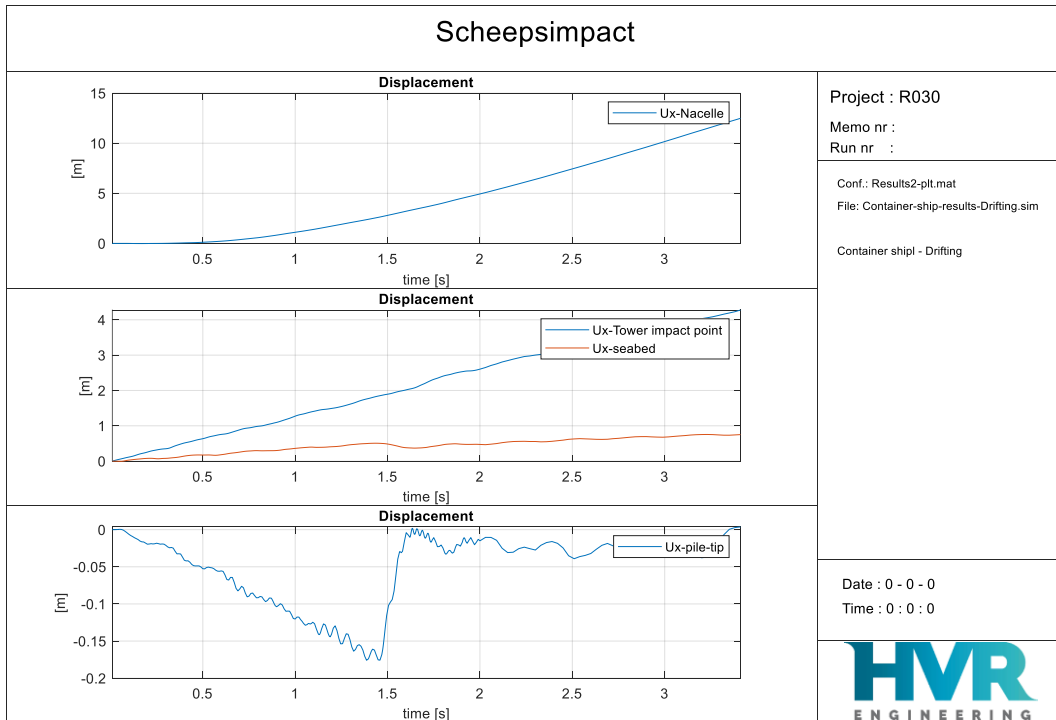


Figure A 39: Container ship, foundation results, Drifting.

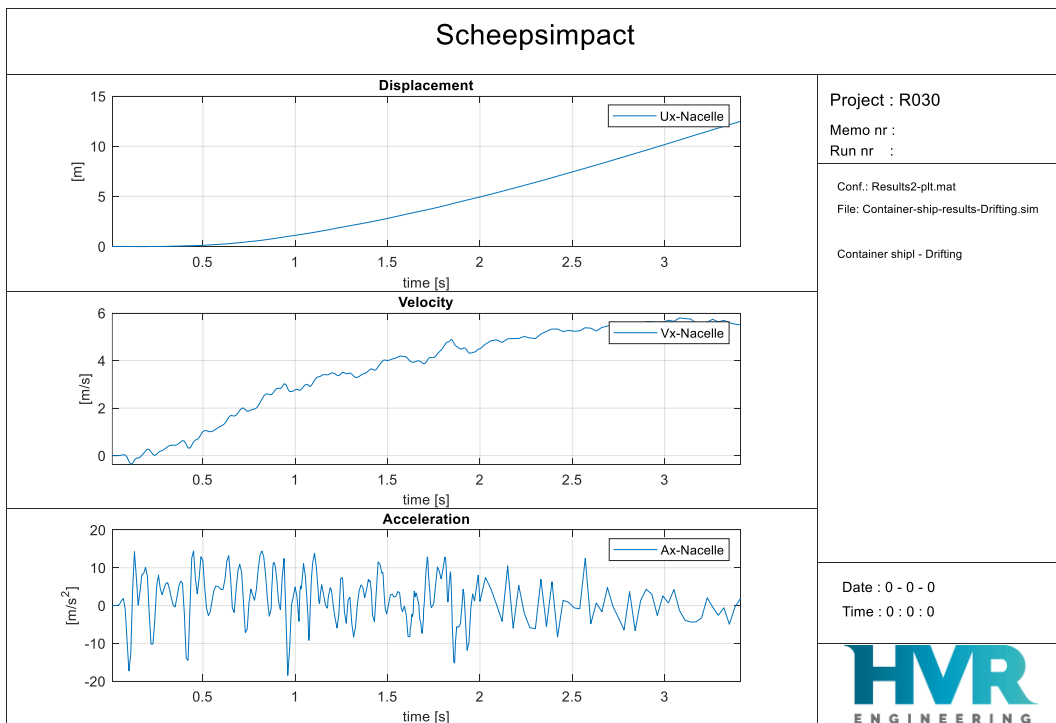


Figure A 40: Container ship, Nacelle results, Drifting.

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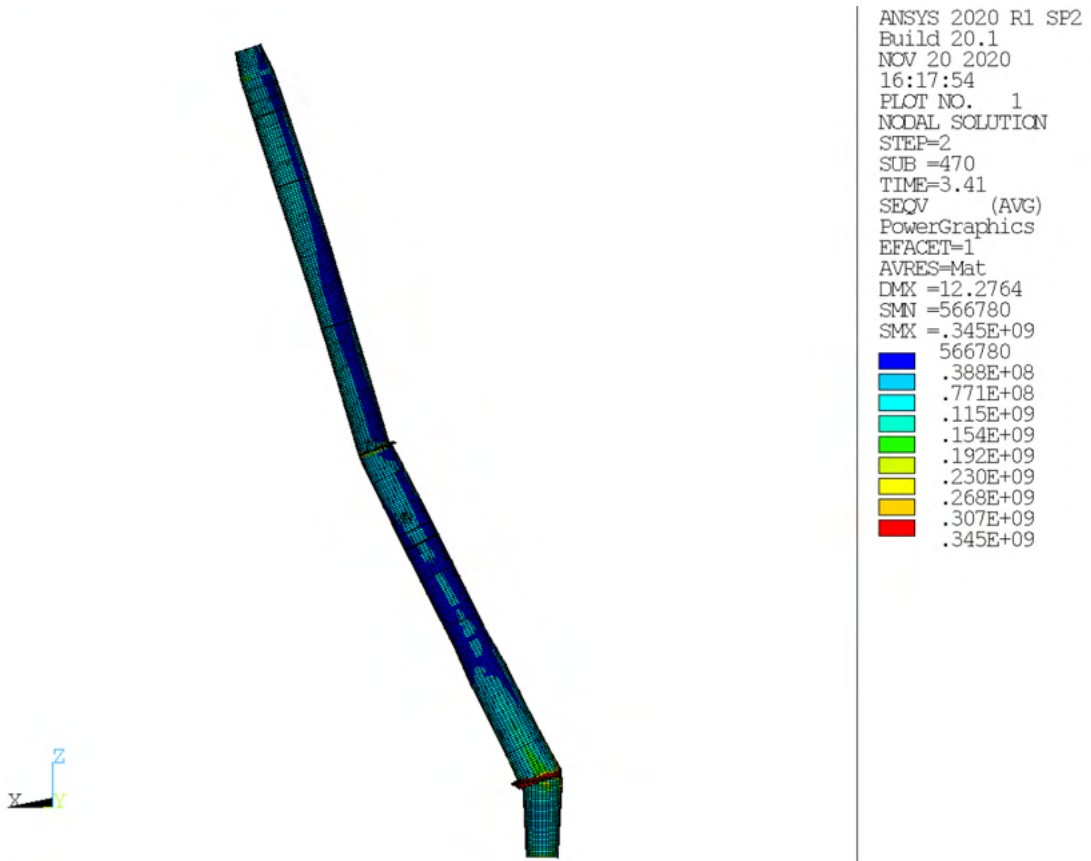


Figure A 41: Container ship, end deformation and Von Mises stress in [Pa], Drifting.

5.3. Sailing.

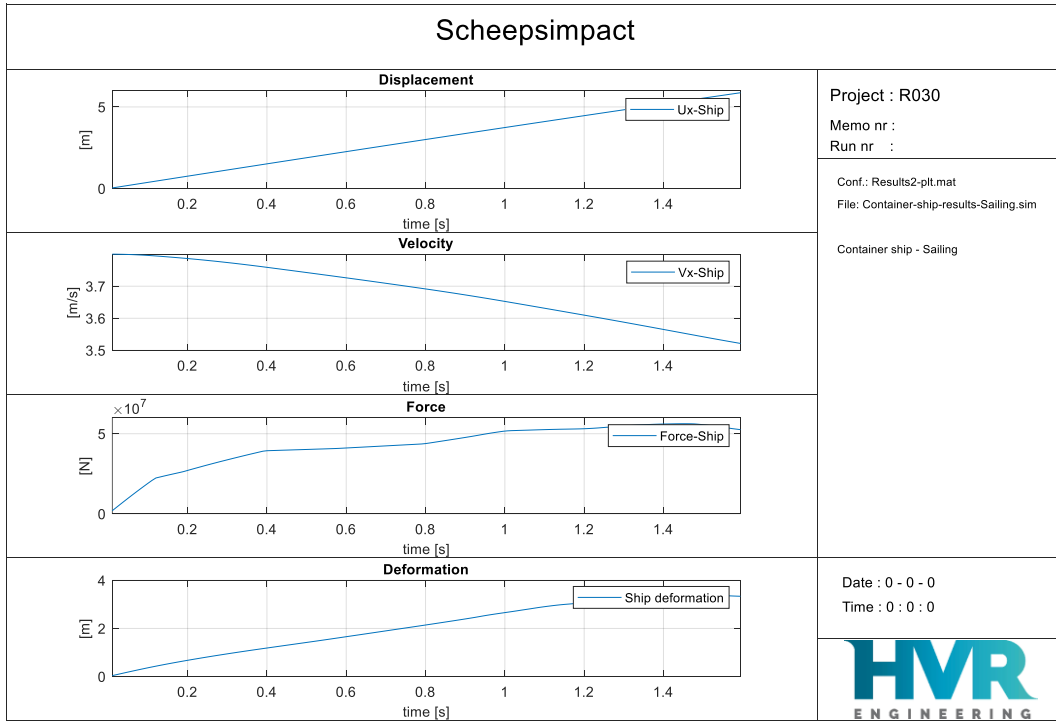


Figure A 42: Container ship, ship results, Sailing.

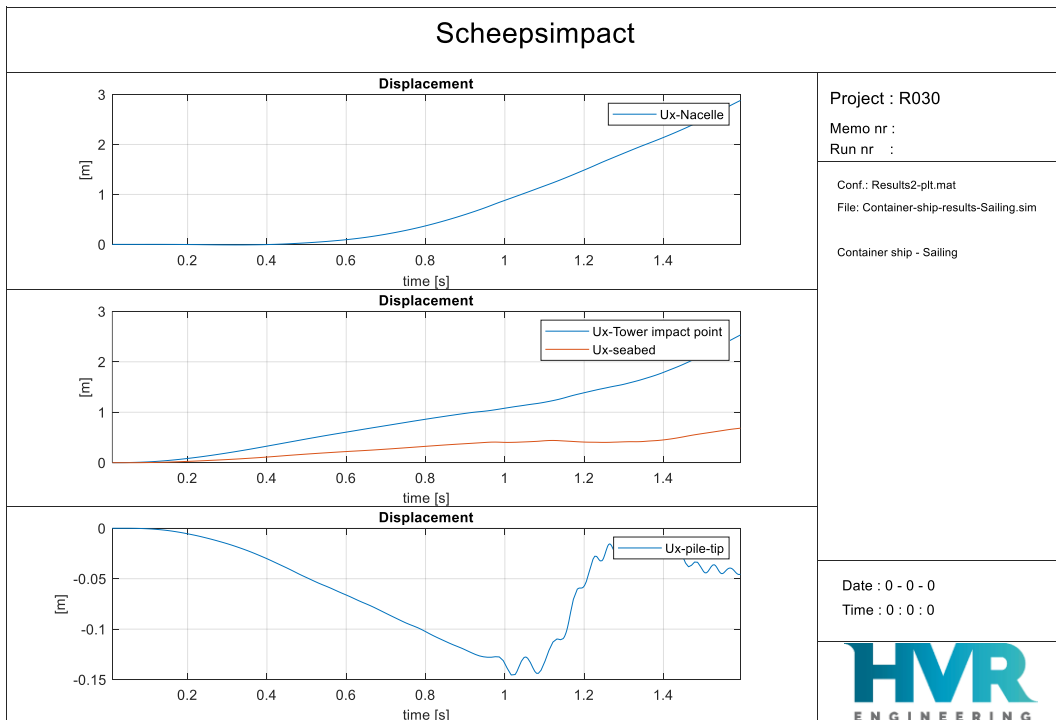


Figure A 43: Container ship, foundation results, Sailing.

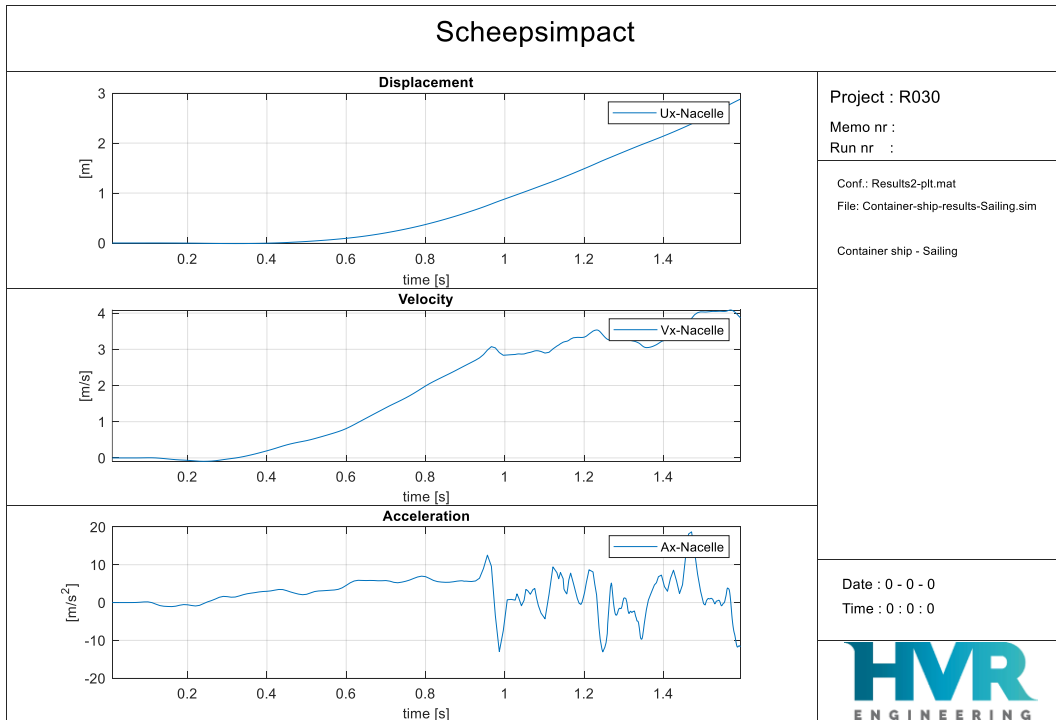


Figure A 44: Container ship, Nacelle results, Sailing.

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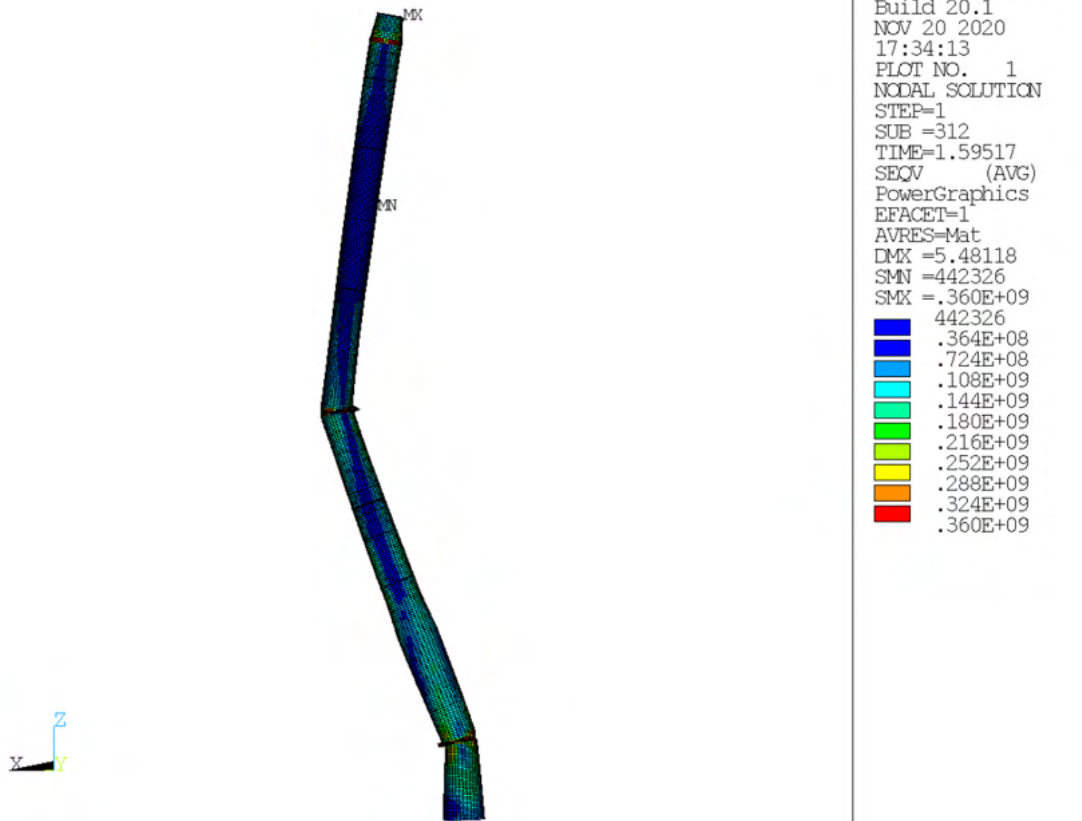


Figure A 45: Container ship, end deformation and Von Mises stress in [Pa], Sailing.

APPENDIX B : PARAMETER VARIATIONS.

1. Soil and foundation variation.

1.1. Supply vessel.

1.1.1. Impact force.

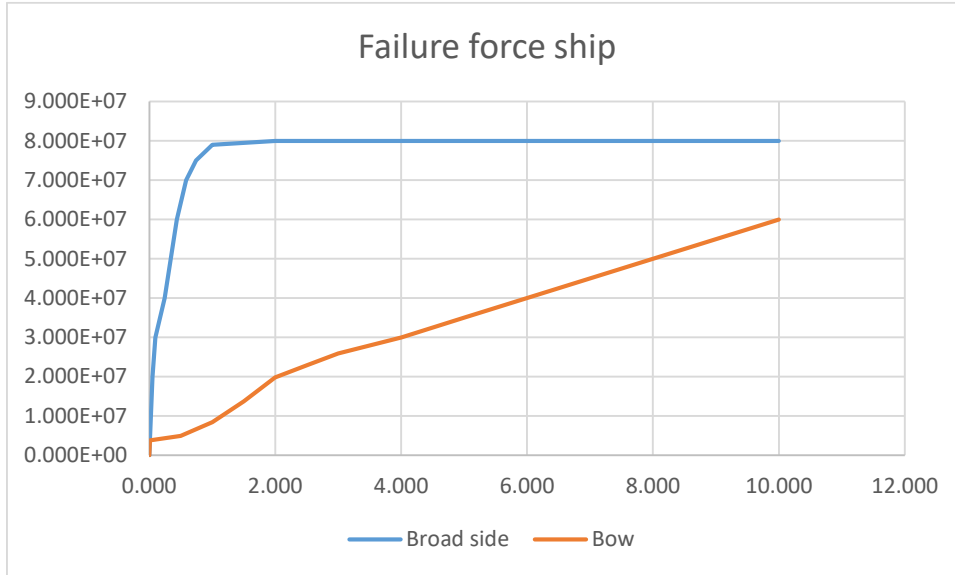


Figure B 1: Ship impact force or failure force (Blue = P001, Red = P002).

1.1.2. Drifting.

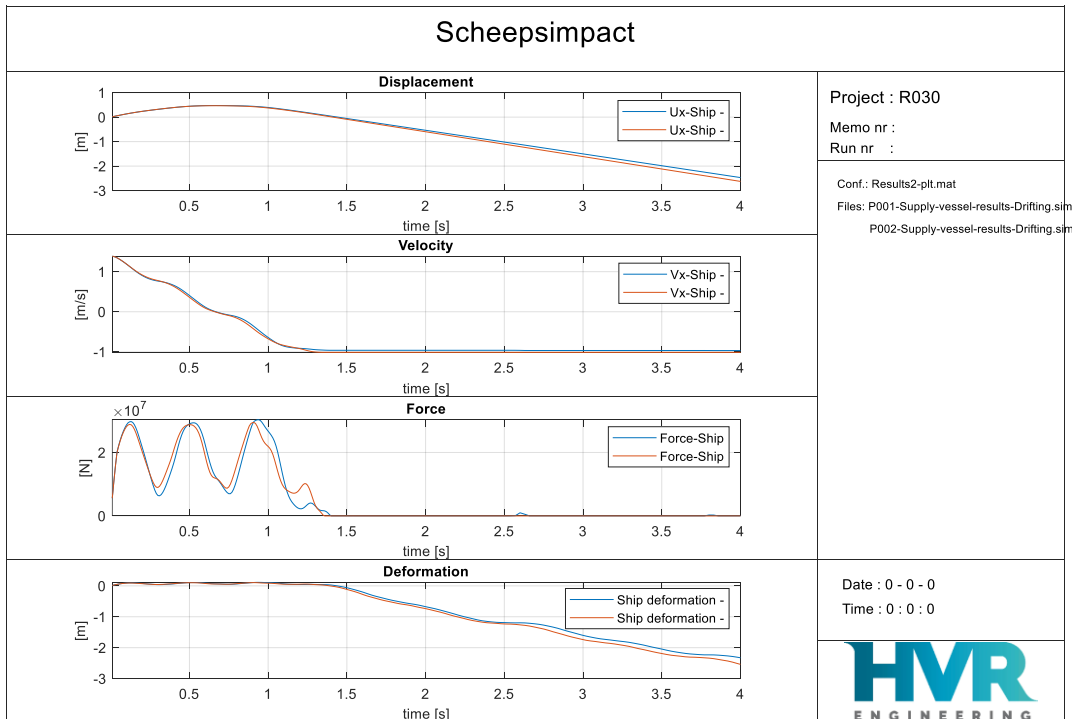


Figure B 2: Supply vessel, ship results, Drifting (Blue = P001, Red = P002).

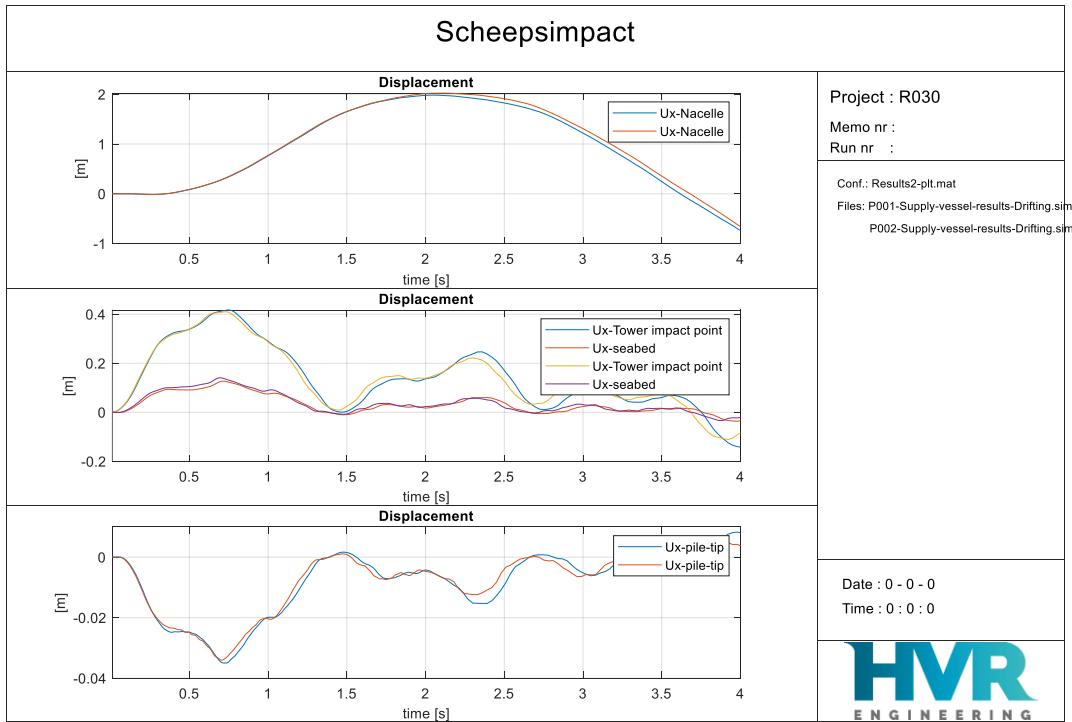


Figure B 3: Supply vessel, foundation results, Drifting (Blue = P001, Red = P002).

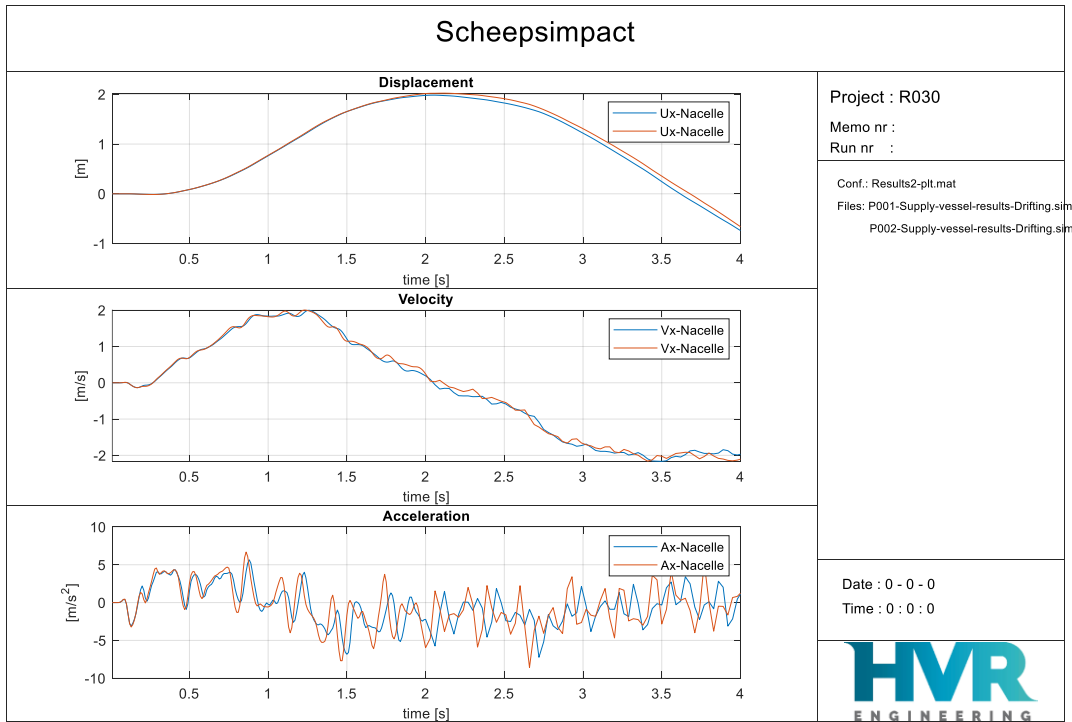


Figure B 4: Supply vessel, Nacelle results, Drifting (Blue = P001, Red = P002).

1.1.3. Sailing.

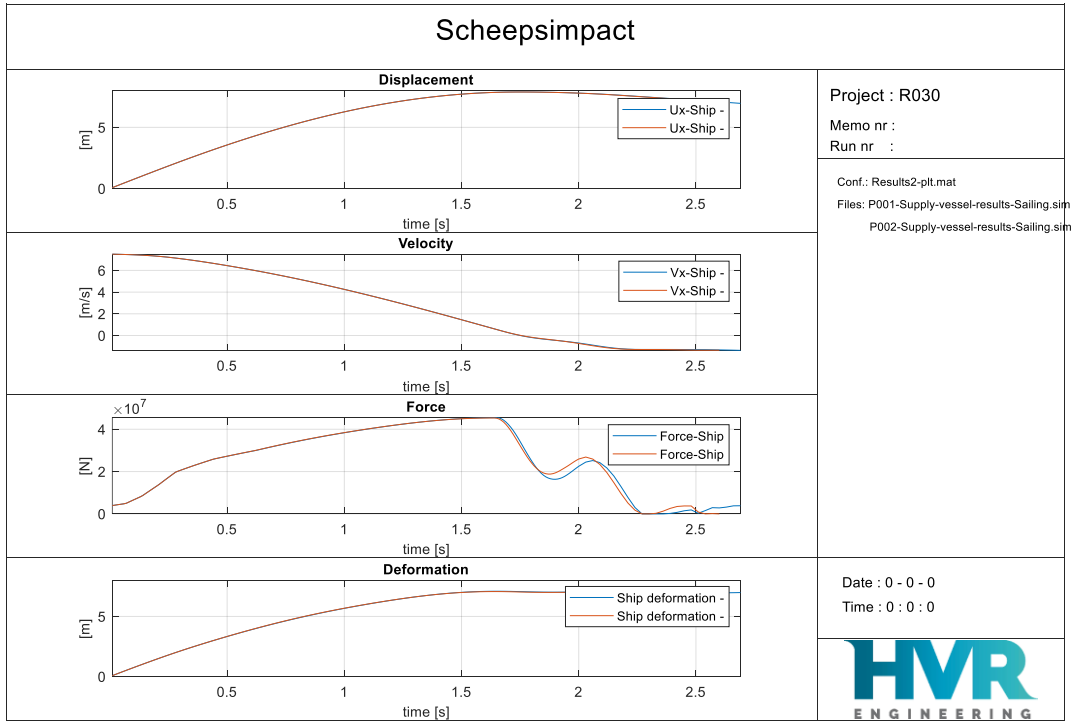


Figure B 5: Supply vessel, ship results, Sailing (Blue = P001, Red = P002).

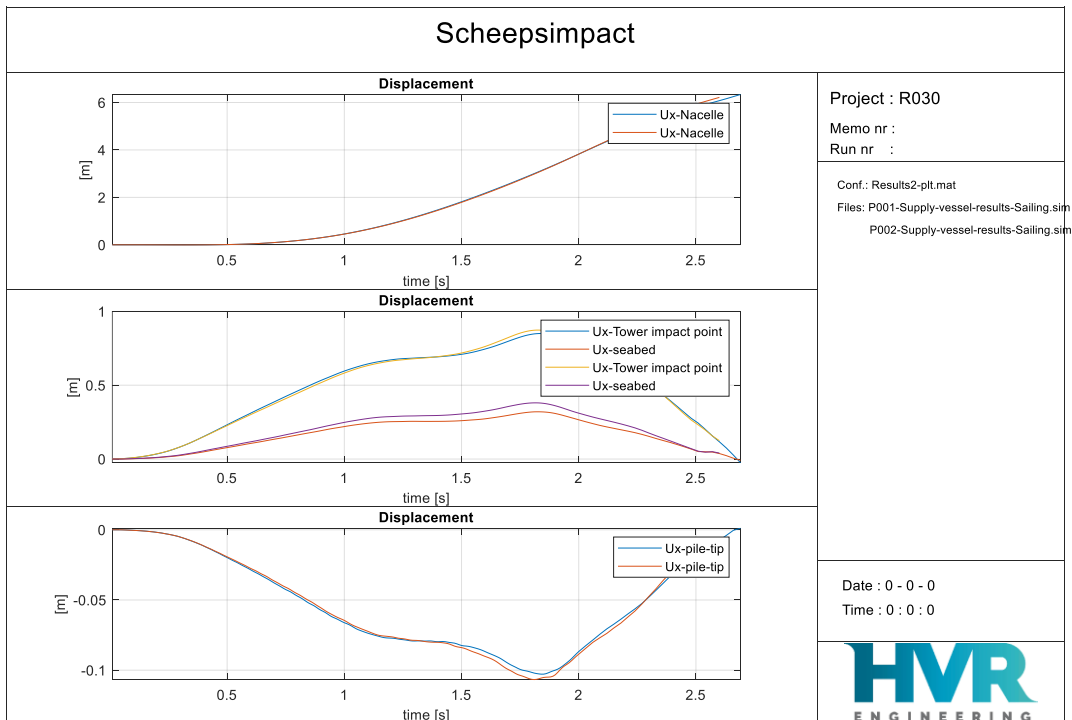


Figure B 6: Supply vessel, foundation results, Sailing (Blue = P001, Red = P002).

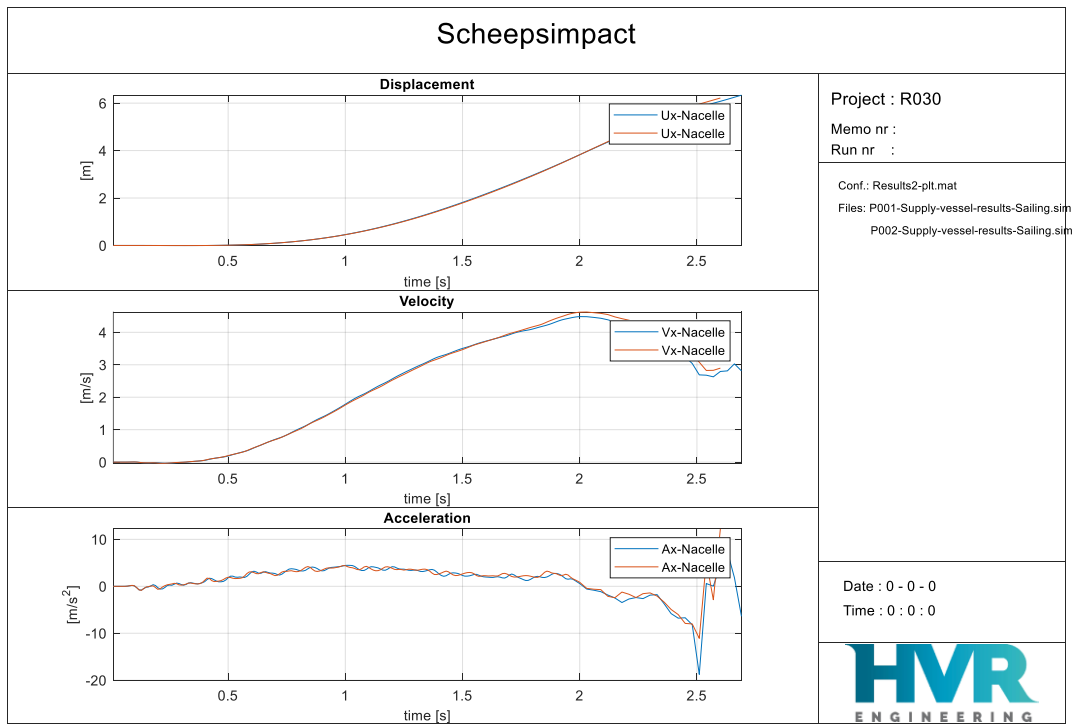


Figure B 7: Supply vessel, Nacelle results, Sailing (Blue = P001, Red = P002).

1.2. Chemical tanker.

1.2.1. Impact force.

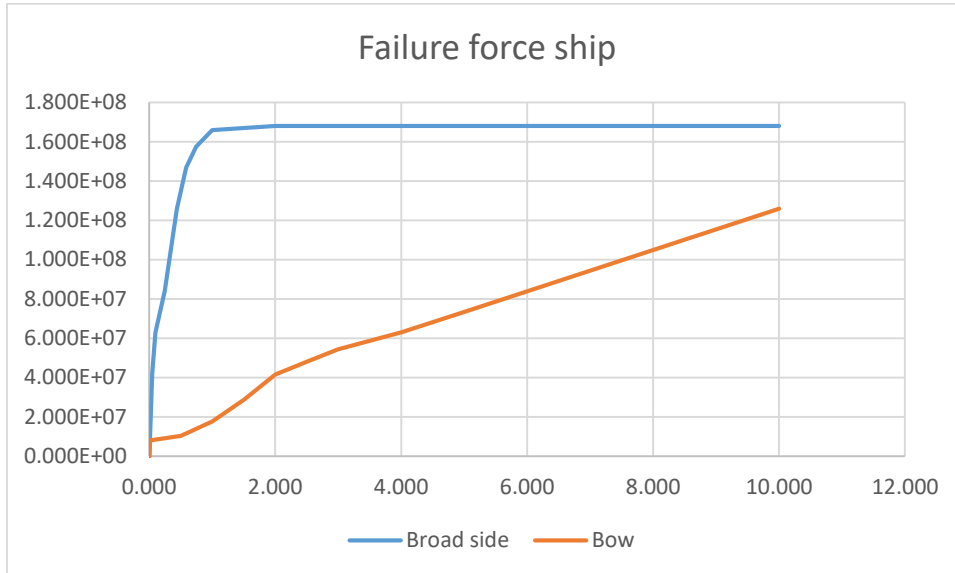


Figure B 8: Ship impact force or failure force.

1.2.2. Drifting.

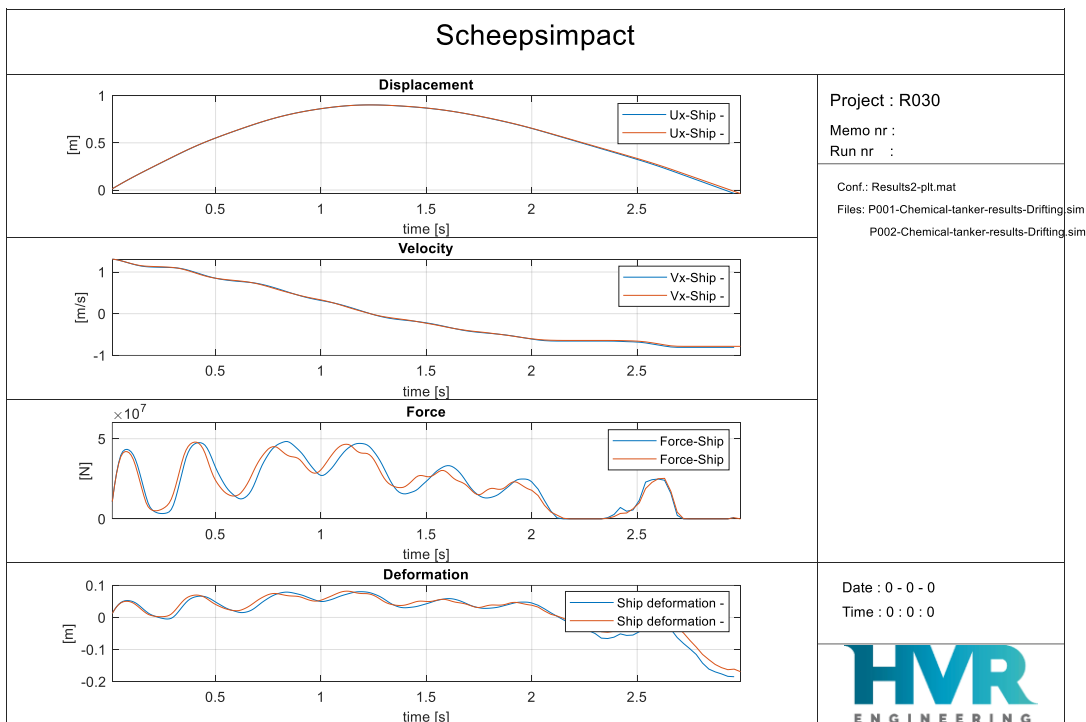


Figure B 9: Chemical tanker, ship results, Drifting (Blue = P001, Red = P002).

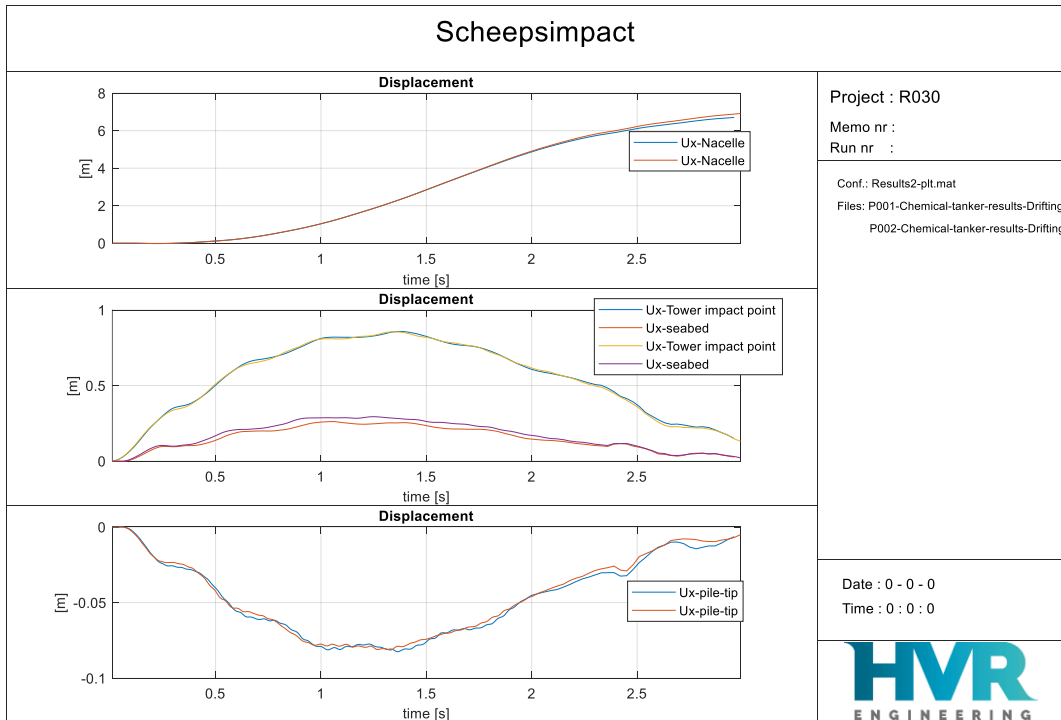


Figure B 10: Chemical tanker, foundation results, Drifting (Blue = P001, Red = P002).

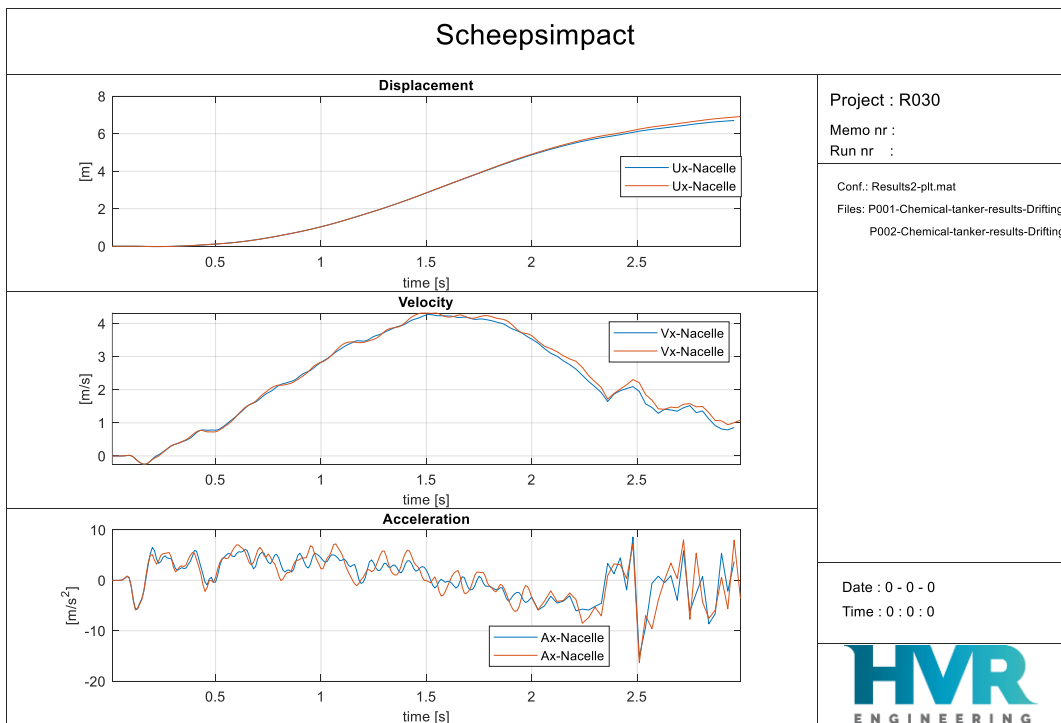


Figure B 11: Chemical tanker, Nacelle results, Drifting (Blue = P001, Red = P002).

1.2.3. Sailing.

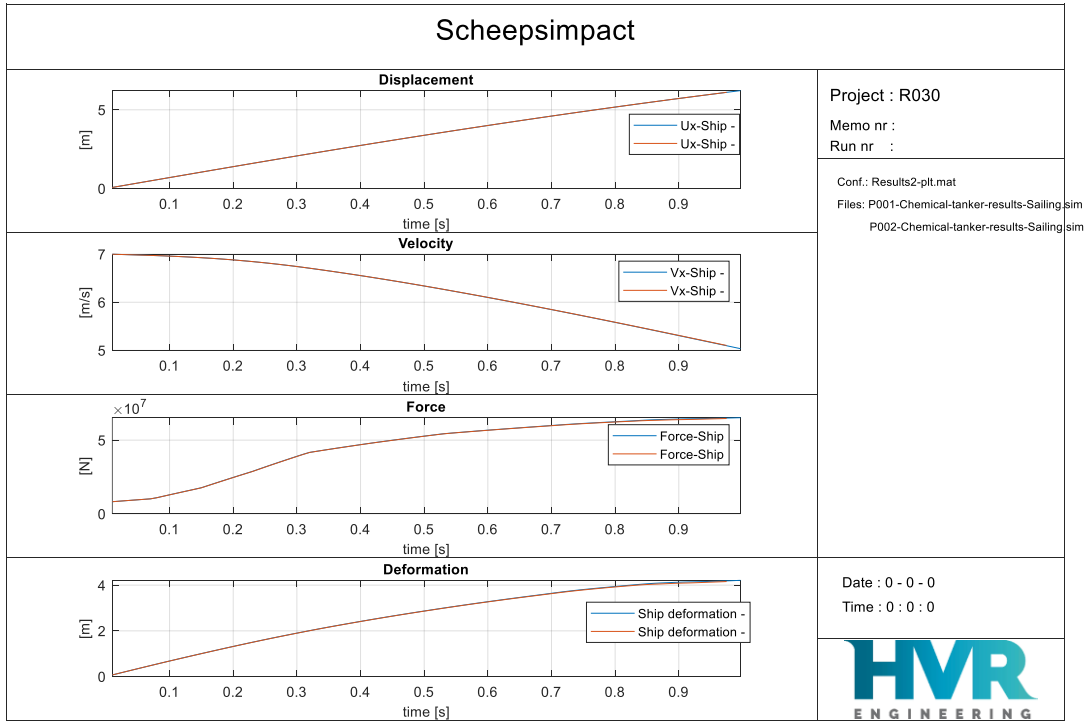


Figure B 12: Chemical tanker, ship results, Sailing (Blue = P001, Red = P002).

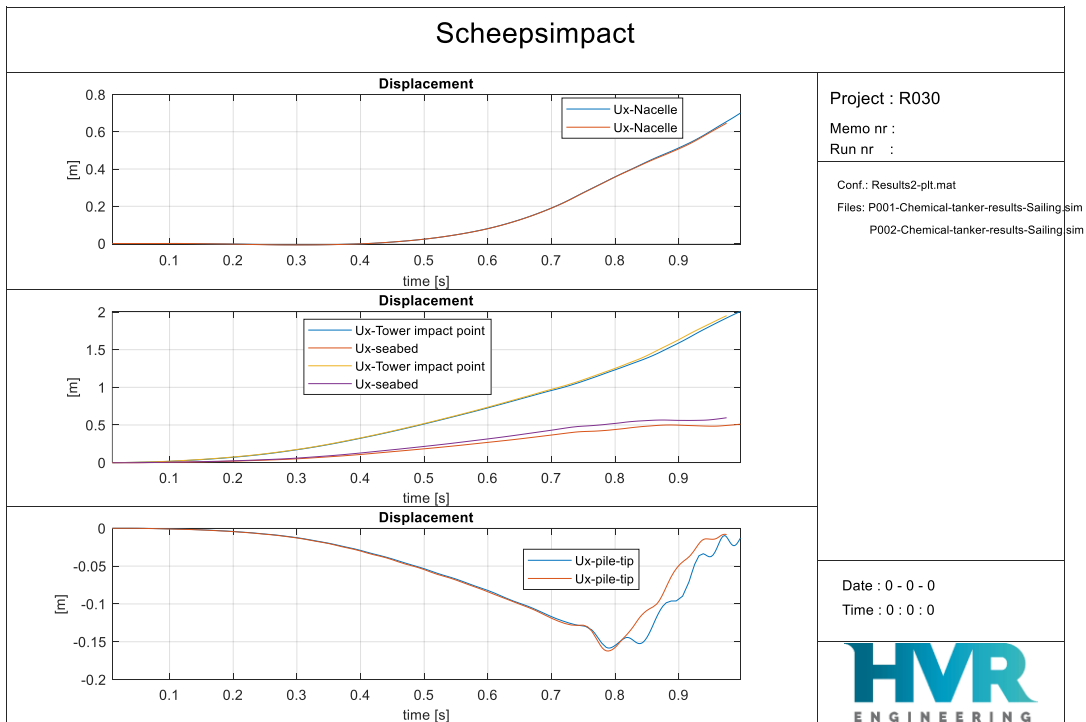


Figure B 13: Chemical tanker, foundation results, Sailing (Blue = P001, Red = P002).

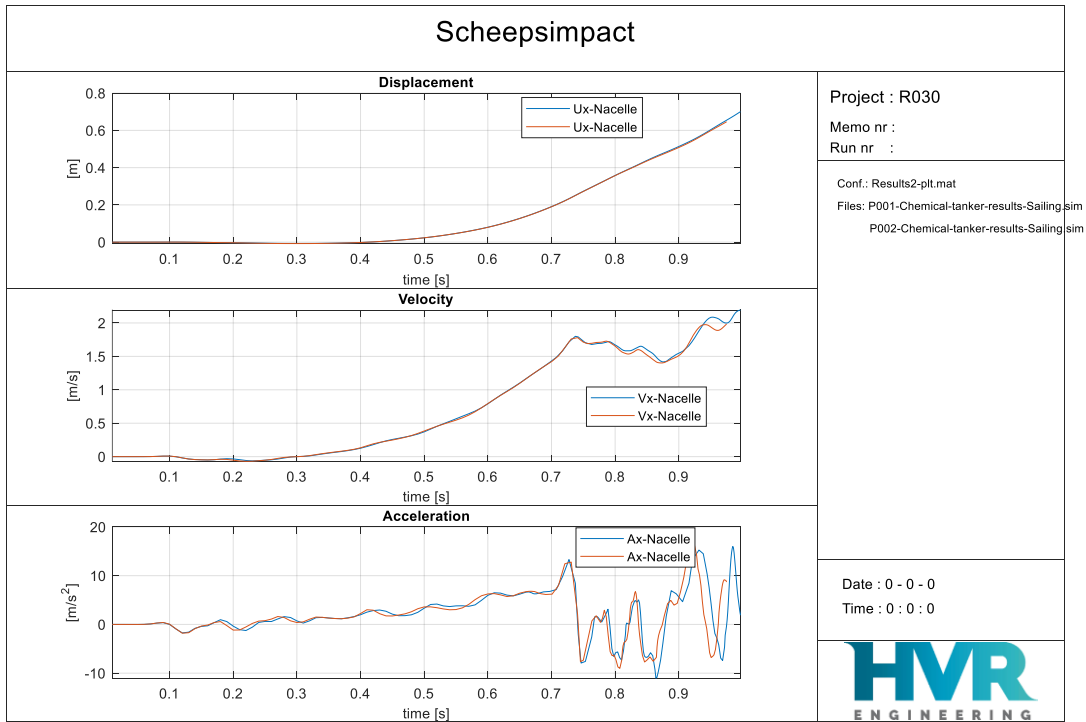


Figure B 14: Chemical tanker, Nacelle results, Sailing (Blue = P001, Red = P002).

2. Soil rebound behaviour.

2.1. Supply vessel.

2.1.1. Impact force.

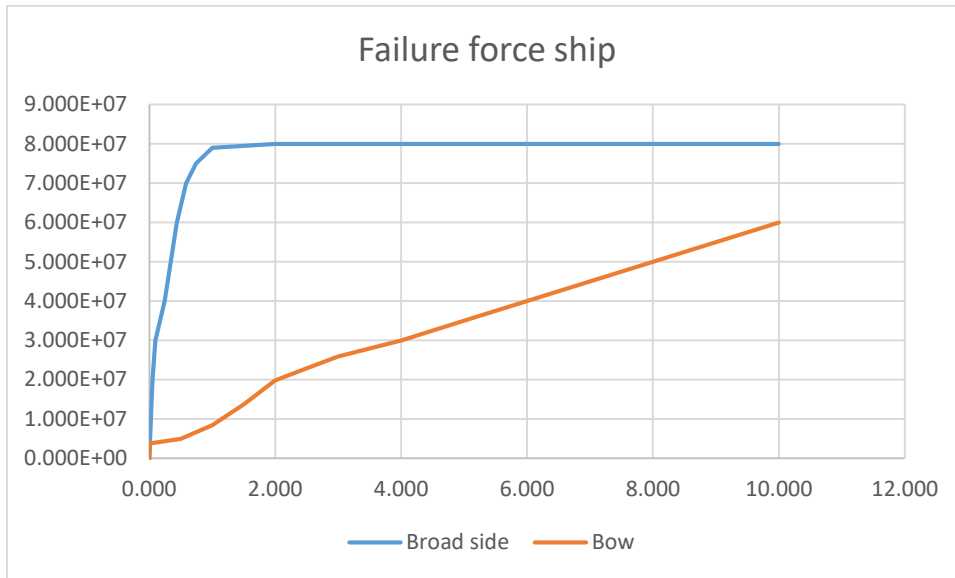


Figure B 15: Ship impact force or failure force.

2.1.2. Sailing.

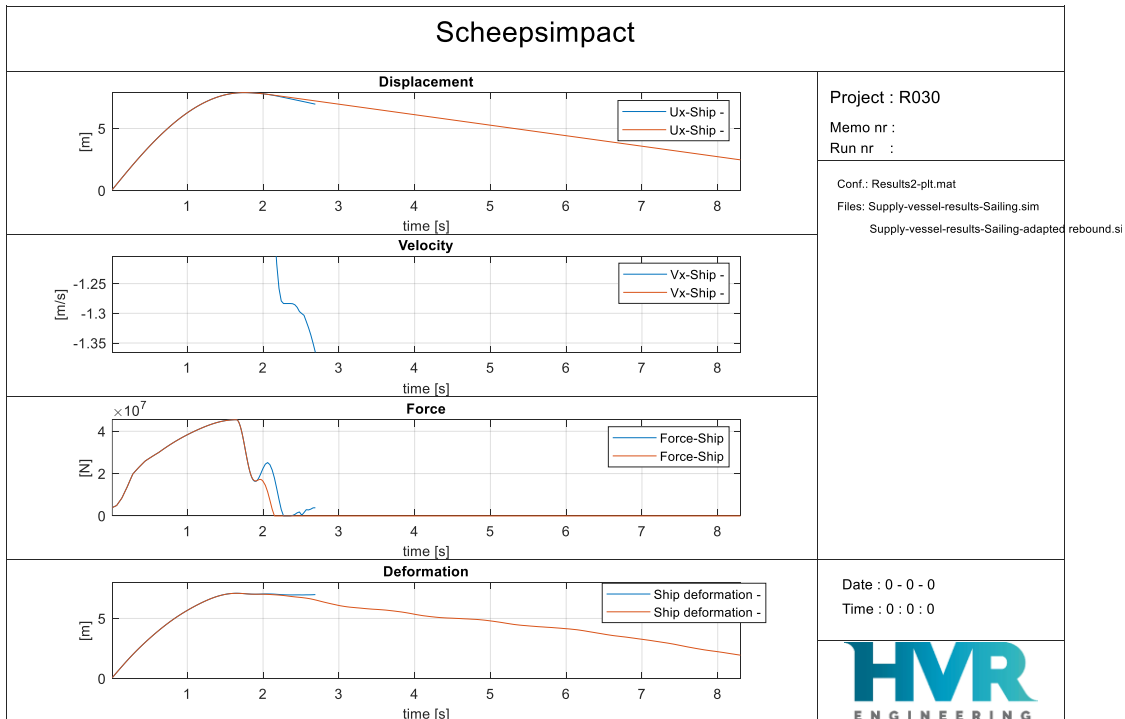


Figure B 16: Supply vessel, ship results, Sailing (Blue = original, Red = Adapted rebound).

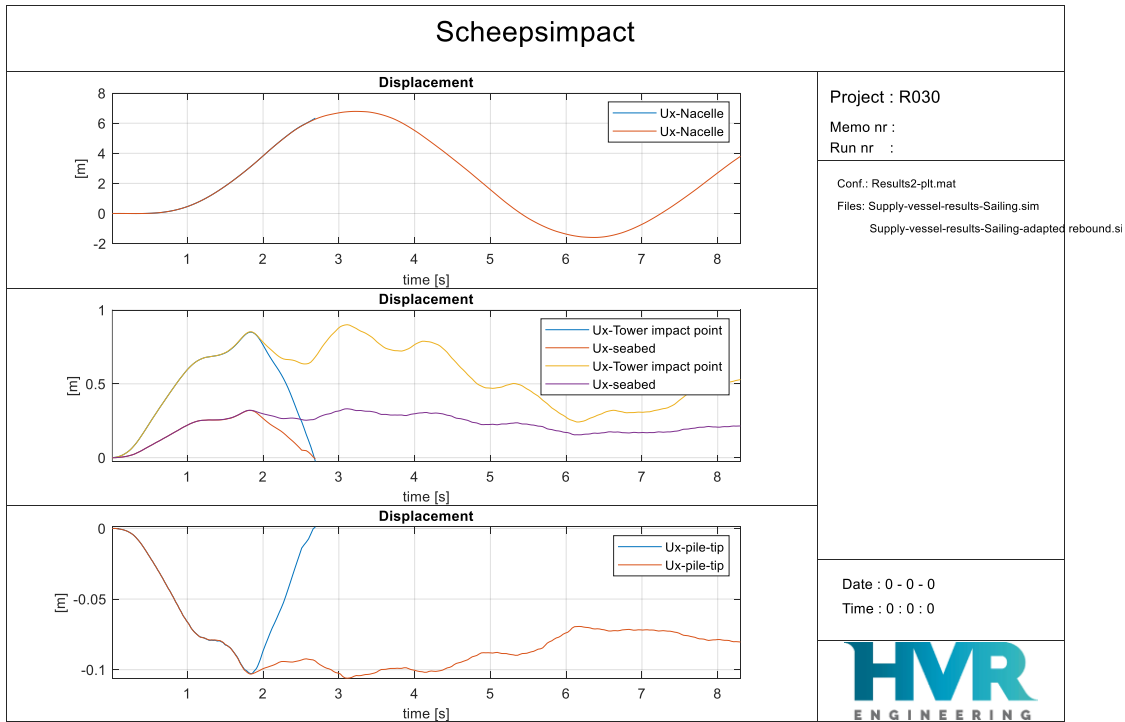


Figure B 17: Supply vessel, foundation results, Sailing (Blue = original, Red = Adapted rebound).

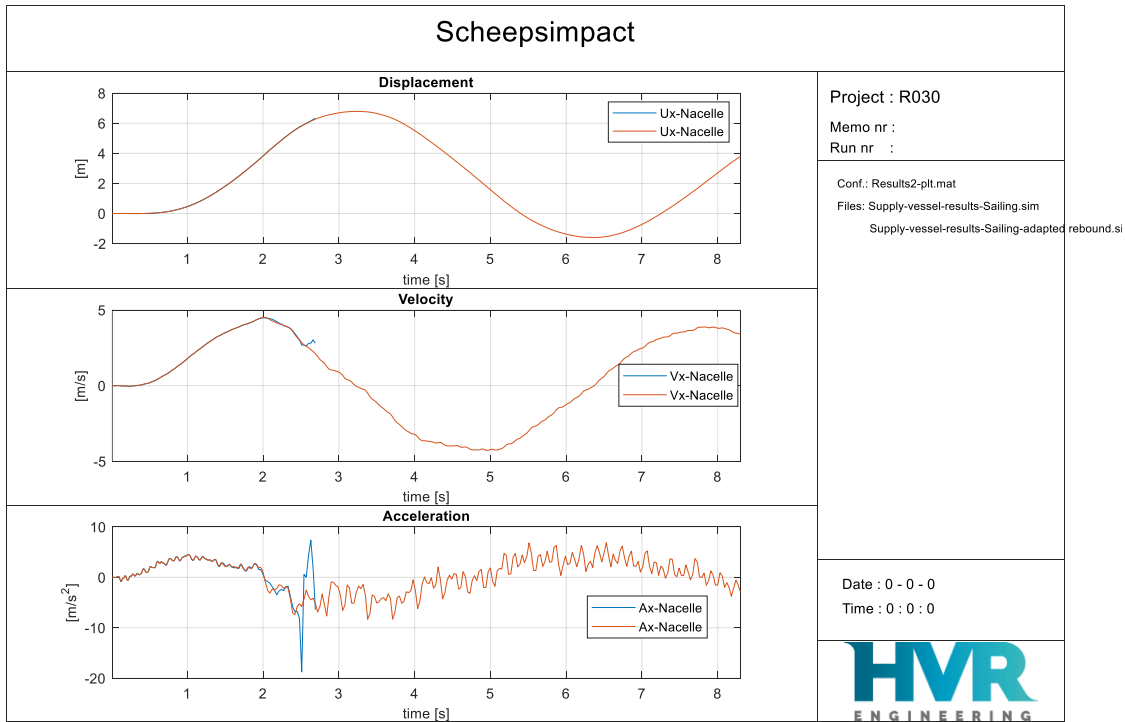


Figure B 18: Supply vessel, Nacelle results, Sailing (Blue = original, Red = Adapted rebound).

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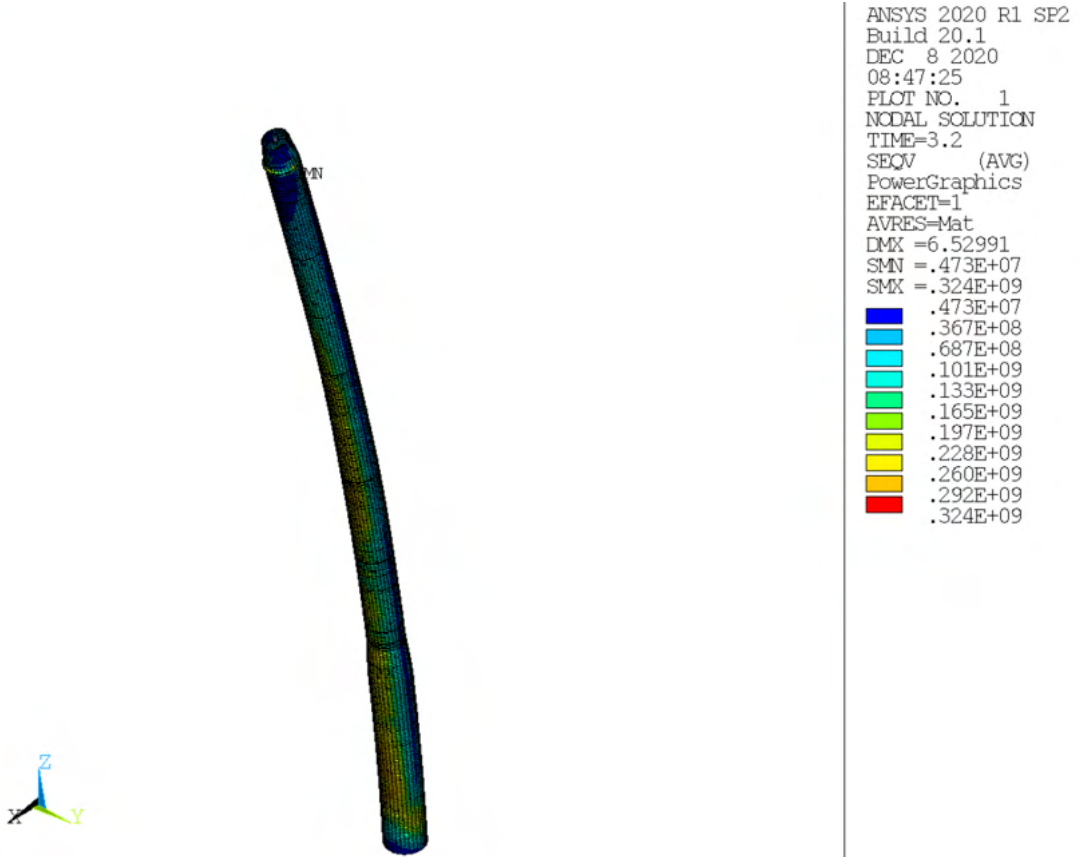


Figure B 19: Supply vessel, maximum deformation and Von Mises stress in [Pa], Sailing.

2.2. Chemical tanker.

2.2.1. Impact force.

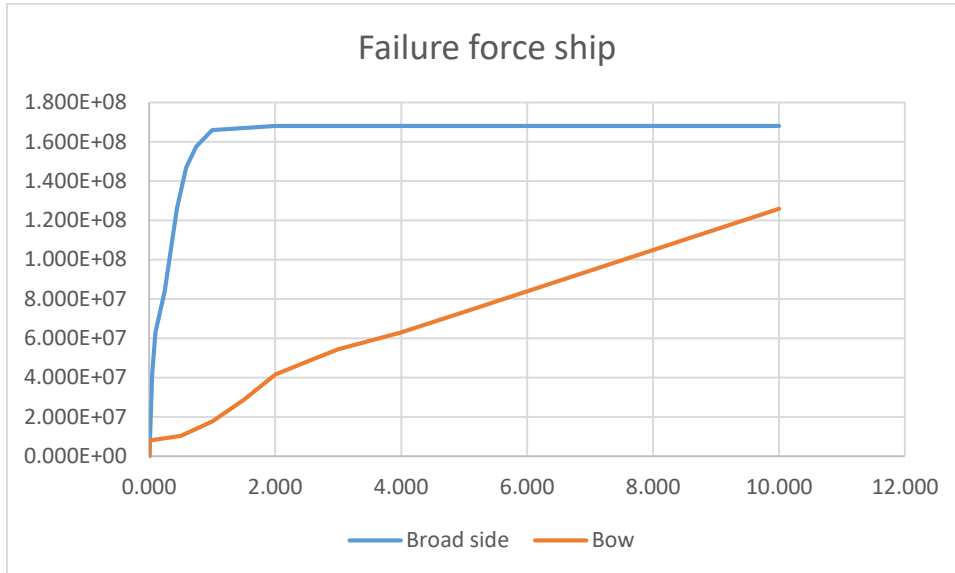


Figure B 20: Ship impact force or failure force.

2.2.2. Drifting.

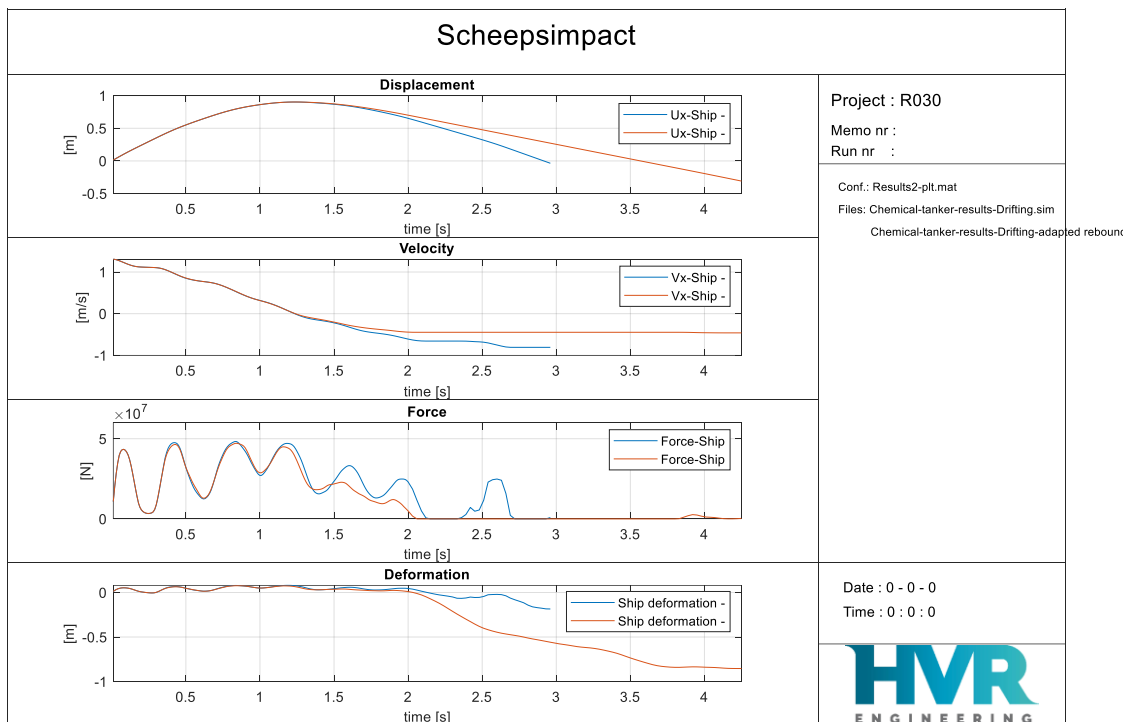


Figure B 21: Chemical tanker, ship results, Drifting (Blue = original, Red = Adapted rebound).

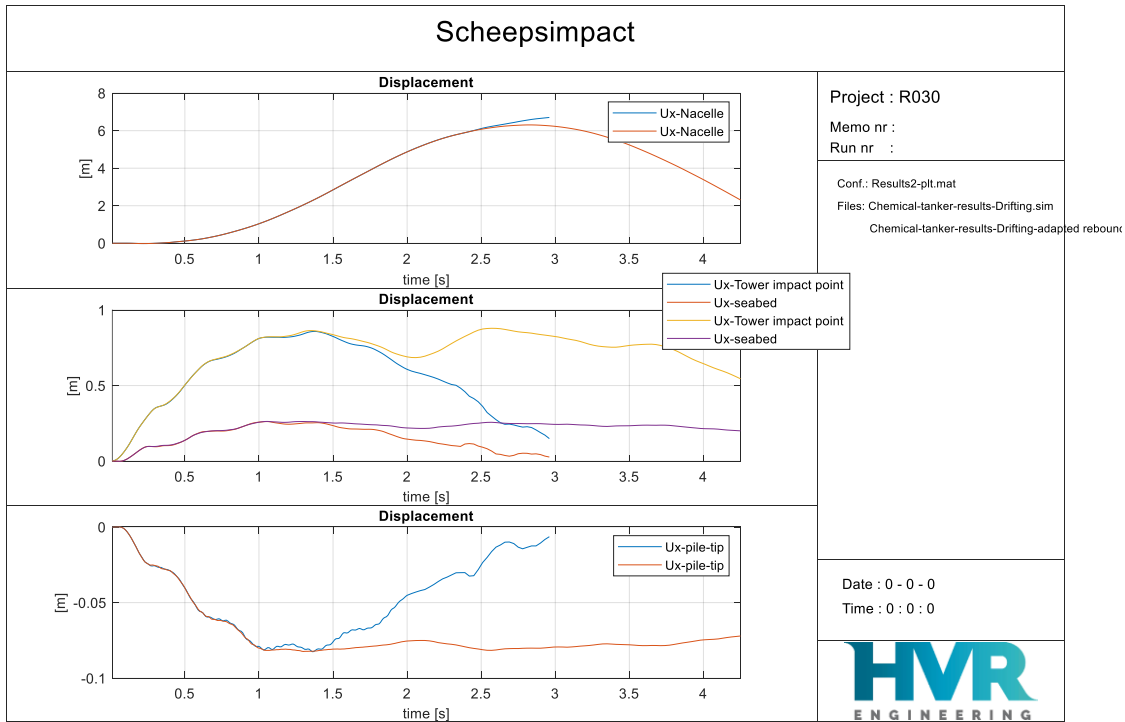


Figure B 22: Chemical tanker, foundation results, Drifting (Blue = original, Red = Adapted rebound).

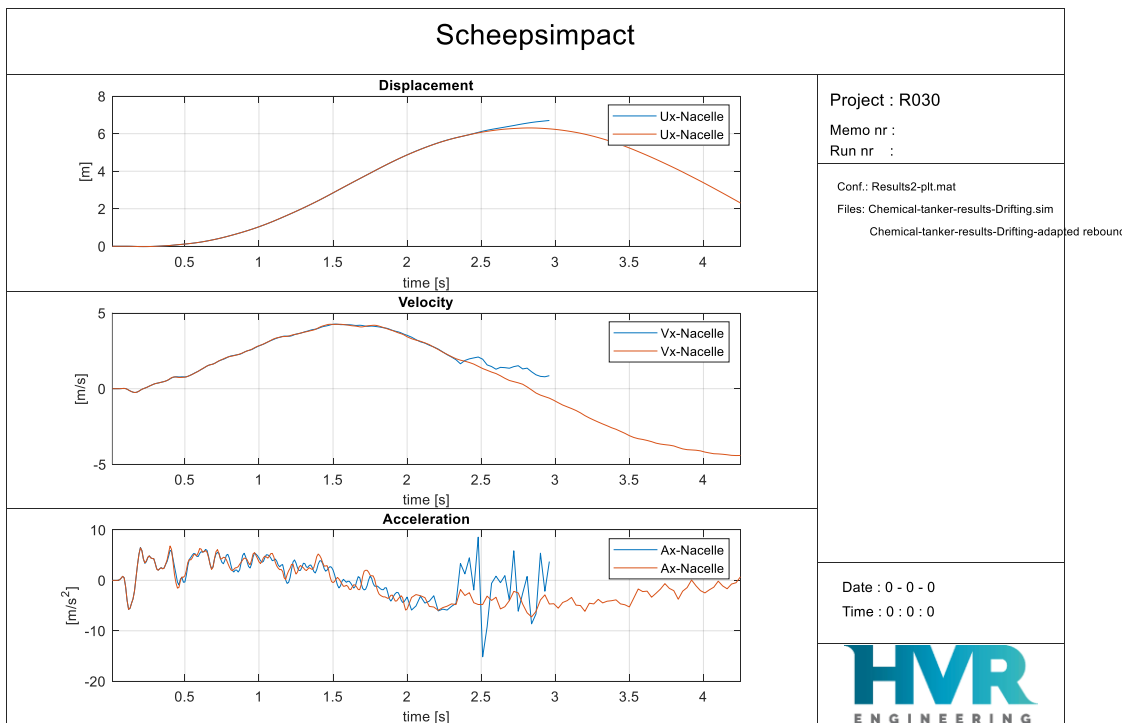


Figure B 23: Chemical tanker, Nacelle results, Drifting (Blue = original, Red = Adapted rebound).

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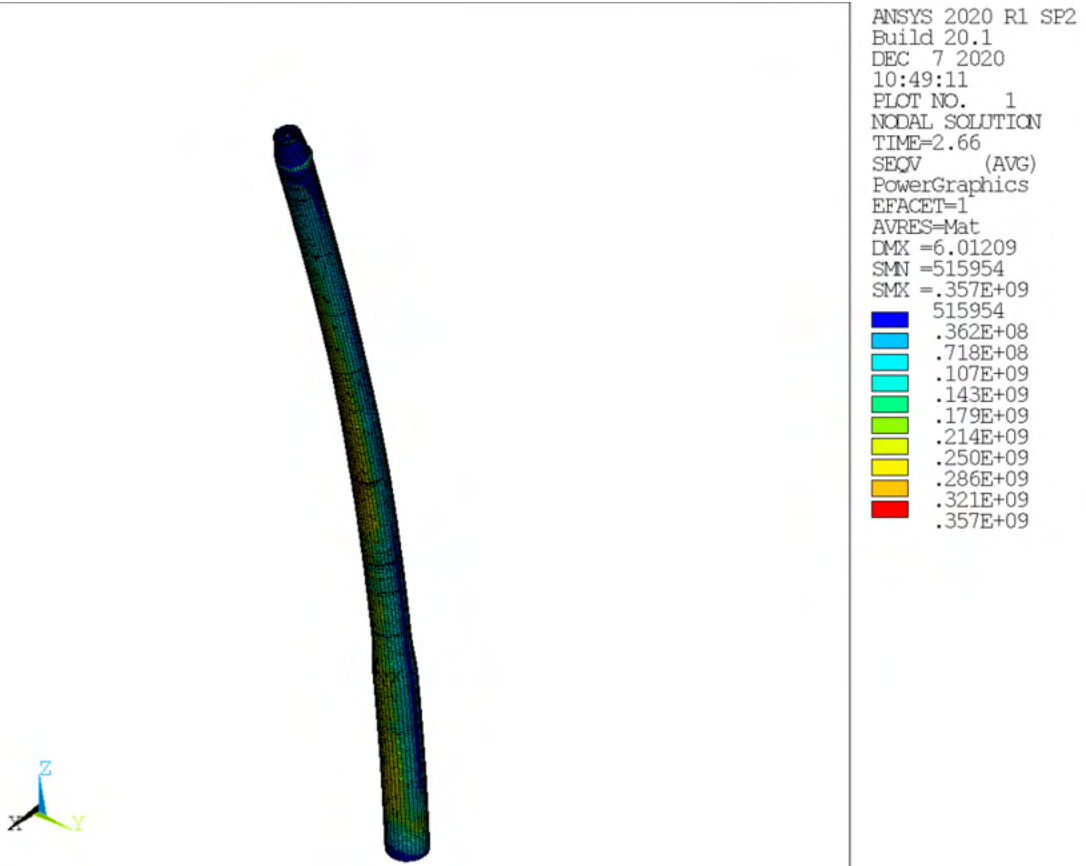


Figure B 24: Chemical tanker , maximum deformation and Von Mises stress in [Pa], Drifting.

2.3. Container ship.

2.3.1. Impact force.

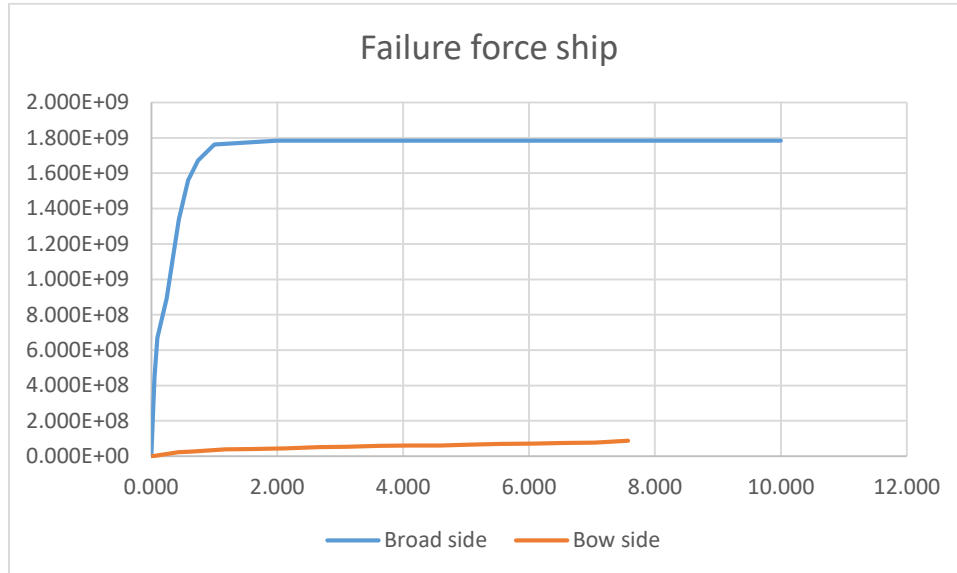


Figure B 25: Ship impact force or failure force.

2.3.2. Drifting.

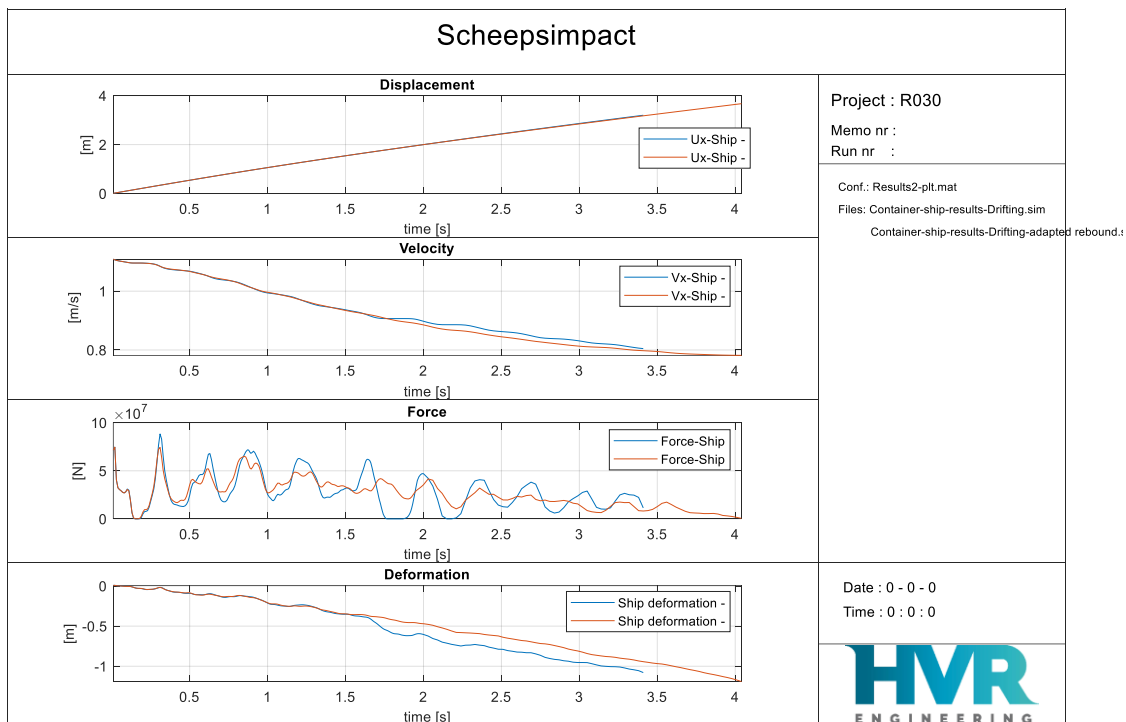


Figure B 26: Container ship, ship results, Drifting (Blue = original, Red = Adapted rebound).

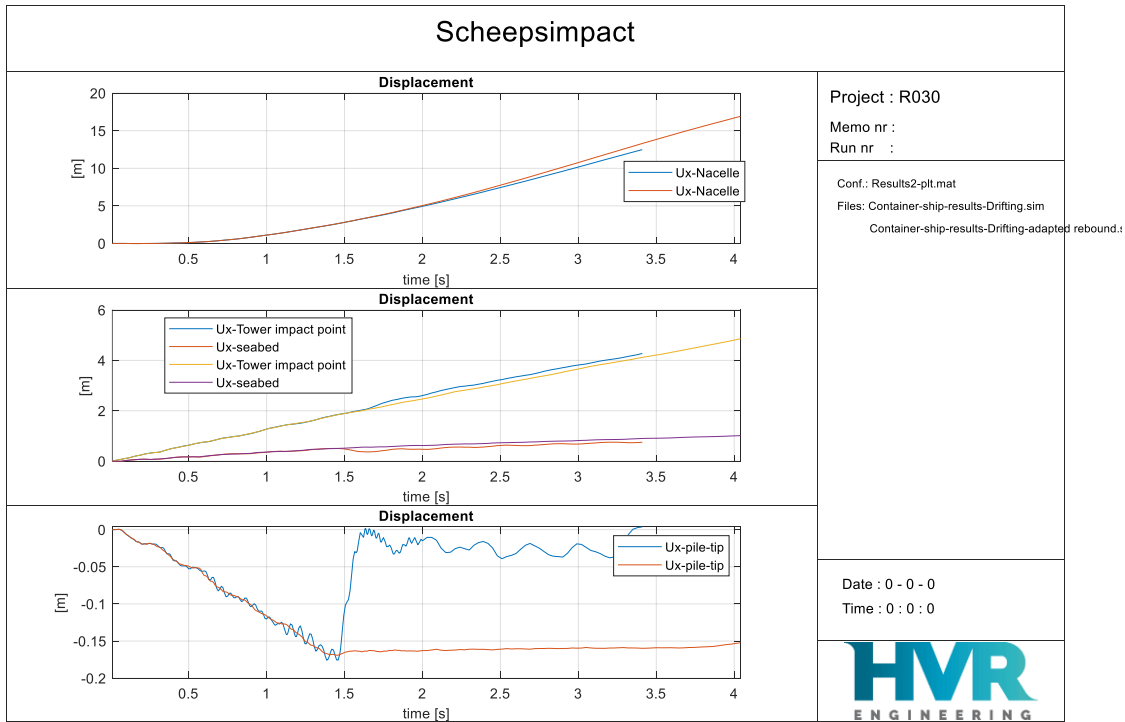


Figure B 27: Container ship, foundation results, Drifting (Blue = original, Red = Adapted rebound).

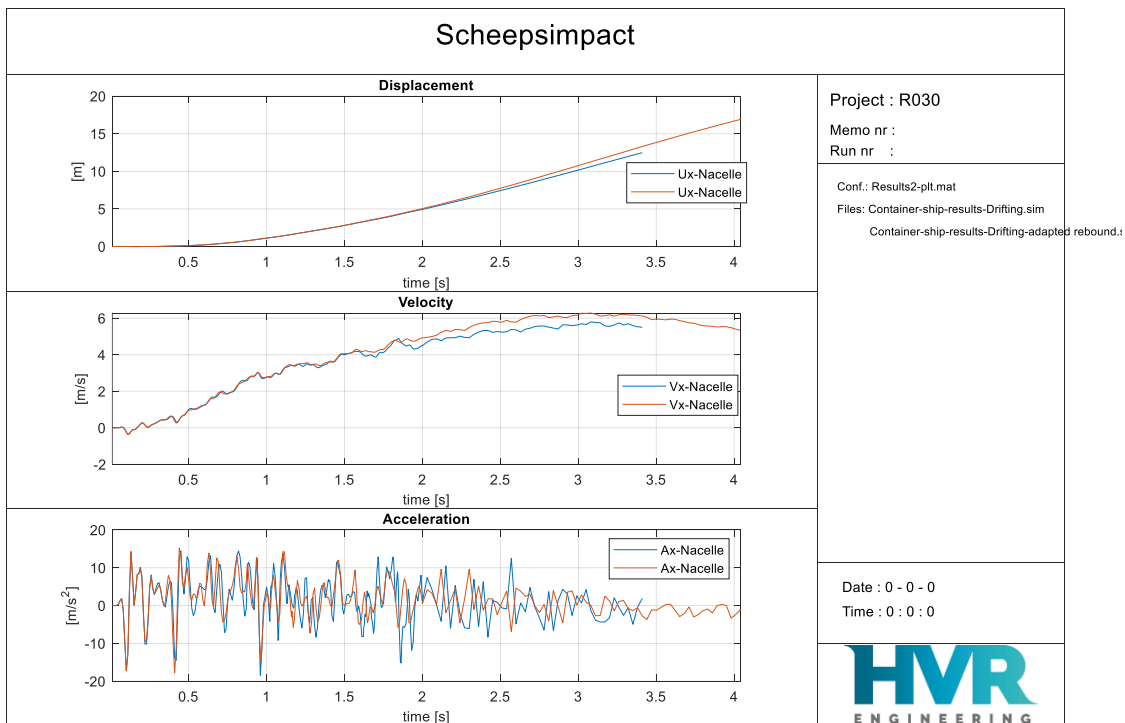


Figure B 28: Container ship, Nacelle results, Drifting (Blue = original, Red = Adapted rebound).

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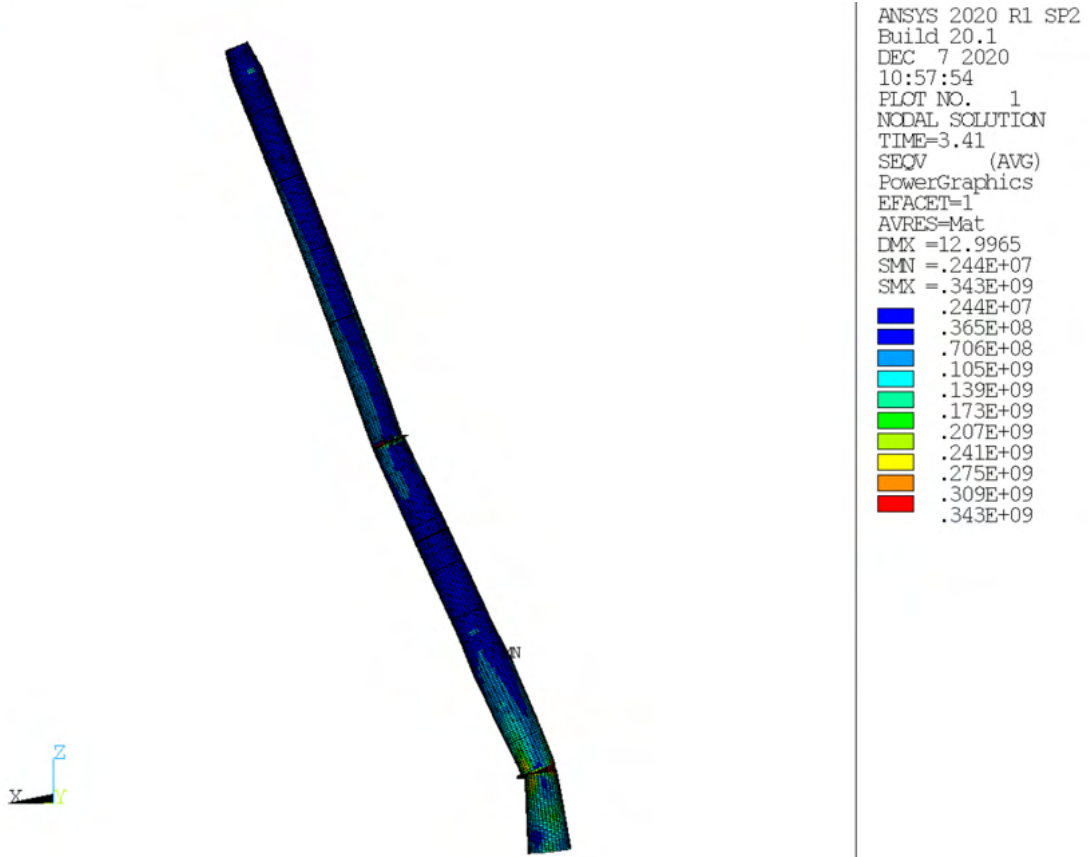


Figure B 29: Container ship, end deformation and Von Mises stress in [Pa], Drifting.

2.3.3. Sailing.

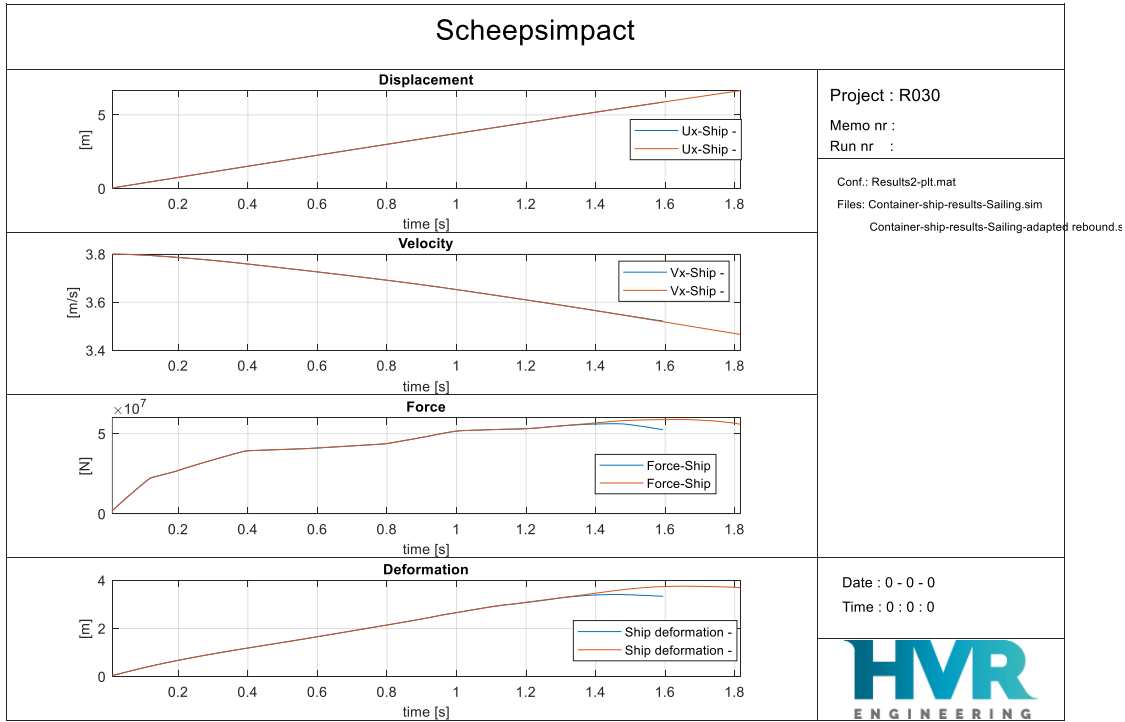


Figure B 30: Container ship, ship results, Sailing (Blue = original, Red = Adapted rebound).

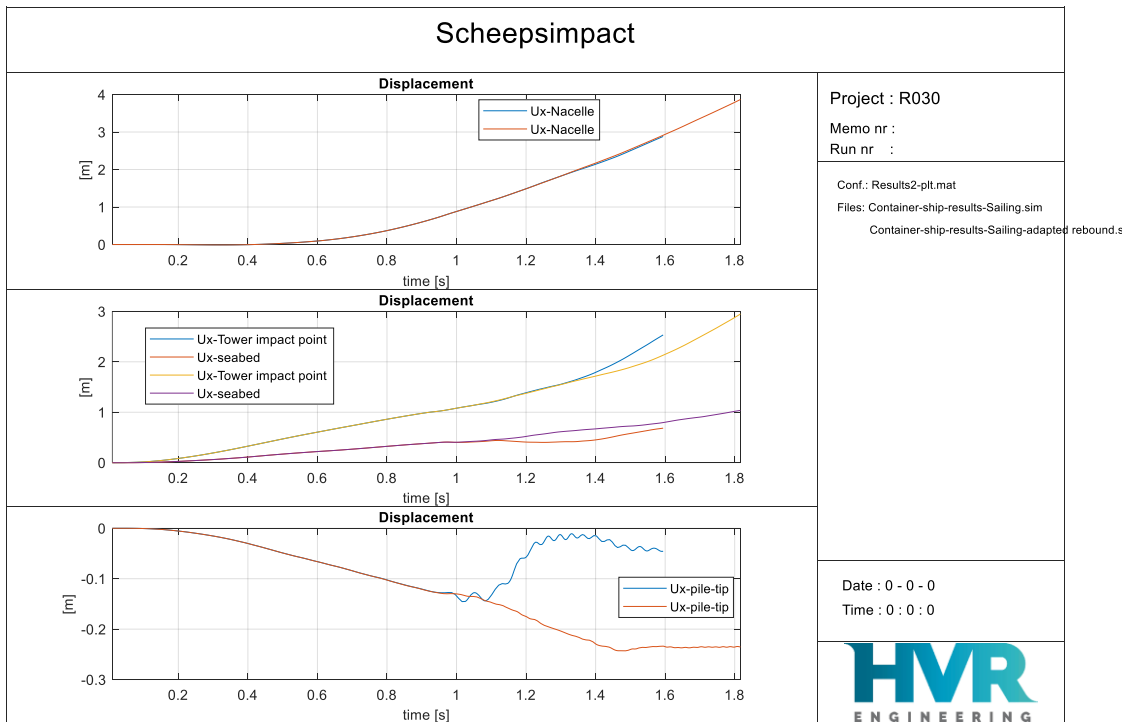


Figure B 31: Container ship, foundation results, Sailing (Blue = original, Red = Adapted rebound).

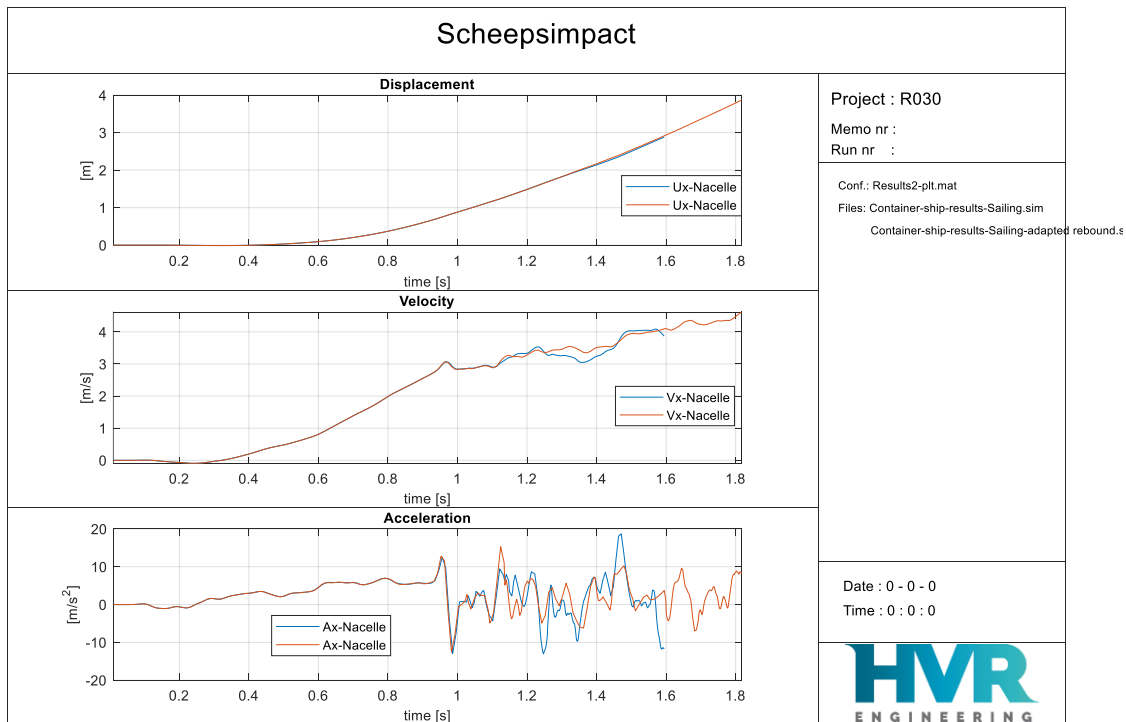


Figure B 32: Container ship, Nacelle results, Sailing (Blue = original, Red = Adapted rebound).

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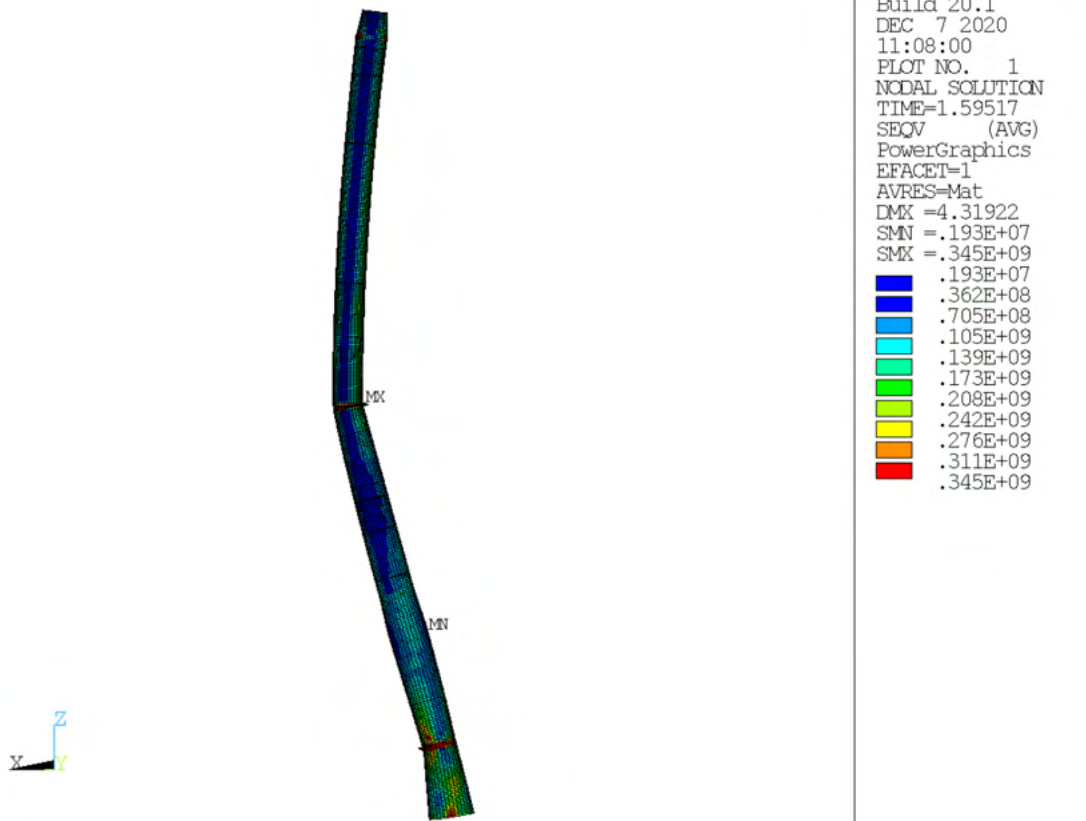


Figure B 33: Container ship, end deformation and Von Mises stress in [Pa], Sailing.

3. Effect of the impact force versus time.

3.1. Chemical tanker.

3.1.1. Impact force.

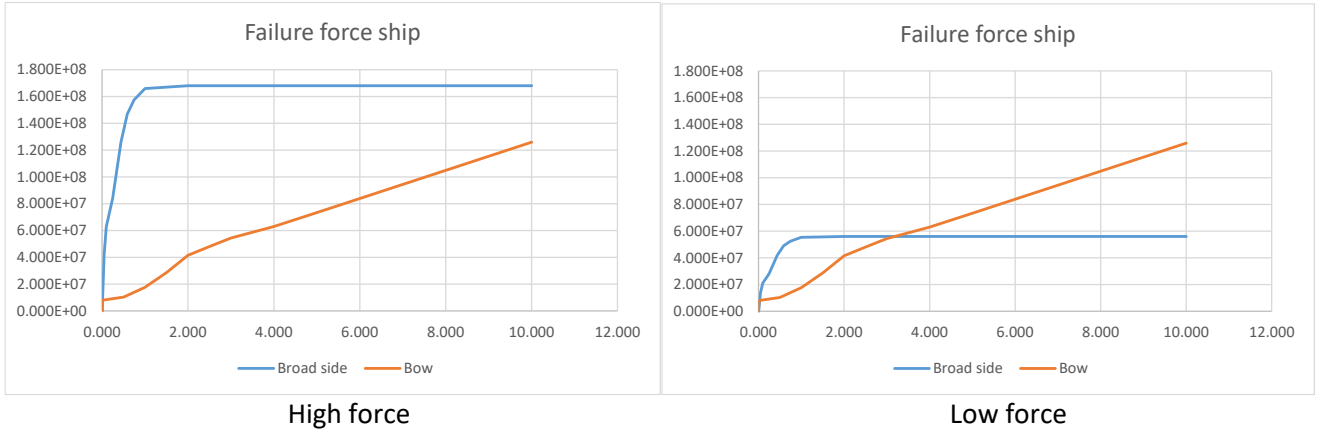


Figure B 34: Ship impact force or failure force.

3.1.2. Drifting.

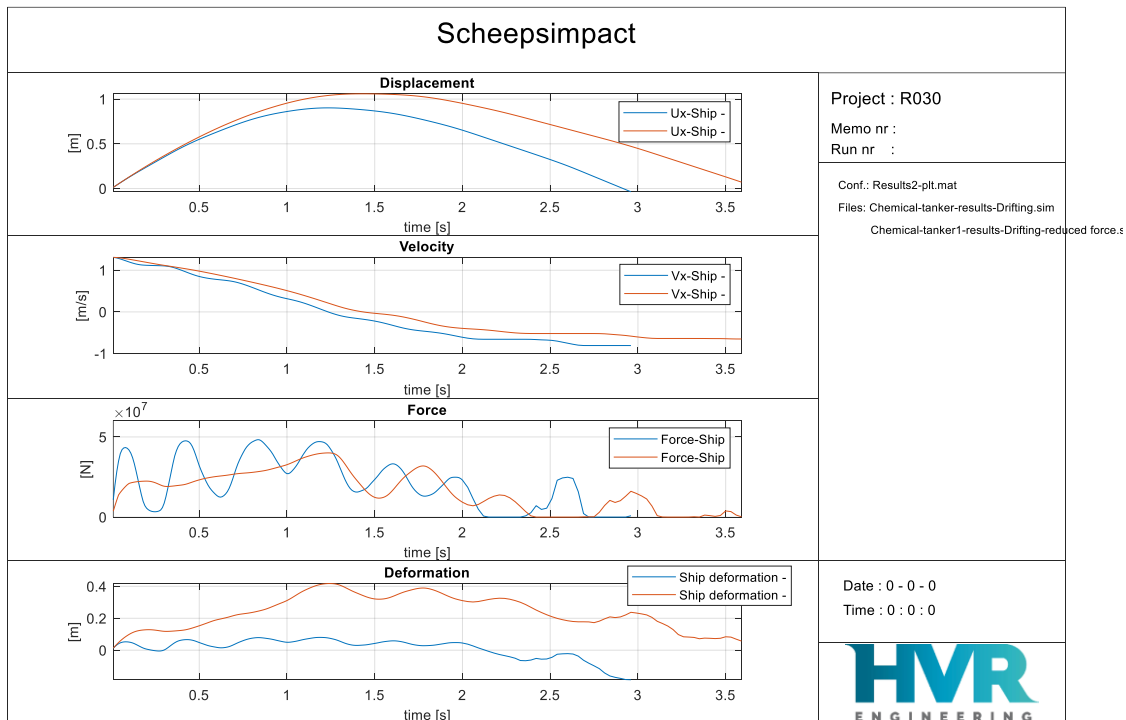


Figure B 35: Chemical tanker, ship results, Drifting (Blue = original, Red = reduced force).

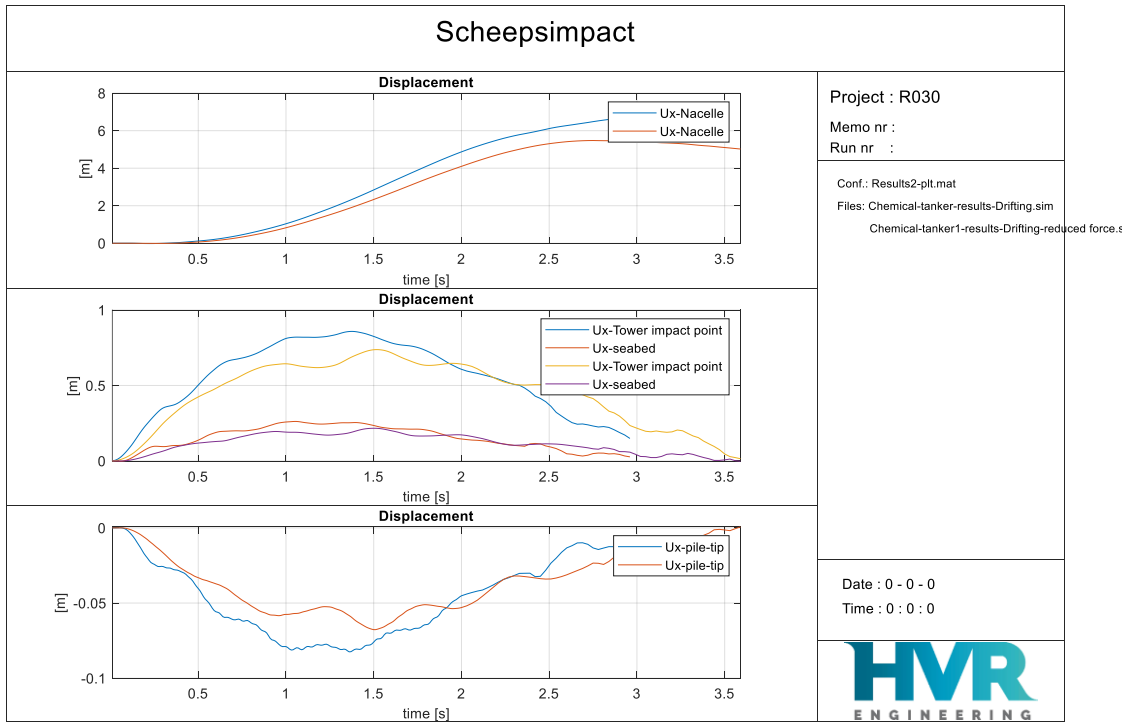


Figure B 36: Chemical tanker, foundation results, Drifting (Blue = original, Red = reduced force).

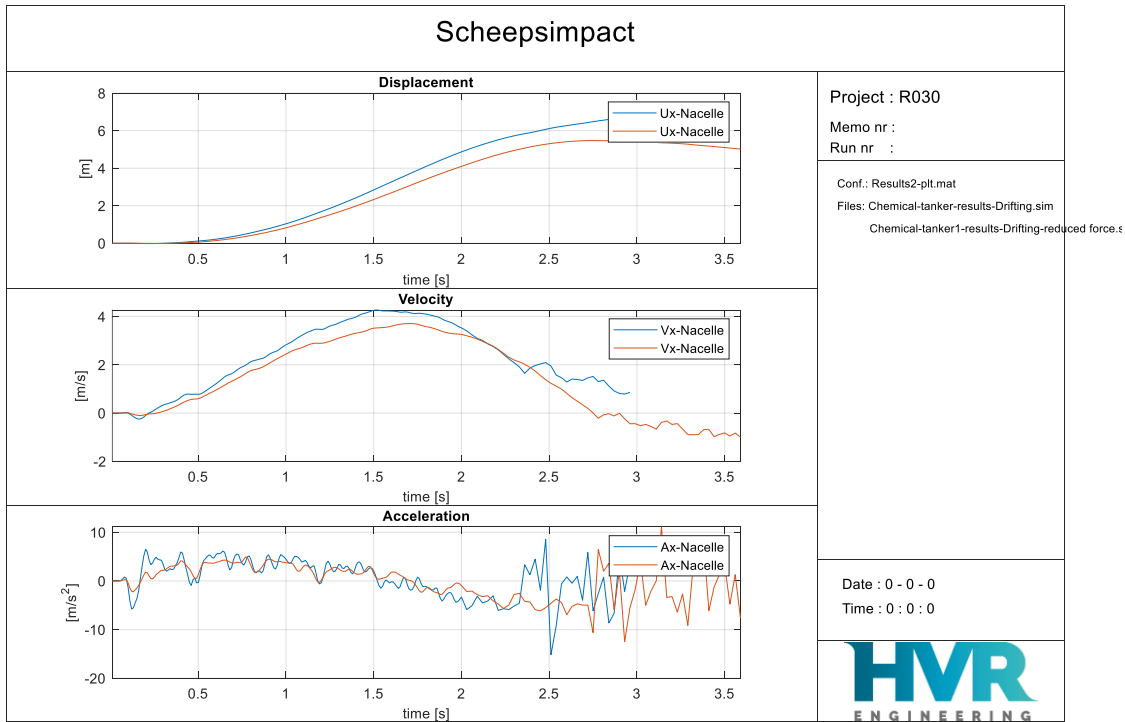


Figure B 37: Chemical tanker, Nacelle results, Drifting (Blue = original, Red = reduced force).

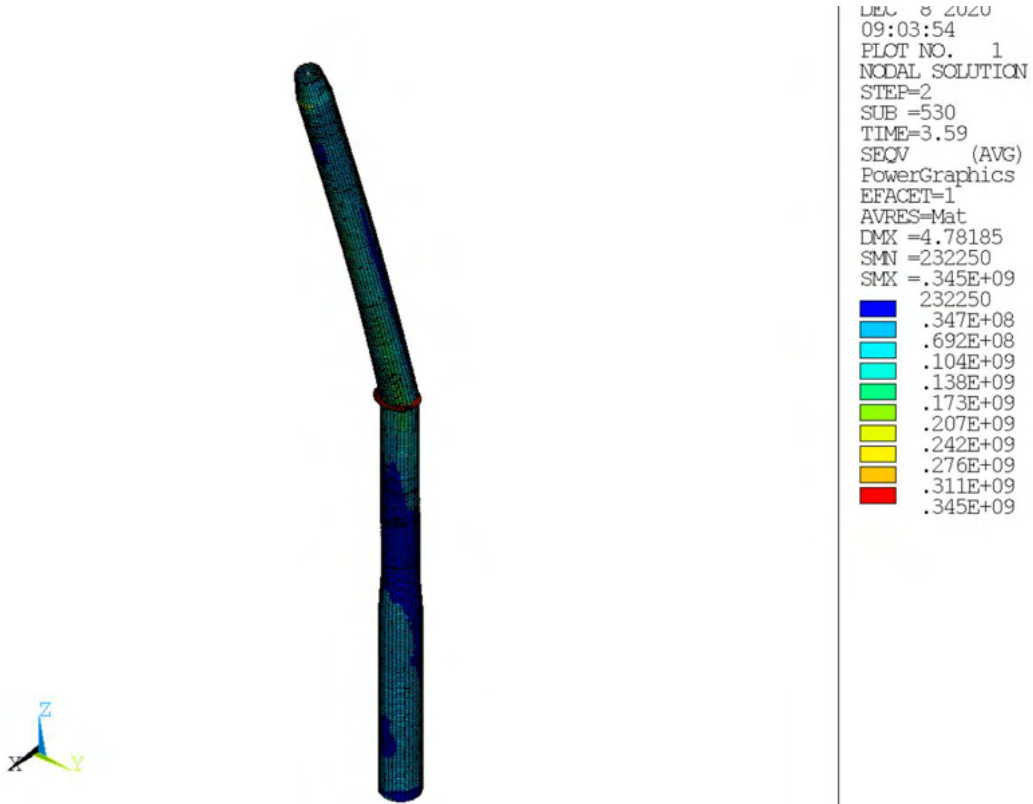
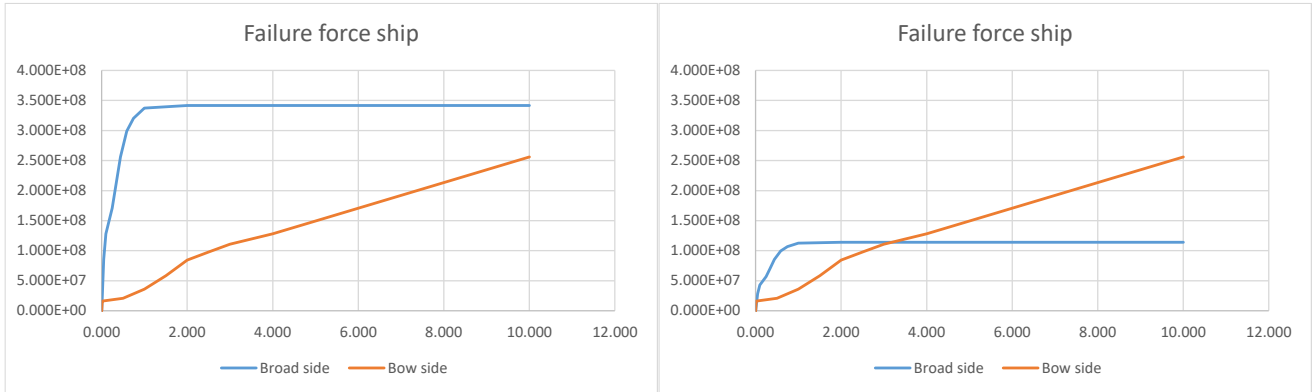


Figure B 38: Chemical tanker , end deformation and Von Mises stress in [Pa], Drifting.

3.2. Passenger vessel.

3.2.1. Impact force.



High force

Low force

Figure B 39: Ship impact force or failure force.

3.2.2. Drifting.

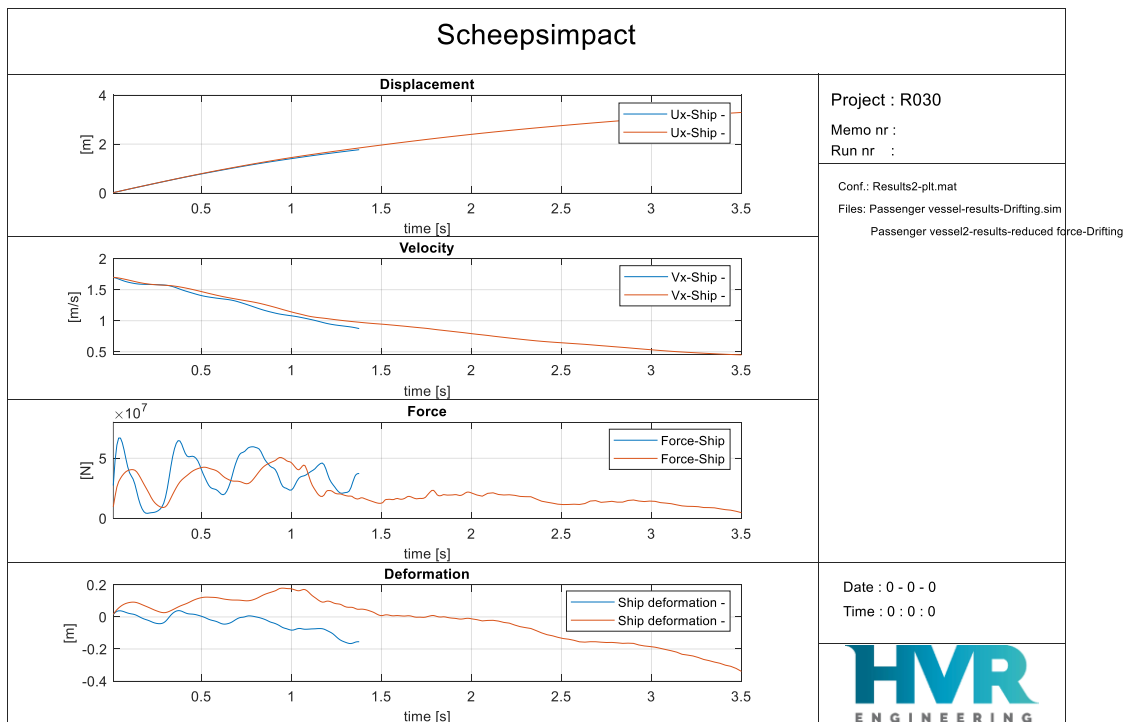


Figure B 40: Passenger vessel, ship results, Drifting (Blue = original, Red = reduced force).

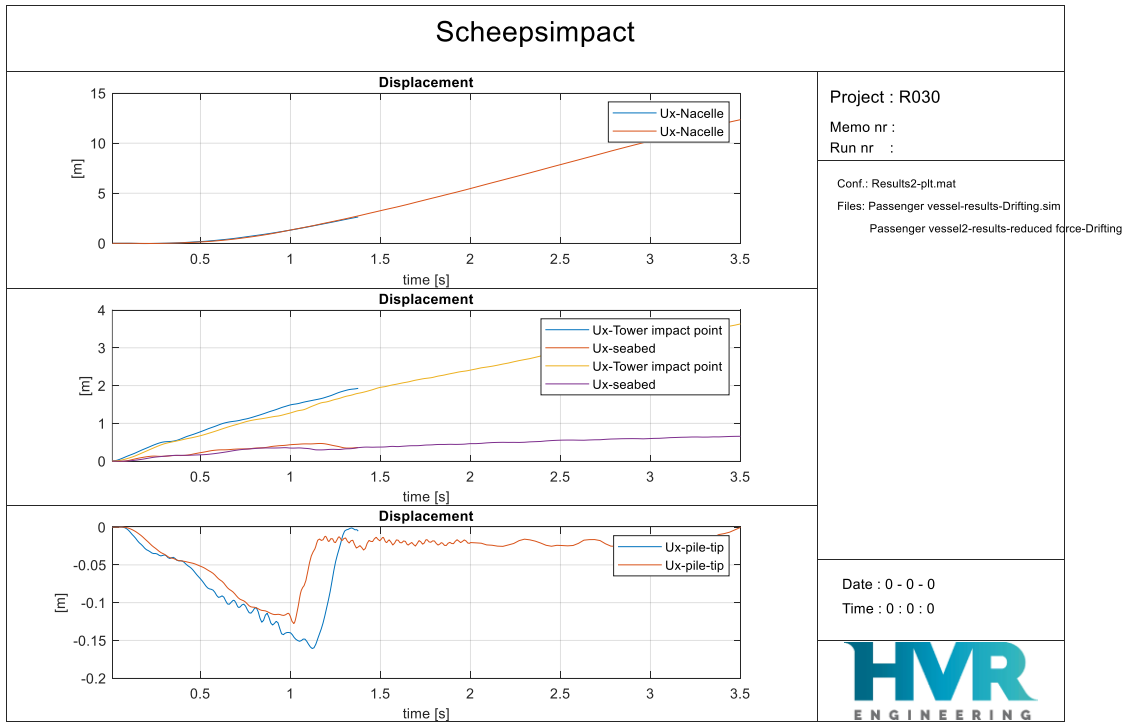


Figure B 41: Passenger vessel, foundation results, Drifting (Blue = original, Red = reduced force).

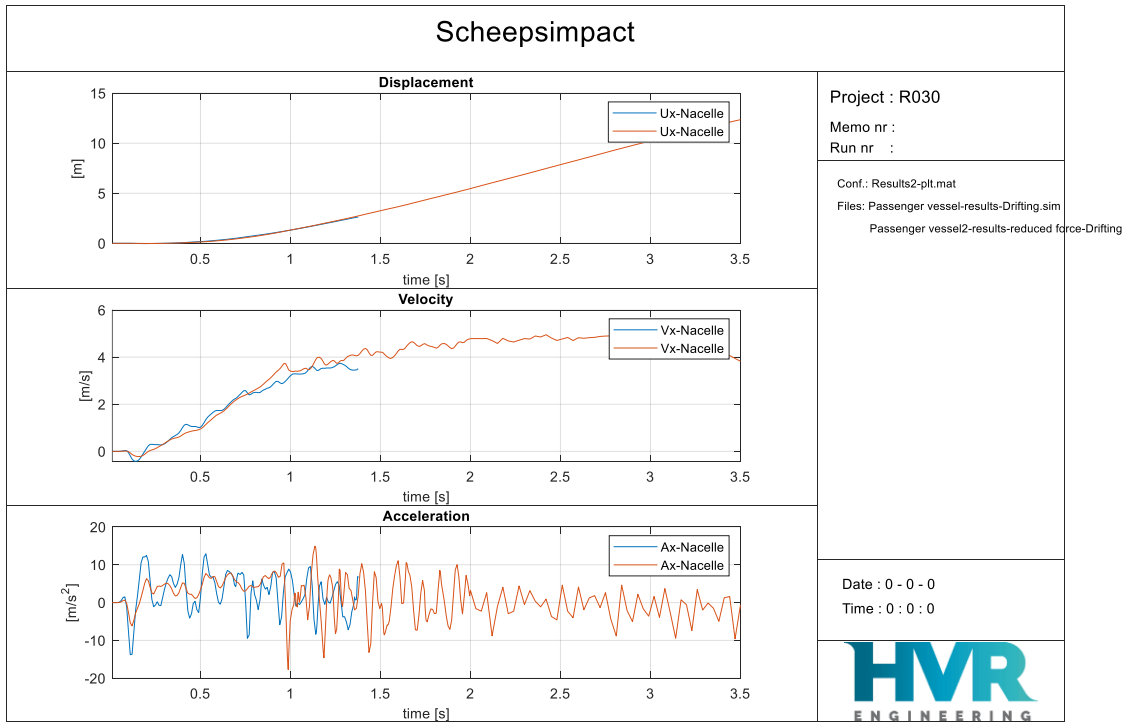


Figure B 42: Passenger vessel, Nacelle results, Drifting (Blue = original, Red = reduced force).

1

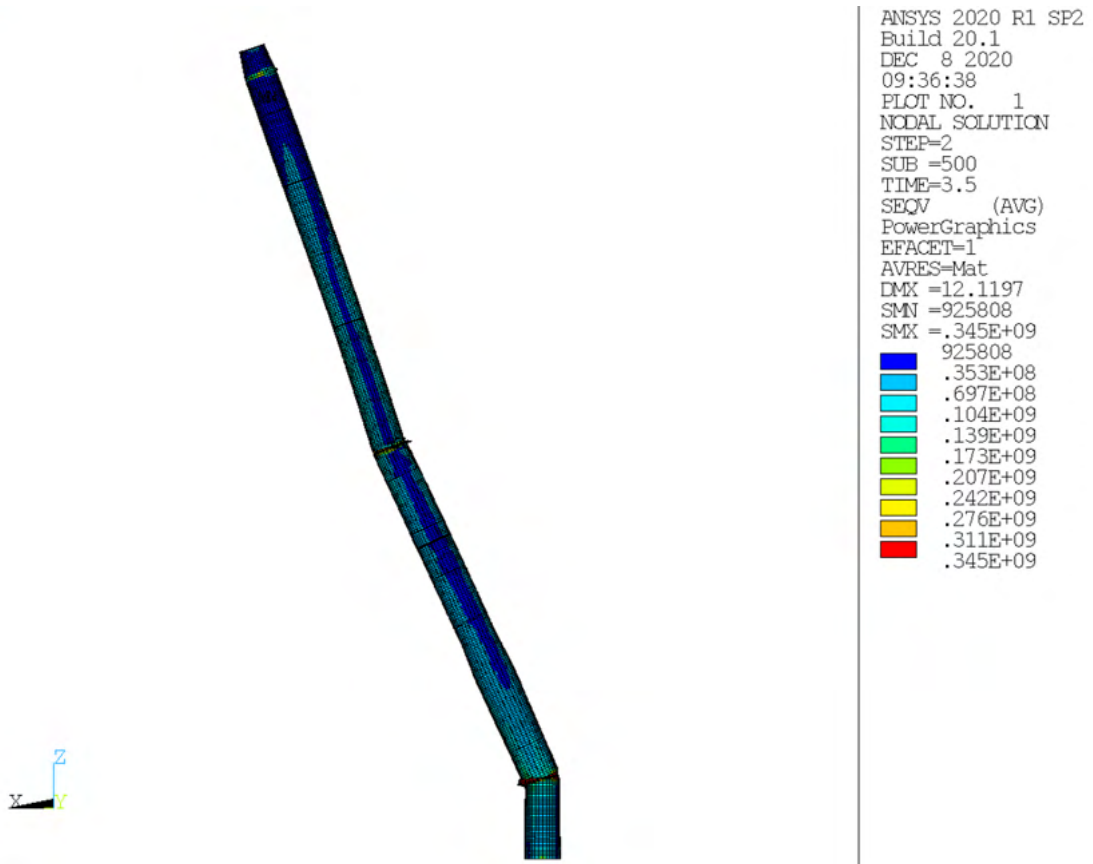


Figure B 43: Passenger vessel, end deformation and Von Mises stress in [Pa], Drifting.

3.3. Container ship.

3.3.1. Impact force.

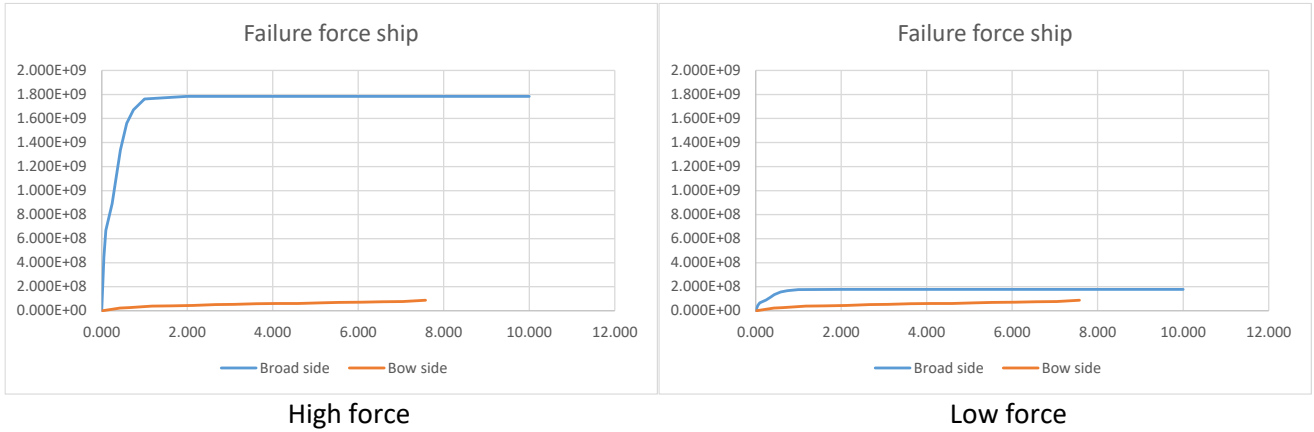


Figure B 44: Ship impact force or failure force.

3.3.2. Drifting.

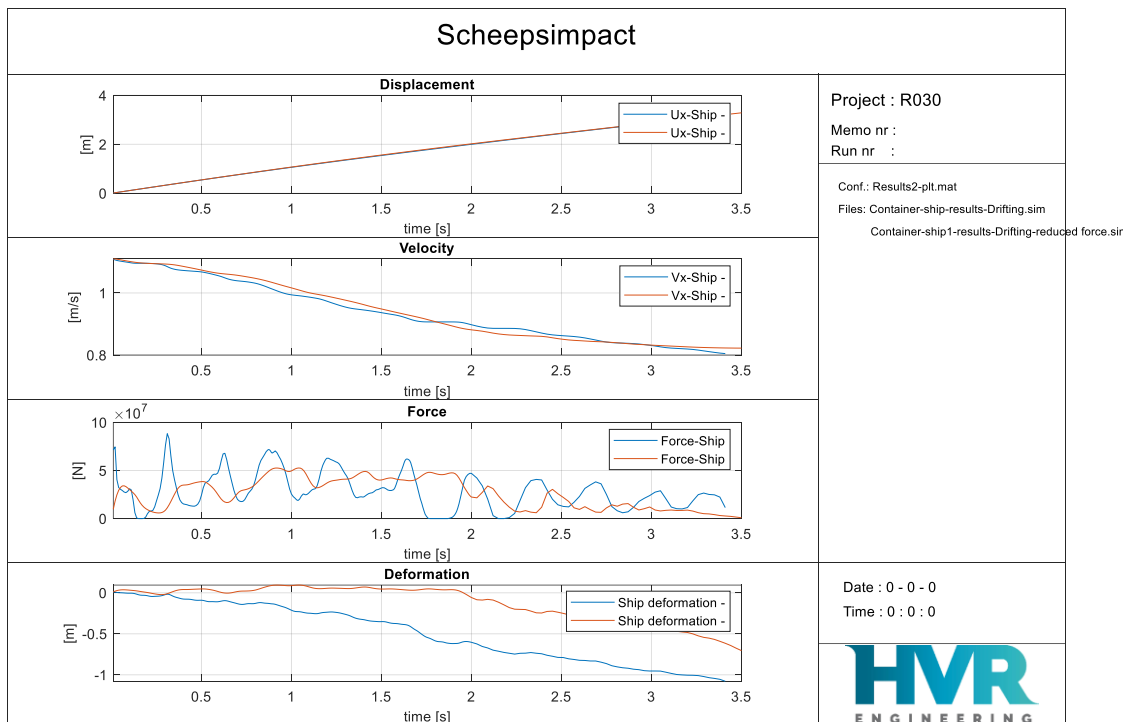


Figure B 45: Container ship, ship results, Drifting (Blue = original, Red = reduced force).

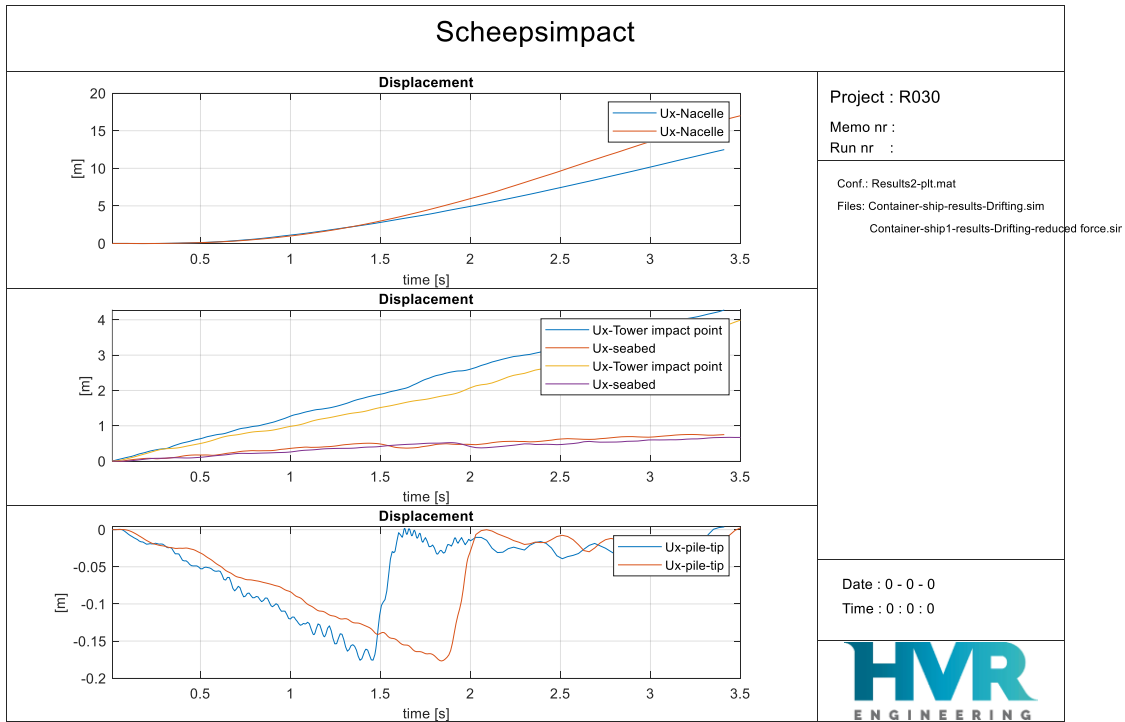


Figure B 46: Container ship, foundation results, Drifting (Blue = original, Red = reduced force).

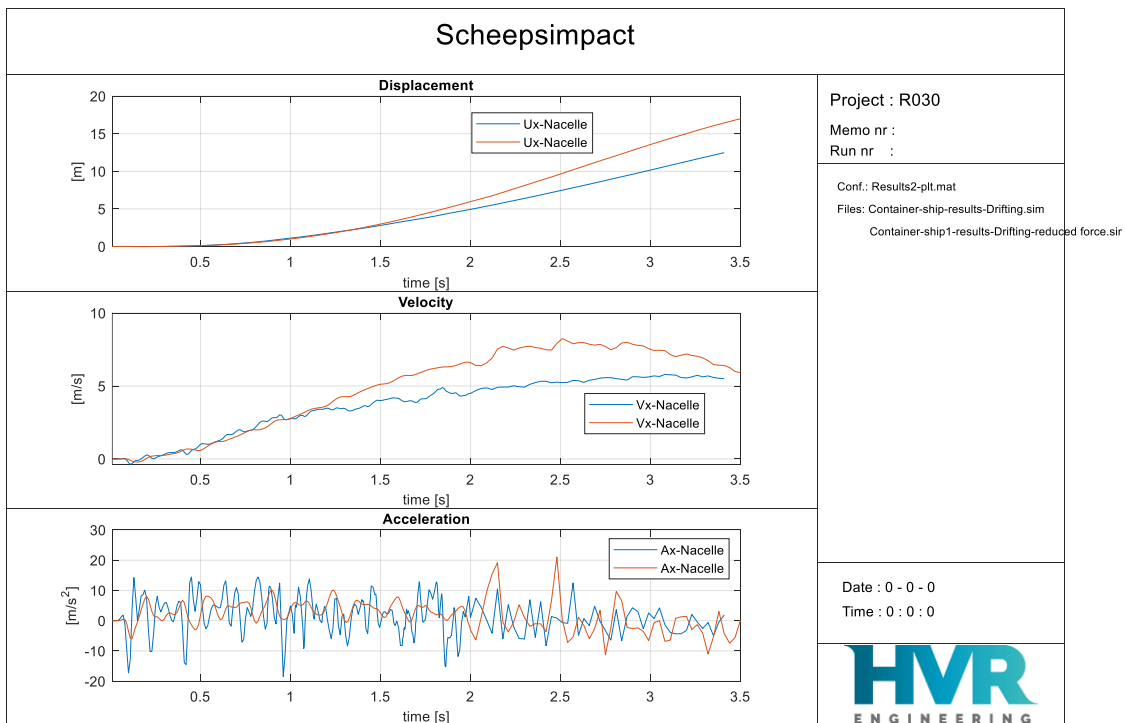


Figure B 47: Container ship, Nacelle results, Drifting (Blue = original, Red = reduced force).

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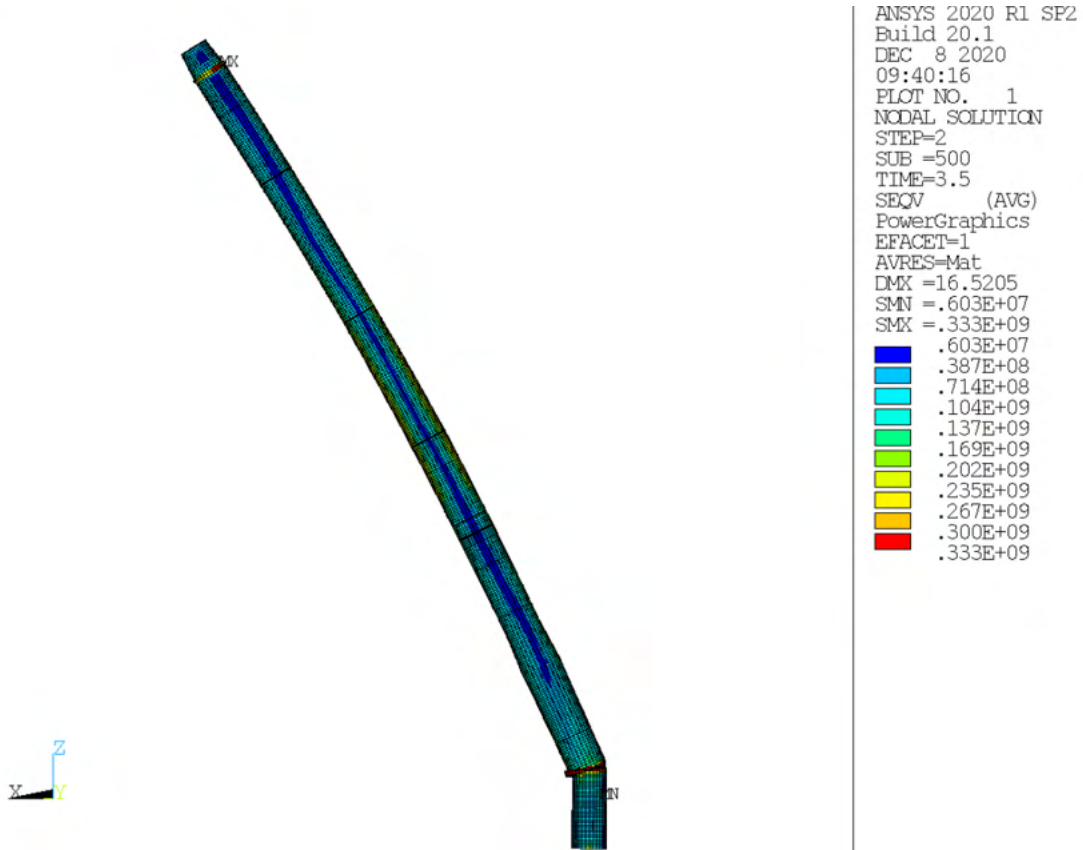


Figure B 48: Container ship, end deformation and Von Mises stress in [Pa], Drifting.

4. Effect of the impact velocity.

4.1. Chemical tanker.

4.1.1. Impact force.

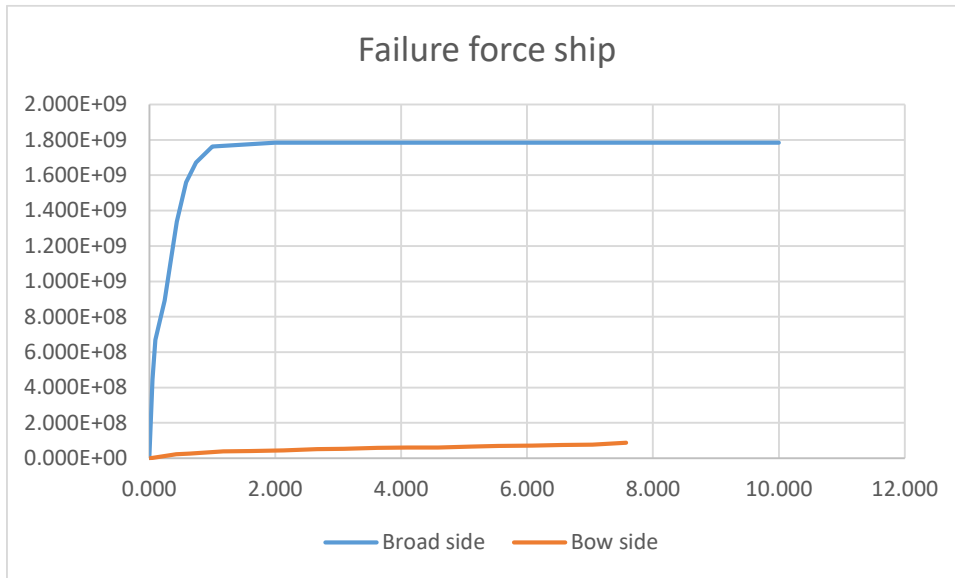


Figure B 49: Ship impact force or failure force.

4.1.2. Drifting.

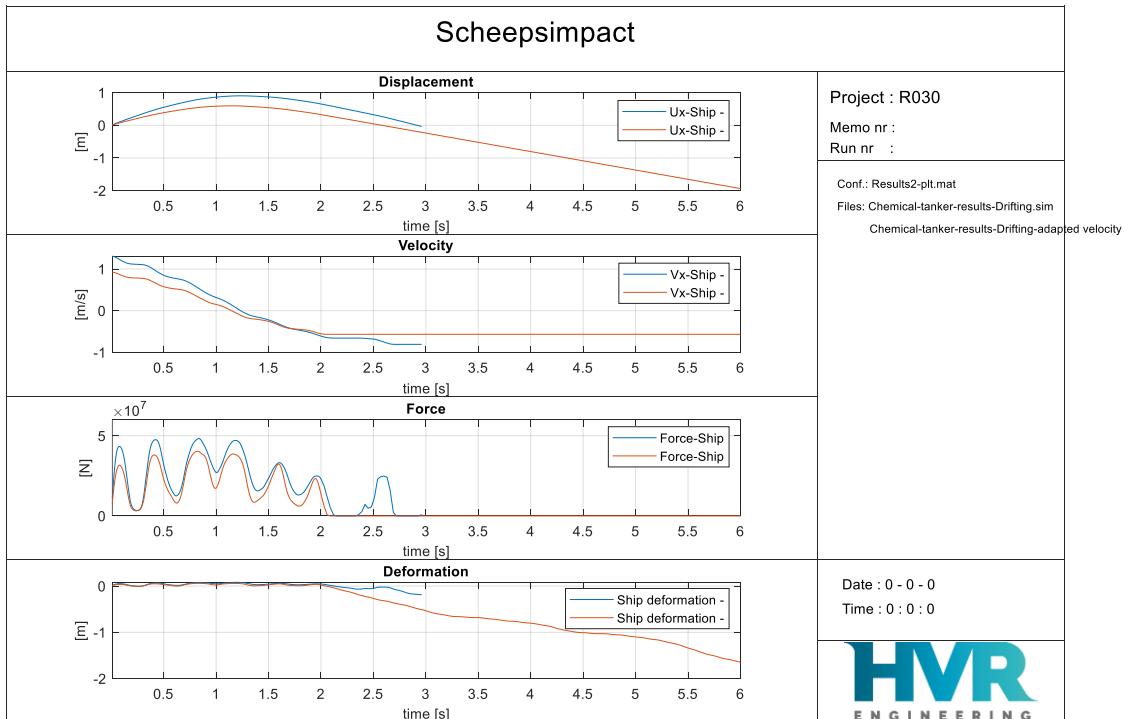


Figure B 50: Chemical tanker, ship results, Drifting (Blue = original, Red = reduced velocity).

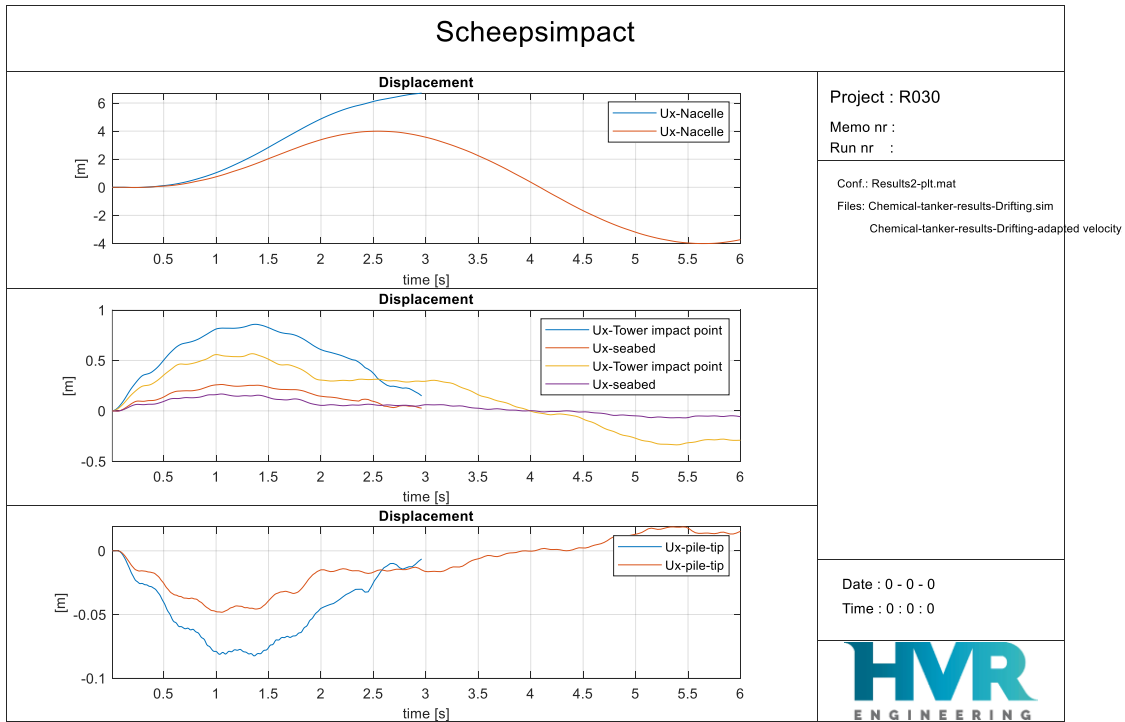


Figure B 51: Chemical tanker, foundation results, Drifting (Blue = original, Red = reduced velocity).

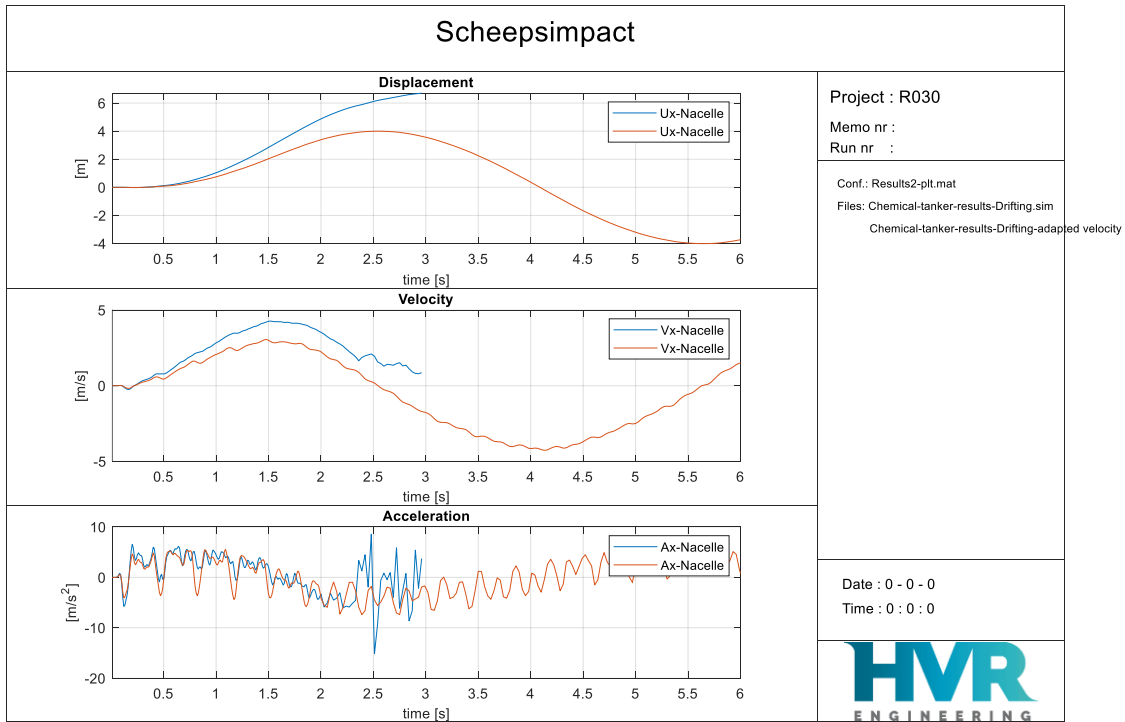


Figure B 52: Chemical tanker, Nacelle results, Drifting (Blue = original, Red = reduced velocity).

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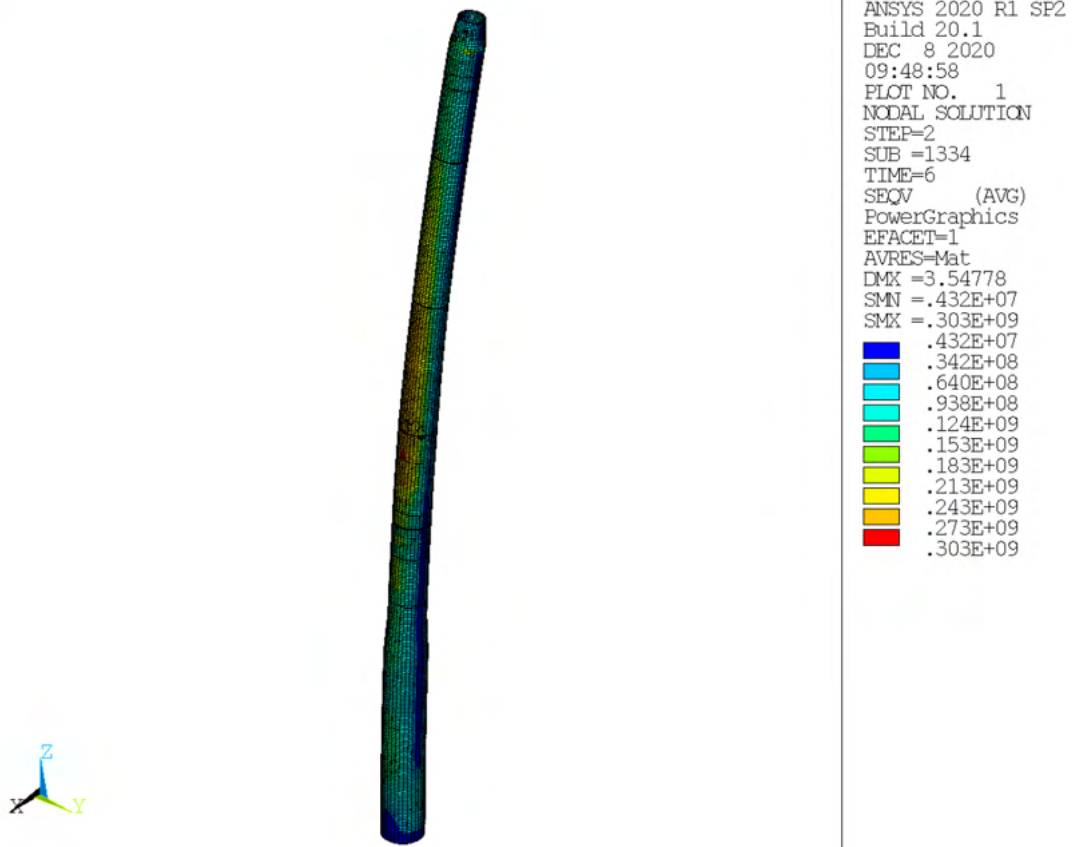


Figure B 53: Chemical tanker , end deformation and Von Mises stress in [Pa], Drifting.

4.2. Passenger vessel.

4.2.1. Impact force.

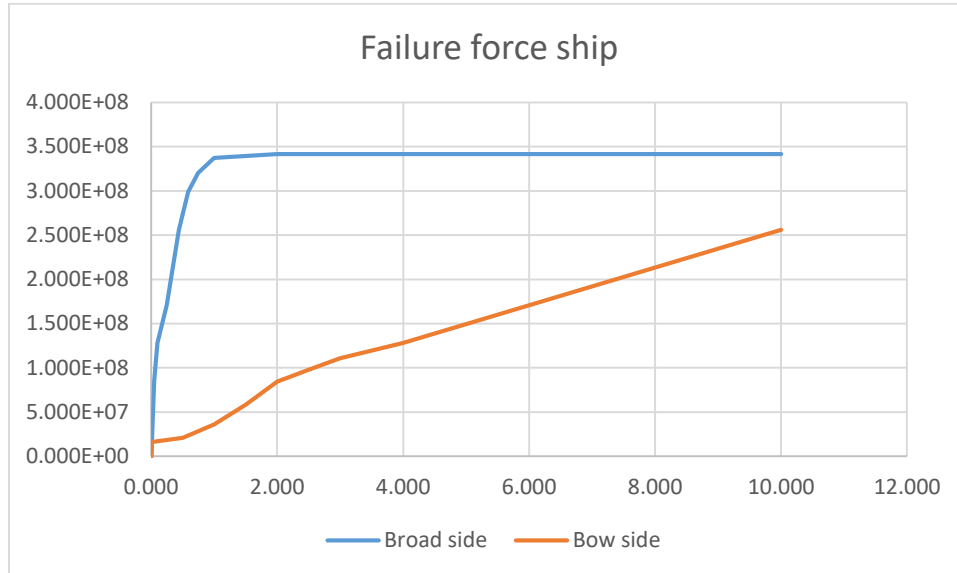


Figure B 54: Ship impact force or failure force.

4.2.2. Drifting.

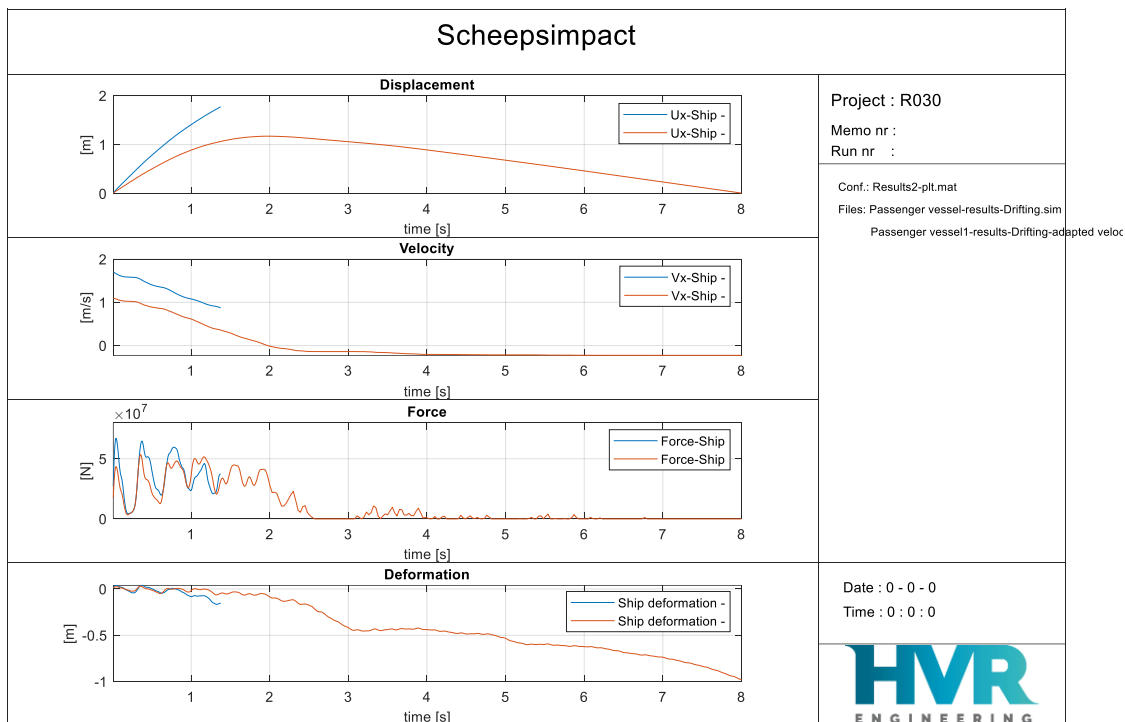


Figure B 55: Passenger vessel, ship results, Drifting (Blue = original, Red = reduced force).

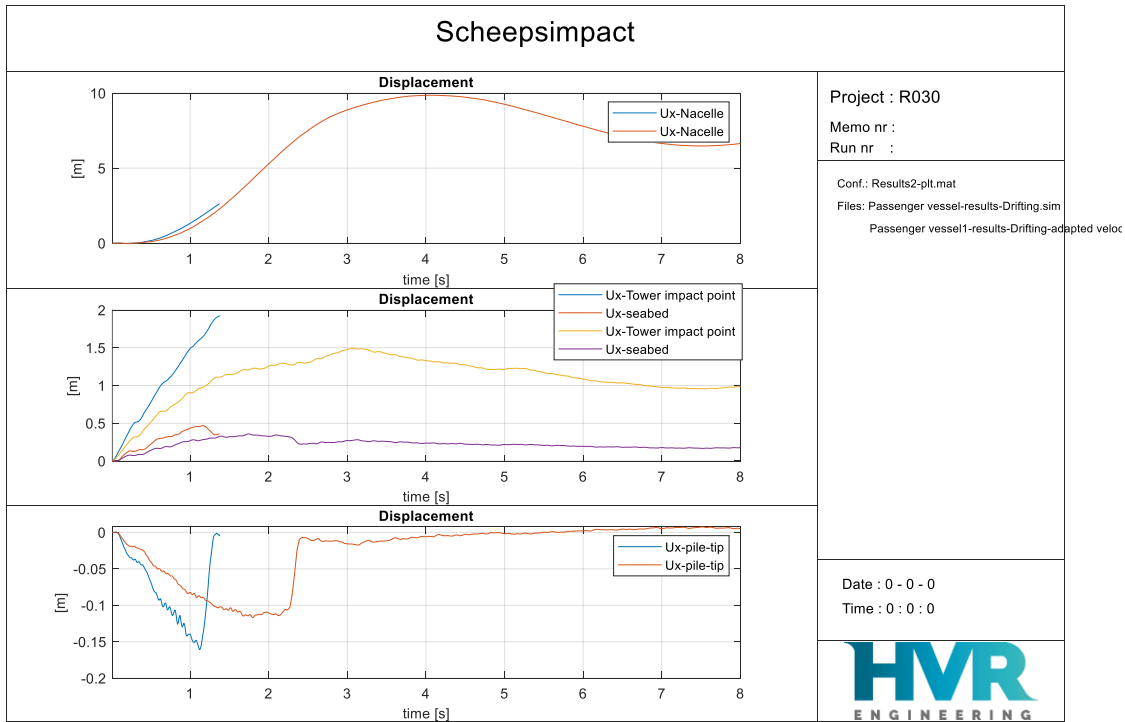


Figure B 56: Passenger vessel, foundation results, Drifting (Blue = original, Red = reduced force).

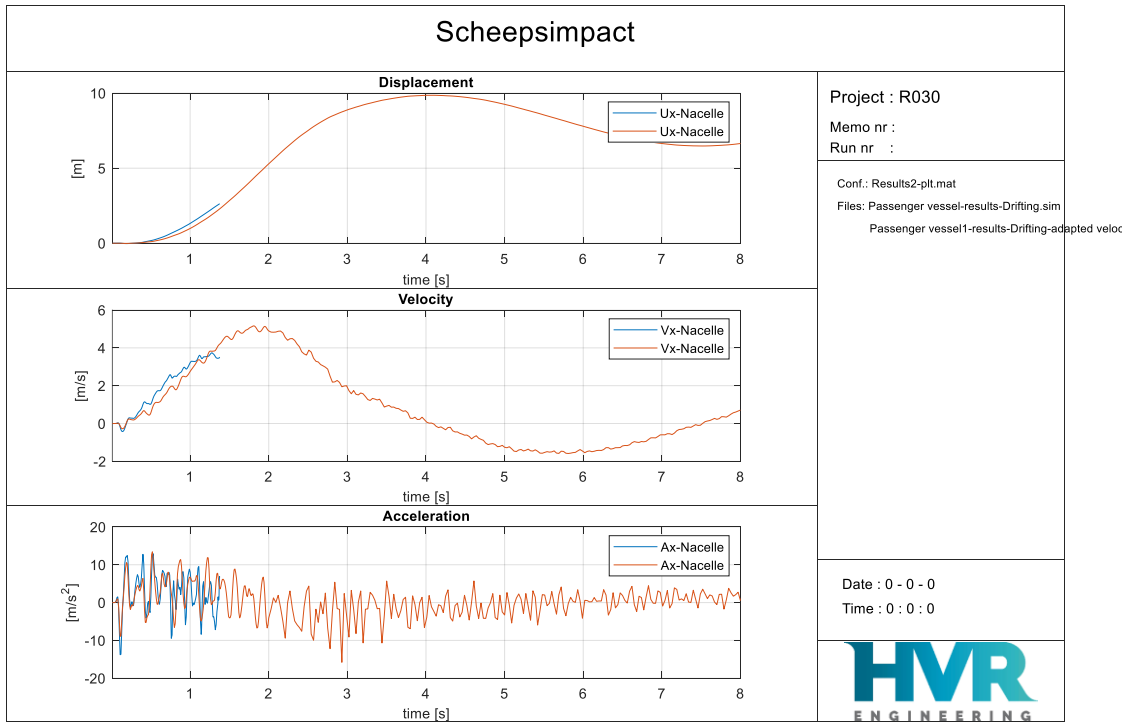


Figure B 57: Passenger vessel, Nacelle results, Drifting (Blue = original, Red = reduced force).

1

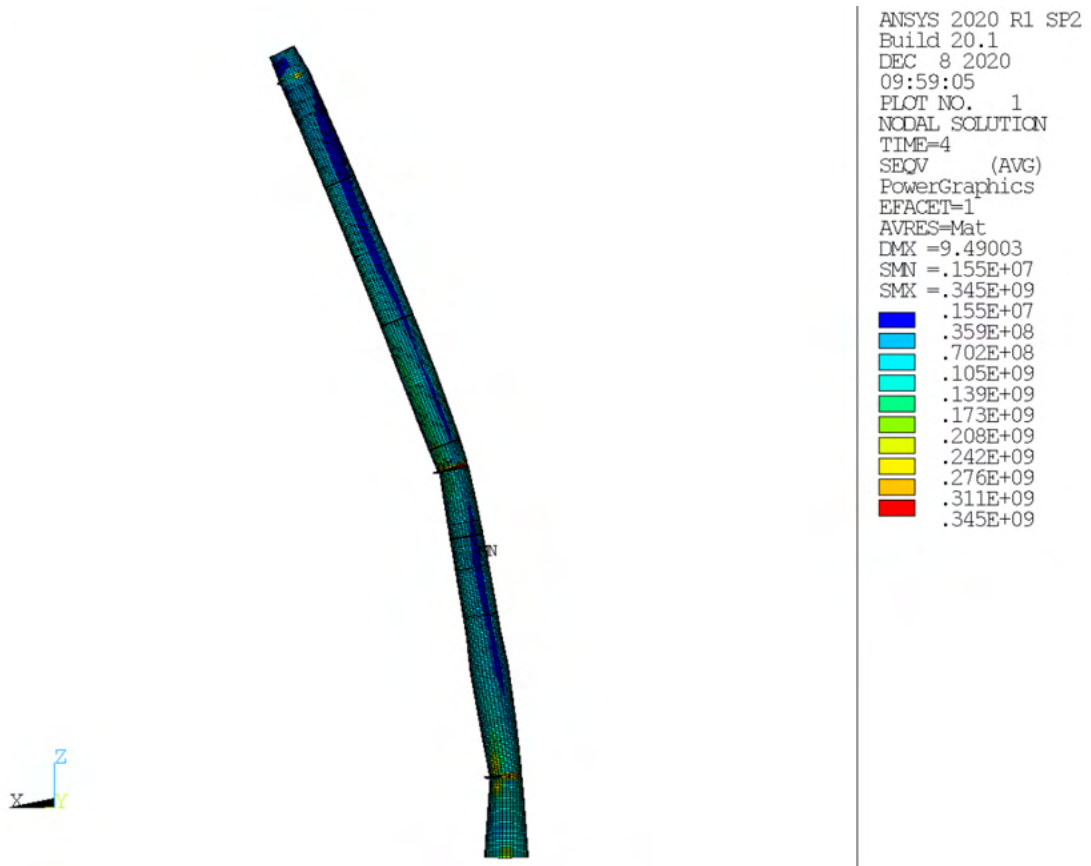


Figure B 58: Passenger vessel, maximum deformation and Von Mises stress in [Pa], Drifting.